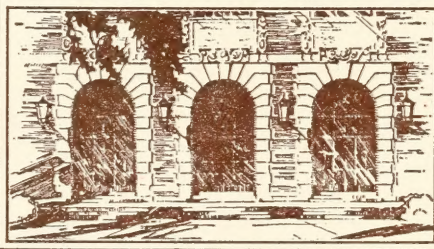


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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

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UNIVERSITY OF ILLINOIS
GRADUATE COLLEGE



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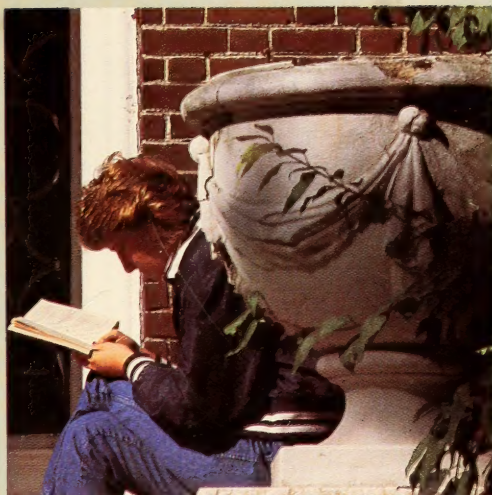
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1986-88
Courses
Catalog

University of Illinois
at Urbana-Champaign

Information contained herein is for informational purposes only and is subject to change without notice. Individual departments and units should be contacted for further information. Courses, faculty assignments, prerequisites, graduation or completion requirements, standards, tuition and fees, and programs may be changed from time to time. Courses are not necessarily offered each semester or each year. The University retains the exclusive right to judge academic proficiency and may decline to award any degree, certificate, or other evidence of successful completion of a program, curriculum, or course of instruction based thereupon. While some academic programs are designed for the purpose of qualifying students for registration, certification, or licensure in a profession, successful completion of any such program in no way assures registration, certification, or licensure by an agency not the University of Illinois.

University of Illinois administrative offices at Urbana-Champaign are open daily from 8:00 a.m. to 12:00 noon and 1:00 to 5:00 p.m. Monday through Friday, but not Saturdays, Sundays, or all-campus holidays which are indicated in the University Calendar.

An information center, available to visitors to the campus, is located in the north entrance lobby of the Illini Union. The center is open from 8:00 a.m. to 8:00 p.m. daily, including Saturdays and Sundays when classes are in session.

Small group information sessions about the campus are available at the Campus Visitor's Center in Levis Faculty Center, 919 West Illinois Street; visitors are welcome between 9:00 a.m. and 4:00 p.m. Monday through Friday, excluding campus holidays.

The policy of the University of Illinois is to comply fully with applicable federal and state nondiscrimination and equal opportunity laws, orders, and regulations. The University of Illinois will not discriminate in its programs and activities against any person because of race, color, religion, sex, national origin, ancestry, age, marital status, handicap, unfavorable discharge from the military, or status as a disabled veteran or veteran of the Vietnam era. This nondiscrimination policy applies to admissions, employment, and access to and treatment in University programs and activities.

For additional information on the equal opportunity and affirmative action policies of the University, please contact on the Urbana-Champaign campus: William A. Savage, Assistant Chancellor and Director of Affirmative Action Swanlund Administration Building, 601 East John Street, Champaign, IL 61820 (217) 333-0574.

Courses Catalog

1986-88 Courses Catalog

AT THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

(217) 333-1000

The 1986-88 Courses Catalog is produced in the Office of Public Affairs/
Office of Publications for the Office of the Vice-Chancellor for Academic
Affairs. The cover photograph was taken by Don Hamerman.

Courses Catalog

The following list of courses is arranged in alphabetical order by department and in numerical order within the departments.

Courses numbered:

100-199 are intended primarily for freshmen and sophomores although they may also be taken by juniors and seniors. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

200-299 are intended for undergraduate students who satisfy the published prerequisite(s), if any. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

300-399 are intended primarily for juniors, seniors, and professional and graduate students who satisfy published prerequisite(s), if any. These courses are offered for either undergraduate credit (expressed in hours) or graduate credit (expressed in units). Only graduate students and certain seniors with Graduate College approval may receive graduate credit.

400-499 are available for professional and graduate students, and certain seniors with Graduate College approval to register for graduate credit (expressed in units).

An undergraduate must have 30 hours of credit to be classified as a sophomore, a minimum of 60 hours to be classified as a junior, and a minimum of 90 hours to be classified as a senior. A graduate student is a person who has been admitted to the Graduate College.

Following the title of each course is a brief description of the content, the credit given, and the requirements for admission to the course, if any. Additional information relating to the course content is available from the offering department. Special requirements for admission to certain courses are introduced by the word *prerequisite*. Courses listed in this catalog are subject to revision without advance notice. Courses are not necessarily offered each semester or each year. Individual departments or units should be contacted for information regarding regularity of course offerings.

Each department has available the undergraduate course number 199, Undergraduate Open Seminar. This is a special course for independent study, for experimentation, or for seminars on topics not treated by regularly scheduled courses. Requests for initiation of

the course and suggestions for areas of study may be made by students; the course may also be initiated by a faculty member. The seminar may be offered with approval of the faculty member involved and the department head. A student may accumulate an unlimited number of credit hours in 199 courses, but no more than 12 such hours listed on the student's transcript may be counted toward fulfilling graduation requirements, except in cases where a larger number of credit hours in 199 courses is an integral part of a formal, college-approved program of study (such as Individual Plans of Study or Unit One). Credit toward satisfying particular college or departmental requirements is contingent upon approval of the appropriate college or departmental committee.

Credit for undergraduate students is counted in semester hours. A semester hour represents the work of one classroom period for fifty minutes each week through one semester (two periods per week in an eight-week summer session), or the equivalent in laboratory or field work or approved independent study. In description of courses, "3 hours" means 3 hours of credit each semester or summer session.

Credit for graduate students taking courses numbered 300 and above usually is counted in units. One unit is usually considered the equivalent of 4 semester hours of credit.

Undergraduate students wishing to enroll in courses numbered 300 and above for graduate credit or in 400-level courses for undergraduate credit must obtain the advance approval of the Graduate College.

Each undergraduate student is expected to pursue a normal program of studies; the number of hours required varies with the college and the curriculum. More or less than a normal program may be permitted only by the dean of the student's college or the dean's representative. To be eligible for participation in specified undergraduate student activities, the student must carry 12 hours in a semester. Twelve credit hours and above (3 units and above) in a semester comprise a full program of study for tuition and fees assessment; in an eight-week summer session the number of hours is 6 semester hours and above (1½ units and above). For information about criteria determining eligibility for Dean's List recognition, interested students should contact their college offices.

The minimum program required for receipt of maximum educational benefit payments under the Veterans Readjustment Benefits Act of 1966 and for receipt of social security benefits as a dependent is 12 hours (or 3 units) in a semester and 6 hours (or 1½ units) in an eight-week summer session.

Detailed information relating to admission, costs, and graduation requirements is given in the *Undergraduate Programs* and *Graduate Programs* catalogs. (See back inside cover for additional sources of information.)

ACCOUNTANCY

Head of Department: Professor F. L. Neumann

Department Office: 360 Commerce Building (West), 1206 S. Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Fundamentals of Accounting.** A survey course in the principles of accounting for students registered in schools and colleges other than Commerce and Business Administration. Prerequisite: Junior standing. 3 hours. Credit is not given for both Accountancy 200 and either 201 or 202.
- 201. Principles of Accounting, I.** Introduction to financial accounting; the communication of relevant information to external parties; includes development of accounting model, internal control, measurement processes, data classification and terminology, as well as interpretation and use of the resultant financial statements. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 201 and 200.
- 202. Principles of Accounting, II.** Introduction to managerial accounting; fundamentals of cost-volume analysis and product costing, management reporting and information for decision-making; introduction to budgets and standards for planning, control, and performance measurement. Prerequisite: Accountancy 201. 3 hours. Credit is not given for both Accountancy 202 and 200.
- 211. Intermediate Accounting, I.** Accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts for external reporting purposes; emphasizes the use of accounting information as a basis for decisions by management, stockholders, creditors, and other users of financial statements and accounting reports. Prerequisite: Accountancy 202. 3 hours.
- 212. Elementary and Intermediate Accounting.** An accelerated course for students with advanced standing and no prior preparation in accounting who desire to major in accountancy; fundamentals of proprietorship, partnership, and corporation accounting; consideration at the intermediate level of basic concepts of accounting theory; interpretation of financial statements and analysis of the principal accounts represented therein. Selected cost accounting topics. Prerequisite: Junior standing, a general University grade-point average of 3.5, or consent of head of department. 5 hours.
- 221. Cost Accounting.** Use of costs for control and decision making, with emphasis on standard costs, relevant costs, direct costing, nonmanufacturing costs, and responsibility accounting; for students who have already studied the basic elements of job order, process costs, and budgeting. Prerequisite: Accountancy 202. 3 hours.
- 251. Basic Federal Income Tax Accounting.** Basic discussion of history, theory, and broad outlines of federal income taxation for individuals, partnerships, and corporations, including the more important basic concepts involved in federal income taxation. Prerequisite: Accountancy 200 or 202. 3 hours.
- 299. Senior Research.** A research and readings course for students majoring in accountancy. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. May be repeated to a maximum of 6 hours.
- 300. Socio-Economic Management as Public Policy.** Same as Business Administration, Political Science, and Social Science 300. See Political Science 300.
- 311. Intermediate Accounting II.** Examines accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts of financial accounting for external reporting purposes; continuation of Accountancy 211. Prerequisite: Accountancy 211 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 312. Advanced Problems.** Consolidated statements; branch accounting; business combinations; foreign exchange; business reorganizations; and recent developments in theory and practice. Prerequisite: Accountancy 211. 2 hours or $\frac{1}{2}$ unit.
- 321. Managerial Accounting and Quantitative Techniques.** Application of quantitative and

mathematical techniques to managerial accounting problems including empirical methods, network techniques, probabilistic methods, linear algebra, sensitivity analysis, and other methods. Prerequisite: Accountancy 221; Economics 172; Mathematics 125. 3 hours or $\frac{3}{4}$ unit.

- 322. Managerial Accounting and Organizational Controls.** Studies managerial accounting and its functioning as an information subsystem, in relationship to the system of organization and the attainment of the goals of the enterprise; stresses the interactions of the components of the enterprise in response to information generated by the managerial accountant. Prerequisite: Accountancy 221; senior standing. 3 hours or $\frac{3}{4}$ unit.
- 331. Accounting Systems Design.** Examines the fundamentals of accounting systems design, including systems analysis and design techniques; surveys hardware and software considerations; analyzes accounting applications within functional areas of the firm; and studies the control of computerized systems in a business environment. Prerequisite: Accountancy 202 and Computer Science 105, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. Introduction to Management Information Systems.** Same as Business Administration 391. Analyzes information systems from a management control perspective, emphasizing organization environment, technology, decision models and performance evaluation as determinants of information processing requirements; cases and design projects explore the management of information processing systems, major functional applications and impacts of information technology on individuals and society. Prerequisite: Computer Science 105 or equivalent, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 333. Information Organization for Management Information Systems.** Same as Business Administration 392. See Business Administration 392.
- 334. Management Information System Development.** Same as Business Administration 393. See Business Administration 393.
- 335. Management Information and Control Systems.** Same as Business Administration 394. Integration of behavioral, quantitative, and system design concepts in relation to professional work in the management information systems area. Prerequisite: Business Administration 393 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 341. Auditing.** Nature of audit evidence; basic audit techniques; audit practices and procedures; professional ethics; and audit reports. Prerequisite: Accountancy 211, Economics 172, and Computer Science 105. 3 hours or $\frac{3}{4}$ unit.
- 342. Advanced Auditing Concepts and Practice.** Emphasizes the concepts and practice of professional auditing, including the application of generally accepted auditing standards, review of internal control, audit reporting practices, professional ethics, S.E.C. practices, statistical sampling, auditing EDP systems, and management advisory services practice. Prerequisite: Accountancy 341. 3 hours or $\frac{3}{4}$ unit.
- 343. Control and Audit of Accounting Systems.** Introduction to information systems, particularly in accounting, and their control and audit; discusses manual systems but emphasizes accounting information systems in a computer environment. Includes case studies and projects. Prerequisite: Accountancy 341 or consent of instructor; Computer Science 105 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 344. Internal Auditing and Management Control.** Examines concepts, standards, and procedures of internal auditing and management control; discusses specific case studies and problems to develop student awareness of and skills in the nonfinancial types of auditing such as operational, compliance, and management auditing, especially as practiced by either a business or a not-for-profit organization's own auditors. Prerequisite: Accountancy 341. 2 hours or $\frac{1}{2}$ unit.
- 351. Advanced Income Tax Problems.** Practical and theoretical training in the more common and important provisions of the federal income tax, advanced problems, and tax case research and preparation. Prerequisite: Senior standing; Accountancy 251. 3 hours or $\frac{3}{4}$ unit.
- 361. Public Sector Accounting.** Examines accounting, budgeting, auditing, and reporting principles and practices for municipalities and other not-for-profit organizations, including federal government, public schools, universities, hospitals, charities, religious organizations, and others. Prerequisite: Accountancy 200, 202, or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 371. Introduction to International Accounting.** Explores similarities and differences of accounting principles and procedures between the United States and other countries with special emphasis on worldwide and regional standardization; emphasizes consolidation of foreign subsidiaries, performance evaluation of foreign operations, statement analysis, translation, solutions to inflation accounting, and taxation of multinationals. Prerequisite: Accountancy 211 and 221, or equivalent; or Business Administration 460. 3 hours or $\frac{3}{4}$ unit.
- 381. Advanced Theory and Practice.** Selected problems from CPA examinations; analysis and revision of statements, partnerships, corporations, quasi-reorganizations, mergers, and others; theory, auditing, and ethics. Prerequisite: Accountancy 251, 311, 312, and 341. 3 hours or 1 unit.
- 382. Accounting Policy and Practice.** Uses case analysis to develop ethical judgment and communication skills concerning a wide range of policy issues and practice problems of the professional accountant. Prerequisite: Accountancy 341 or 404, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 401. Accounting Analysis, I.** Uses of accounting information; collection, processing, and communication of accounting information; measurement of assets, liabilities, equities, and income; and accounting system design. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 402. Accounting Analysis, II.** An in-depth study of accounting valuation processes, accounting income measurement, and special reporting problems of multiple-entity organizations. Prerequisite: Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 403. Managerial Accounting.** Introduction to management accounting as part of the firm's information system, in terms of modern cost accounting and budgetary systems for planning and controlling business operations. Prerequisite: Credit or concurrent registration in Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 404. Auditing.** Introduction to conceptual and applied material in the specialized accounting area of auditing; emphasizes the audit process, reporting, and professional responsibilities. Prerequisite: Credit or concurrent registration in Accountancy 402, or equivalent; enrollment in graduate degree program or consent of instructor. $\frac{1}{2}$ unit.
- 405. Federal Taxation.** Introduction to historical and conceptual as well as applied material in the accounting area of federal taxation; emphasizes the provisions of the tax law relevant to accounting measurement methods. Prerequisite: Accountancy 401; enrollment in graduate degree program or consent of instructor. $\frac{1}{2}$ unit.
- 411. Concepts and Principles.** The fundamental structure of accounting theory developed through the study of concepts characteristic of accounting and an examination of the literature dealing with the concise formulation of accounting principles. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor; Accountancy 491. 1 unit.
- 412. Income Measurements.** A study of the pros and cons of various unsettled issues involved in the calculation and disclosure of enterprise periodic income. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. 1 unit.
- 417. Financial Statement Analysis.** Examines tools and techniques of financial statement analysis from the perspective of investors and creditors; emphasizes theoretical and empirical properties of financial ratios. Prerequisite: Business Administration 451, 460, and 472; or equivalent; and enrollment in graduate degree program or consent of instructor. 1 unit.
- 421. Management Accounting, I.** Examines recent conceptual and analytical developments in the area of management accounting; includes a study of modern and relevant planning and control techniques and their underlying concepts as applied to the various functional areas within the firm. Prerequisite: Enrollment in graduate degree program or consent of instructor; an undergraduate course in management accounting. The student's background in statistics, economics, and mathematics should be equivalent to the undergradu-

ate requirements of the University of Illinois College of Commerce and Business Administration in these areas. 1 unit.

- 422. Management Accounting, II.** Development of the role and importance of accounting data in conjunction with modern quantitative methods in the process of industrial enterprise administration; attention focused on the use of existing accounting data in models and the demands on data accuracy and reliability as well as the necessity to develop additional data for the purpose of facilitating integrated planning, budgeting, and control processes. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 423. Cost Accounting Theory and Analysis.** A critical examination of recent developments in management accounting theory and research. Prerequisite: Accountancy 321 or 421. 1 unit.
- 424. Industrial Cost Control.** Study of cost accounting with emphasis on the use of operating data by management for control purposes; methods of material pricing and labor costs including fringe benefits; indirect manufacturing costs, direct costing, and standard costs; estimated and statistical costs; distribution costs; contribution to overhead theory; depreciation and replacement of equipment; selection of plant; decision to make or buy; and relation between costs and pricing policy. Prerequisite: Business Administration 460 or equivalent. 1 unit.
- 431. The Theory of Accounting System Design.** Problems and procedures in connection with designing and installing accounting systems. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 432. Information Systems and Inquiry Processes.** Investigates systems theory and methodology as a basis for generating knowledge useful in action to achieve social goals. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 441. Auditing Standards and Techniques.** A critical analysis of the techniques used in auditing; interrelation of audit standards, procedures, principles, and techniques; internal control as related to audit techniques; and trends and developments in the accounting profession. Prerequisite: Enrollment in a graduate degree program or consent of instructor. 1 unit.
- 450. Impact of Income Tax on Management Decisions.** Studies the impact of federal income tax law on management decisions; stresses awareness and recognition of the types of tax problems, so that the managers who are generalists will recognize situations where they will need to seek advice from specialists. Prerequisite: Business Administration 460 or consent of instructor. 1 unit.
- 451. Partnership Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving partnerships and their partners, including Subchapter S corporations and their shareholders. Prerequisite: Accountancy 251 or equivalent. 1 unit.
- 452. Corporate Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving corporations and their shareholders; coverage includes formations, operations, distributions, liquidations, reorganizations, and affiliations. Prerequisite: Accountancy 351 or equivalent. 1 unit.
- 453. Selected Topics in Federal Taxation.** Seminar on federal tax topics of current interest and how they shape the tax system; topics include international taxation, problems of closely-held businesses, tax factors in organizing and selling a business, planning for capital gains, real estate taxation, tax shelter, and new developments. Prerequisite: Accountancy 351 or consent of instructor. 1 unit.
- 459. Income Tax Development.** A theoretical and historical approach to the study of the development of federal income taxation, together with some research on tax cases and critical appraisal of the current law and proposals for its revision. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 471. Multinational Enterprise Accounting.** Analysis of accounting for operations of multinational enterprises which are subject to a wide variety of regulatory, social, and environmental influences; emphasizes financial and managerial accounting systems and their

- functions as evaluative, control, and reporting tools; and examines social accounting, foreign taxation, and nonmonetary evaluation methods. Prerequisite: Undergraduate degree in accountancy or equivalent; or Business Administration 460 and consent of instructor. 1 unit.
- 472. Accounting Under Different Social Systems.** Analyzes and compares accounting systems under different social systems with emphasis on the impact of regulatory and political structures on accounting; compares both macro and micro accounting systems for politically centralized and decentralized planning. Prerequisite: Undergraduate degree in accounting. 1 unit.
- 481. History of Accounting Theory.** Examines the more important aspects of accounting theory under the impact of changing conditions over four centuries, with major emphasis on the later developments. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 491. Methods and Practices in Professional Research.** Instruction in research methods, materials, and techniques together with individual practice in conducting and reporting specific professional research projects. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. 1 unit.
- 492. Accountancy Research Orientation.** Comparative study of alternative methodologies and conceptual frameworks and their application to selected current research issues central to the development of accounting thought, both theoretical and empirical. Prerequisite: Accountancy 411 and 421 and courses in behavioral science, mathematics, and economics; or equivalent background and admission to the accountancy Ph.D. program; or consent of instructor. 1 unit.
- 493. Special Research Problems.** Individual investigations or research projects selected by the students, subject to approval by the graduate adviser and the executive officer of the department. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. $\frac{1}{4}$ to 2 units.
- 494. Doctoral Research Seminar.** Seminars in various accounting areas designed to enhance the research abilities of doctoral students and to assist them in preparing research proposals; these include Behavioral Dimensions, Public Sector, Tax, Auditing, Managerial, and others announced in the Timetable. Prerequisite: Credit or concurrent registration in Accountancy 492 or consent of instructor. 1 unit. May be repeated.
- 499. Thesis Research.** Individual direction and guidance in writing theses; seminar discussion of progress made. 0 to 4 units.

ADMINISTRATION, HIGHER, AND CONTINUING EDUCATION

Chairperson of Department: Professor Thomas L. McGreal

Department Office: 333 Education Building, 1310 S. Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 267. The American College.** A survey of the American college and university; its history, structures, problems, trends, and governance. Provides an opportunity to explore the nature and scope of higher education in the United States. 3 hours.
- 362. Adult Learning and Development.** Same as Educational Psychology 362. Theory of and research on adult learning and development; includes societal context, performance, physiology and health, personality, and learning; and considers stability and change during young adulthood, middle age, and old age. Prerequisite: Educational Psychology 311 or 312, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 363. Instructional Design.** Same as Educational Psychology 363. See Educational Psychology 363.
- 380. Continuing Education General Seminar.** Introductory analysis of literature and professional practice in continuing education of adults; for beginning graduate students major-

ing in continuing education and for non-majors. 2 or 4 hours, or ½ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.

- 418. Economics of Education, Health, and Human Capital.** Same as Economics 418. See Economics 418.
- 433. Clinical Supervision of Instruction.** Same as Secondary Education 433. See Secondary Education 433.
- 438. Instructional Supervision.** Methods, theories, and research applying to supervision in education; analyzes the work of curriculum directors, supervisors, supervising principals, and department heads; studies supervisory methods, staff utilization, and staff development; and stresses evaluation of educational programs and the effects of supervision. 1 unit.
- 442. The Community College.** Same as Vocational and Technical Education 442. Community colleges and vocational-technical institutes: their purposes, function, and objectives; social forces related to their development and evaluation; characteristics and needs of students; educational programs and teaching strategies; and organization, control, and financing. 1 unit.
- 443. The College Student.** Study of the characteristics and development of college students, the institutional contexts in which they operate, and the interaction of students with the college environment. 1 unit.
- 448. Continuing Education Program Development.** Same as Secondary Education 448 and Vocational and Technical Education 448. Analysis of the process of planning and conducting continuing education programs for adults; includes theory, research, and practice regarding sponsors, need appraisal, objectives, selection and organization of learning activities, and evaluation. Recommended for majors in continuing education. Prerequisite: Consent of instructor. Administration, Higher, and Continuing Education 362 is recommended, especially for majors in continuing education. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. ½ to 1 unit. May be repeated for credit with consent of advisor and department chair.
- 450. Public Control and Administration of Education.** Provides the basic common understanding of theory and practice in operation and control of schools useful to teachers and other citizens; analyzes both formal and informal influences on governance; and serves as an introductory course for prospective administrative officers and supervisors. Not open to experienced administrators nor to students who have taken any of the following (or equivalents): Administration, Higher, and Continuing Education 430, 440, 461, 462, 463, 465, 466. 1 unit.
- 452. Current Issues in Higher Education.** Seminar on current issues, problems, and trends in higher education. Prerequisite: Two units in higher education or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 455. The Principalship in Elementary and Secondary Education.** Provides an overview and analysis of the administrative, supervisory, and leadership functions of building-level administrators; emphasizes the design and implementation of effective educational programs on a school-wide basis; analyzes administrative tasks and processes through case studies, interviews with practitioners, simulations, and readings. Prerequisite: Administration, Higher and Continuing Education 450 and teaching experience required. 1 unit.
- 461. Administration of Educational Programs and Personnel.** Studies principles and criteria for analysis of programs at various levels of operation, such as individual departments, schools, school systems, intermediate units, state education departments, and the federal government. This course and Administration, Higher, and Continuing Education 462 and 463 and Educational Psychology 413 constitute the required core program for all students specializing in educational administration who are candidates for a degree beyond the master's. Prerequisite: Admission to post-master's degree program in Administration,

Higher, and Continuing Education; Administration, Higher, and Continuing Education 450, and 430 or 440; or consent of instructor. 1 unit.

- 462. Organization and Business Administration of Public Education.** Organization and operation of public school government; functions and processes of school business administration, including internal organization of the division of business services; and scope and role of the business manager, budgetary process, accounting and financial reporting, contracts, liability, insurance, purchasing, auxiliary services, salary policies, and methods of survey, evaluation, and planning. Prerequisite: Administration, Higher, and Continuing Education 450, 430 or 440, and 461. 1 unit.
- 463. The Role of Administrative Leadership.** Studies perspectives on administrative leadership drawn from the social sciences and their application to the analysis and formulation of strategies for performing leadership functions in educational administration. Prerequisite: For majors in educational administration, Administration, Higher, and Continuing Education 461 and Educational Psychology 413; for students in other departments, admission to a post-master's degree program and consent of instructor. 1 unit.
- 464. Directed Field Experience in Administration.** Direct experience in the study of educational problems of concern to administrators; features an action component whereby the student is provided with opportunities for assuming responsibility for decision making in a live or simulated setting; each student works under the supervision of a professor, and where possible and appropriate, a practicing administrator. 1 to 3 units. May be repeated to a maximum of 3 units, with no more than 1 unit earned at the master's level.
- 465. Personnel Administration.** Principles, problems, and trends in the administration of professional public school personnel; organization of personnel; assessment and definition of personnel needs; recruitment, selection, and induction; evaluation; personnel development programs; and teacher organizations. Prerequisite: Administration, Higher, and Continuing Education 430 or 440, and 450. 1 unit.
- 466. Public School Finance.** Advanced graduate study of the theory and technology of public school finance; attention centered on analysis of principles and theory underlying fiscal practice in various states; technical knowledge of designing controls, organization, and fiscal systems in harmony with expressed theory; and the application of research to the analysis of problems related to the improvement of financing public schools. Prerequisite: Admission to advanced graduate program in the Department of Administration, Higher, and Continuing Education, or consent of instructor. 1 unit.
- 468. School-Community Relations.** Studies the relationship of the American school to the community; analysis of the power structure, social agencies, school liaison groups, and economic character of the community as they affect and are affected by the school; and evaluation of the various media of communication between the school and the larger community, and the development of criteria for an effective program of school-community relations. 1 unit.
- 469. Legal Basis of School Administration.** Legal rights, privileges, responsibilities, immunities, and authority of pupils, parents, teachers, administrators, and school board members in relation to the school. 1 unit.
- 471. State and Federal Educational Politics and Policies.** Examines the legislative and political processes in the formulation of current federal and state educational policies, together with the evaluation of policy and the formulation of policy alternatives. Prerequisite: Administration, Higher, and Continuing Education 469. 1 unit.
- 474. The American College and University.** Introduction to higher education as a subject: its history, purposes, leaders, and literature; attention to conceptual framework in which further development of this subject can progress. 1 unit.
- 475. Administration of Higher Education.** Administrative practices, procedures, and arrangements for policy implementation in the American college (including the community college) and university; special attention given to the roles of major administrative officers. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 477. Student Personnel Work in Higher Education.** Studies the theoretical foundations and

- principles underlying the practice of student personnel work; investigation of the role and function of student personnel workers in terms of their relationship to various goals, philosophies, issues, trends, and research. 1 unit.
- 478. The Administration of Student Personnel Work.** Structural arrangements for meeting student oriented needs in the American college (including the junior college) and university; attention to the role of the chief administrative officer for student affairs. Prerequisite: Administration, Higher, and Continuing Education 477 or equivalent. 1 unit.
- 479. Organization and Control of Higher Education.** Organizational patterns whereby colleges and universities seek to accomplish their purposes; agencies involved in the control of higher education. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 480. Internship in the Administration of Higher Education.** Provides supervised direct experience in the administration of higher education; with the aid of the faculty, students select the institution and position most relevant to their career goals. Prerequisite: Consent of instructor. 1 unit. No more than 2 units may be given toward an advanced degree.
- 483. Societal Context of Continuing Education.** Analyzes the continuing education agency as a social system; includes learning group, planning committee, organizational relations with parent institution, and linkage with community; recommended for majors in continuing education. Prerequisite: A basic graduate course on social systems (such as Educational Psychology 413, Educational Policy Studies 315 or 385, Sociology 456 or 492, or Psychology 355). 1 unit.
- 484. Continuing Education Internship.** Supervised field experience. Prerequisite: Consent of instructor. 1 to 2 units. May be repeated to a maximum of 4 units.
- 485. Continuing Education Agency Administration.** Organization and administration of continuing education programs for adults: decision making, policy, finance, personnel, program, and community relations; analysis of theory, research, and practice; and emphasis on case analysis. Recommended for majors in continuing education. Prerequisite: Administration, Higher, and Continuing Education 483 and a basic administration course such as Administration, Higher, and Continuing Education 450 or 479, Vocational and Technical Education 489, Library Science 405, or Business Administration 401. 1 unit.
- 486. Continuing Education Advanced Seminar.** Analyzes specialized topics related to continuing education of adults; for advanced students. Recommended for majors in continuing education. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
- 490. Seminar for Advanced Students of Education.** Open only to persons who have been admitted for doctoral study in the Department of Administration, Higher, and Continuing Education. Prerequisite: Consent of instructor. 1 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage, and 4) the final design stage. Students are expected to analyze all presentations critically. Prerequisite: Consent of instructor. 1 to 2 units.
- 497. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Social Work 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ADVERTISING

Head of Department: Professor Kim B. Rotzoll

Department Office: 103 Gregory Hall, 810 S. Wright, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 281. Introduction to Advertising.** A survey of the economics, psychology, and philosophy

of advertising; preparation of advertisements; selection of media; and organizational structure. Not open to seniors unless enrolled in the College of Communications. Prerequisite: Sophomore standing and consent of department. 3 hours.

288. Sales Writing. Same as Business and Technical Writing 271. See Business and Technical Writing 271.

291. Special Problems. Special projects, research, and independent reading in advertising for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Written research proposal and consent of head of department. 2 or 3 hours.

309. Public Relations. Publicity methods and public relations; representation of profit and nonprofit institutions to the public; use of communications research and media; and preparation of public relations campaigns. Prerequisite: Junior standing in the College of Communications; consent of department. 3 hours or 1/2 unit.

381. Advertising Research Methods. Quantitative techniques and research methodology in advertising; philosophy of science; statistical methods; survey and experimental design; emphasizes the problems of advertising research. Prerequisite: Advertising 281; junior standing; a specified course in statistical methods; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.

382. Advertising Creative Strategy and Tactics. Theory and practice of advertising message planning and creation for print and broadcast media; use of consumer and market surveys; copytesting methods; and advertising readership studies. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.

383. Advertising Media Strategy and Tactics. Analyzes the various advertising media in terms of markets served and factors to consider in the selection of media. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.

390. Advanced Creative Strategy and Tactics. Advanced work in application of behavioral science and creative process to planning and writing of advertisements. Prerequisite: Advertising 382; consent of department. 3 hours, or 1/2 or 1 unit.

391. Advertising Management: Planning. Analyzes actual advertising situations through the case method and study of how such situations might be met; covers all of the decision making areas of advertising. Prerequisite: Advertising 381, 382, and 383; Mathematics 111 or 112, or equivalent, Business Administration 202; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.

392. Advertising Management: Strategy and Tactics. Application of advertising management decision criteria to actual communication problems involving advertisers; development of strategy and tactics. Prerequisite: Advertising 391; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.

393. Advertising in Contemporary Society. A studies advertising as an institution and its role in communications, society, our economy, and business. Prerequisite: Advertising 181; senior standing; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.

481. Economic and Social Aspects of Advertising. Same as Communications 481. Examines advertising as an institution; the economic, social, and legal aspects of advertising with focus on current problems. Prerequisite: Advertising 391, 392, and consent of department. 1 unit.

482. Research Methods in Advertising and Communications. Same as Communications 482. A treatment of basic research concepts and procedures in the social sciences with emphasis on advertising and communications; examines both nonquantitative and quantitative methods. Prerequisite: Advertising 481; a basic course in statistical methods; and consent of department. 1 unit.

483. Advertising as Communication. Advertising messages from the perspective of communication and mass communication theories; application of theory to advertising communication problems. Prerequisite: Advertising 382 and consent of department. 1 unit.

484. Advertising and Consumer Behavior. Examines consumer behavior as a means of

shaping the communications message; use of the behavioral sciences in creative communication strategy. Prerequisite: Advertising 391 and consent of department. 1 unit.

- 485. Advertising Planning and Decision Making.** Same as Communications 485. Examines the theoretical foundations of decision theory as they relate to planning and decision making in advertising; use of decision models in the development of strategies and tactics. Prerequisite: Advertising 391 and consent of department. 1 unit.
- 486. Analytical Methods in Advertising and Communications.** Same as Communications 486. Seminar emphasizing fundamental problems in advertising and communications and the methods applicable to their solution; problem areas covered include aspects of message-related issues and response function building and usage; applies methods drawn from various disciplines to these problem areas; and applies analyses on pre-collected advertising and communications data using computerized statistical program packages. Prerequisite: Advertising 391 and a specified course in statistical methods. 1 unit.
- 490. Special Topics in Advertising.** Prerequisite: Consent of department. $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** Prerequisite: Graduate standing in advertising. 1 to 2 units.

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

Acting Head of Department: Professor S. M. Yen

Department Office: 101 Transportation Building, 104 S. Mathews, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 212. Aerodynamics, I.** Quasi-one-dimensional flow; conservation of mass, momentum, and energy; steady flow with variable area; steady, constant area flow with friction, heat addition, and mass injection; shock waves; nonsteady, one-dimensional flows; and two-dimensional flow, oblique shock waves, and Prandtl-Meyer waves. Prerequisite: Mechanical Engineering 207; Theoretical and Applied Mechanics 156; credit or concurrent registration in Mathematics 343. 4 hours.
- 213. Aerodynamics, II.** Equations of motion for a viscous, heat-conducting fluid; exact solutions of the Navier-Stokes' equations; boundary layer theory; inviscid approximations, vorticity, and circulation; potential flow; solutions of potential flow equations, sources, sinks, and Prandtl-Meyer flow; thin airfoil and slender body theory; and method of characteristics. Prerequisite: Aeronautical and Astronautical Engineering 212. 4 hours.
- 224. Flight Structures, I.** Development of fundamental concepts of elasticity as related to stress, strain, equilibrium, compatibility, and material properties; applications to flight vehicle structural problems in unsymmetric bending, torsion, thick-walled cylinders, rotating discs, shear flow, and shear center problems. Prerequisite: Mathematics 345; Theoretical and Applied Mechanics 156. 4 hours.
- 225. Flight Structures, II.** Energy concepts with applications to indeterminate flight structures, sandwich beams, and shear flow; elastic and plastic buckling of columns and plates; and membrane theory of shells. Prerequisite: Aeronautical and Astronautical Engineering 224. 4 hours.
- 233. Aircraft Propulsion.** Fundamentals of air breathing jet propulsive devices; prediction of thrust, specific fuel consumption, and operating performance; ramjets; turbojets; turbopumps; turboprops; aerothermodynamics of inlets, combustors, and nozzles; compressors, turbines, and propellers; and component matching. Prerequisite: Aeronautical and Astronautical Engineering 212 or first course in gas dynamics. 3 hours.
- 241. Flight Vehicle Design.** Introduction to preliminary design of airplanes, missiles, and space vehicles; further development of concepts in orbital mechanics, hypersonic aerodynamics, and aerodynamic heating. Prerequisite: Aeronautical and Astronautical Engineering 213, 225, 233, and 255; Computer Science 101. 3 hours.
- 254. Aerospace Dynamic Systems, I.** Modeling of linear dynamic systems; Laplace transforms and linear feedback control systems; stability criteria and design techniques; introductory

aircraft flight stability and control. Prerequisite: Mathematics 345 and Theoretical and Applied Mechanics 156. 4 hours.

255. **Aerospace Dynamic Systems, II.** Examines particle kinematics and dynamics; fundamentals of orbital mechanics; Lagrange's equations; vibration of multiple degree of freedom systems and continuous elastic structures; rotational kinematics and dynamics of rigid bodies. Prerequisite: Aeronautical and Astronautical Engineering 254 and Mathematics 225. 4 hours.
260. **Aerospace Laboratory, I.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on fluid dynamics, aerodynamics, thermal, combustion and propulsion phenomena. Prerequisite: Aeronautical and Astronautical Engineering 213 and 233. 2 hours.
261. **Aerospace Laboratory, II.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on structural mechanics, vibrations, dynamics, and systems. Prerequisite: Aeronautical and Astronautical Engineering 225 and 255. 2 hours.
280. **Energy Alternatives and Societal Values: Technology Assessment for Non-Engineers.** The energy-environment crisis as a societal problem. Energy alternatives: their technology, potential, and human and environmental consequences. Values, technology, and the social construction of future reality. Introduction to the information, ideas, values, and perceptions currently affecting the societal definition and resolution of the energy-environment problem. Student participation in simulated adversary proceedings, role playing, panel discussions, and values-clarification and problem-clarification strategies. Lectures and extensive readings. 4 hours.
281. **Introduction to Renewable Energy Sources.** The technology of renewable energy sources: wind power and the performance of large and small wind turbine systems; ocean thermal energy conversion and ocean wave power; solar thermal electric power; solar cells; the elements of design and sizing of solar heating and cooling systems; hydroelectric power; biomass fuels; hydrothermal-reservoir and dry-rock geothermal energy; energy storage; on-site energy systems; the concept of appropriate technology, and the economics of renewable energy systems. Prerequisite: Mathematics 132, and Physics 102 or 108, or consent of instructor. 3 hours.
292. **Seminar.** Reports and discussions of recent developments in the fields of aerodynamics, flight mechanics, power plants, structures, and maintenance and operations as related to airplanes, missiles, and space vehicles. Prerequisite: Senior standing. 1 hour.
296. **Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
303. **The Effect of Space Environment on Satellite Motion.** Free molecule aerodynamics, gravity gradient and solar radiation torques on satellites, interaction of on-board magnetic dipoles with the earth's magnetic field, solar wind, cosmic dust and micrometeoroid torques, lifetime problem and density determination, and utilization of these various environmental effects in satellite attitude control. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or 3/4 or 1 unit.
306. **Orbital Mechanics.** Analysis of orbits in an inverse square gravitational field; elementary rocket dynamics, impulsive orbit transfer and rendezvous, and Lambert's Theorem with applications; patched-conic trajectories, planetary swingby maneuvers, and linearized orbit theory with application to simplified analytical models. Prerequisite: Aeronautical and Astronautical Engineering 253 or consent of instructor. 3 hours, or 3/4 or 1 unit.
311. **Aerodynamics of Compressible Fluids.** Methods of solution of fluid flow problems in subsonic, transonic, and supersonic flight regimes. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or 3/4 or 1 unit.
313. **Aerodynamics of Incompressible Fluids.** Governing equations for incompressible flow;

vorticity, circulation, and Kelvin's, and Helmholtz's theorems; velocity potential and stream function; three-dimensional steady and nonsteady flows, d'Alembert's paradox, and apparent mass; two-dimensional steady flows, complex potential and velocity, and mapping of flows; two-dimensional airfoils and Joukowski transformation and airfoils; and thin airfoil theory. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 314. Aerodynamic Heat Transfer.** Thermal boundary layers; turbulent heat transfer; aerodynamic heating; and radiative heat transfer. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 316. Applied Aerodynamics.** Two-dimensional and finite wing theory with emphasis on the mechanisms of lift and drag generation; Reynolds number and Mach number effects; drag analysis; high-lift wing systems; propeller and rotor aerodynamics; control surface design; and application of V/STOL aerodynamics. Prerequisite: Aeronautical and Astronautical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 317. Elements of Magnetohydrodynamics.** Equations of magnetohydrodynamics; single-fluid and multiple-fluid models; magnetic interaction parameters; magnetosonic waves; hydromagnetic shock waves; aligned-field and crossed-field flows; theory of characteristics; MHD acceleration, generation, and propulsion. Prerequisite: Aeronautical and Astronautical Engineering 212 or consent of instructor. 3 hours or 1 unit.

- 319. Aircraft Flight Mechanics.** Steady and quasi-steady aircraft flight performance; take-off and landing, climbing and diving, cruise, level turn, and introduction to energy methods; longitudinal, directional, and lateral static stability and control; and introduction to longitudinal and lateral motion and dynamic stability. Prerequisite: Aeronautical and Astronautical Engineering 213, 233, and 255, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 320. Finite Element Methods in Aerospace Structures.** Finite element methods in the analysis of aerospace structures; includes treatment of different types of elements in the analysis of static, dynamic, and stability problems; and emphasizes structures most commonly used in aerospace applications. Introduction to NASTRAN program use. Prerequisite: Computer Science 101 and Aeronautical and Astronautical Engineering 225. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.

- 326. Theory of Continuous Media.** Introduction to the general theory of continuous media and its application to the theories of elasticity, fluid mechanics, and inelasticity; stress and strain tensors and their invariants; nonlinear equilibrium conditions; the mechanism of deformation of single crystal and polycrystalline media; basic concepts of the structure of matter; thermodynamic considerations; and equations of state and stress-strain relationships with applications. Prerequisite: Consent of instructor. 3 hours or 1 unit.

- 333. Electric Propulsion.** Elements of propulsion as applied to deep space missions; physics of ionized gases; plasmadynamics; electrothermal, electromagnetic, and electrostatic acceleration of gases to high velocity; high-impulse thruster design and performance; and the resistojet, arcjet, ion engine, MPD arc, and plasma gun. 3 hours or 1 unit.

- 334. Rocket Propulsion and Rocketry.** Basic principles of rocket propulsion and rocketry, propellants and their influence on design of rockets, internal and external ballistics, combustion processes, design of components, flight performance, and rocket testing. Prerequisite: Aeronautical and Astronautical Engineering 212 or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 335. Air Pollution and Combustion.** Same as Mechanical Engineering 333 and Civil Engineering 358. Natural and man-made pollutants in the atmosphere; fundamentals of stoichiometry, reaction kinetics, and chemical equilibrium as applied to pollutants and their reactions in the air; and all combustion devices which make major contributions to air pollution, and current and possible control techniques for these devices. Prerequisite: Chemistry 102 and Mechanical Engineering 205 or 207, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 351. Aeroelasticity and Aeroinelasticity.** Advanced fundamental treatment of aerodynamic and dynamic structural phenomena associated with flexible airplanes and missiles; diver-

gence of linear and nonlinear elastic lifting surfaces; effect of elastic and inelastic deformations on lift distributions and stability; elastic flutter of straight and swept wings; equations of disturbed motion of elastic and inelastic aircraft; dynamic response to forces, gusts, and continuous atmospheric turbulence; creep divergence of lifting surfaces; flutter in the presence of creep; and effect of temperature on inelastic divergence and flutter. Prerequisite: Aeronautical and Astronautical Engineering 255. 3 hours or 1 unit.

381. **Wind Power Technology.** Aerodynamic, electromechanical, and structural design of wind power systems; classical windmills; modern wind power generators; wind characteristics and distribution; instrumentation and measurement; energy storage considerations; socioeconomics of wind power systems; performance of large and small scale wind turbines; and current design approaches. Prerequisite: Aeronautical and Astronautical Engineering 213, Chemical Engineering 371, Mechanical Engineering 211, or Theoretical and Applied Mechanics 235, or equivalent; and Electrical Engineering 220 or equivalent, and Aeronautical and Astronautical Engineering 255, Mechanical Engineering 220, or Theoretical and Applied Mechanics 311, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
391. **Special Problems.** Special problems relating to the theory, design, testing, operation, maintenance, or production of airframes or aircraft power plants. Prerequisite: Senior standing in engineering; consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
404. **Optimization of Aerospace Systems.** Formulation of parameter and functional optimization problems for dynamic systems; applications of optimization principles to the control and performance of aerospace vehicles, including optimal flight paths, trajectories, and feedback control. Prerequisite: Aeronautical and Astronautical Engineering 255 or equivalent. 1 unit.
412. **Aircraft Dynamic Stability and Control.** Study of dynamic stability and control of rigid aircraft; small disturbance theory; linearization of equations of motion; uncontrolled motion characteristics; longitudinal and lateral natural modes; open loop control response; introduction to closed loop response. Prerequisite: Aeronautical and Astronautical Engineering 319, or consent of instructor. 1 unit.
414. **Boundary Layer Theory.** Theories of the boundary layer of a compressible fluid and their solutions; laminar and turbulent; boundary layer in hypersonic flows. Prerequisite: Aeronautical and Astronautical Engineering 213. 1 unit.
415. **Wing Theory.** Theoretical analysis of the aerodynamic characteristics of two- and three-dimensional wings and multiple body systems in subsonic and supersonic flows. Prerequisite: Mathematics 346 or equivalent. 1 unit.
417. **Fundamentals of Gas Kinetics.** Fundamental concepts required to study gas dynamic problems from the viewpoint of kinetic theory; derivation of the Boltzmann equation from classical mechanics; reduced and truncated distribution functions and the BBGKY hierarchy; molecular collisions; flux vectors and equations of change; moment equations; summational invariants; H-theorem and Maxwellian distribution; inclusion of the effect of solid surfaces in kinetic theory; existence theory for the Boltzmann equation; iteration procedures; moment methods; Chapman-Enskog procedure; and first and second approximations to the distribution function; heat flux vector; and stress tensor. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 1 unit.
418. **Theory of Rarefied Gas Flows.** Application of kinetic theory to rarefied gas flow problems; free molecule flow; near free molecule flow; linearized problems; and flows with appreciable deviation from equilibrium. Prerequisite: Aeronautical and Astronautical Engineering 417. 1 unit.
428. **Theory of Large Deformations in Nonlinear Continuous Media.** Fundamental concepts of large deformations in nonlinear elasticity and inelasticity with applications: generalized tensors; finite deformations; stress-strain relations in terms of strain energy functions; solutions of tension, shear and bending problems; finite plane strain; theory of successive approximations; fiber-reinforced beams; plates and cylinders; thermodynamics of deformable media; stability considerations; and constitutive relations for inelasticity. Prerequisite: Aeronautical and Astronautical Engineering 326 or equivalent. 1 unit.

- 429. Theory of Linear and Nonlinear Viscoelasticity.** Same as Theoretical and Applied Mechanics 429. Fundamental concepts of viscoelasticity with applications: elastic-viscoelastic analogies, creep and relaxation functions, thermomechanical reciprocity relations, variational principles, model fitting, shear center motion, thick-walled cylinders under pressure and inertia loads with material annihilation, sandwich plates, propagation of viscoelastic waves, vibration of bars, plates and shells, nonlinear elastic-viscoelastic analogy, properties of nonlinear viscoelastic stress-strain laws, creep rupture, and torsion of nonlinear bars and shells. Prerequisite: Aeronautical and Astronautical Engineering 326 or consent of instructor. 1 unit.
- 434. Aerodynamic Heating.** Theory of convective aerodynamic heating in high-speed flow and laminar and turbulent flows; ablation, transpiration cooling, and mass transfer cooling; aerodynamic heating in hypersonic flow, real gas effects, and effect of pressure interactions and vorticity interactions; and heat transfer in rarefied gas flows. Prerequisite: Aeronautical and Astronautical Engineering 414 or equivalent. 1 unit.
- 438. Fundamentals of Combustion.** Same as Mechanical Engineering 403. Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex detonation waves; and supersonic burning. Prerequisite: Aeronautical and Astronautical Engineering 213 or Mechanical Engineering 305. 1 unit.
- 452. Stochastic Structural Dynamics.** Same as Theoretical and Applied Mechanics 417. Structural dynamics problems treated from a probabilistic point of view; theory of probability and random processes introduced as mathematical tools; response of structures under random excitation is studied in order of increasing complexity; and probability of failure for such structures is discussed. Prerequisite: Aeronautical and Astronautical Engineering 255, Theoretical and Applied Mechanics 314, or equivalent. 1 unit.
- 453. Aerodynamic Noise.** Same as Theoretical and Applied Mechanics 418. Mathematical techniques for the analysis of intensity, spectrum, and directivity of noise field in various environments; practical examples including jet and rocket engines, propeller and fan, sonic boom, and cabin noise of high speed vehicles. Prerequisite: Graduate standing in engineering, physics, or mathematics. 1 unit.
- 490. Seminar.** Presentation by graduate students and staff of current topics in the field of aeronautics. Prerequisite: Graduate standing in aeronautical and astronautical engineering. 0 units.
- 498. Special Problems.** Theoretical and experimental investigations of problems in airplane, missile, and space flight engineering. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Research in the various areas of the aeronautical and astronautical engineering sciences. 0 to 4 units.

AFRICAN STUDIES

Director of Center: Professor Donald E. Crummey

Center Office: Room 101, 1208 West California Street, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Elementary Hausa, I.** Same as African Languages 201. See African Languages 201.
- 202. Elementary Hausa, II.** Same as African Languages 202. See African Languages 202.
- 210. Introduction to Modern African Literature.** Same as Comparative Literature 210 and English 211. Significant contemporary African writings depicting the history and cultural traditions of African peoples. 3 hours.
- 211. Elementary Lingala, I.** Same as African Languages 211. See African Languages 211.
- 212. Elementary Lingala, II.** Same as African Languages 212. See African Languages 212.

- 222. Introduction to Modern Africa.** Same as Anthropology, Political Science, and Sociology 222. An interdisciplinary introduction to Africa dealing with basic themes and problems in the politics, economics, sociology, anthropology, and history of Africa. 3 hours.
- 231. Elementary Swahili, I.** Same as African Languages 231. See African Languages 231.
- 232. Elementary Swahili, II.** Same as African Languages 232. See African Languages 232.
- 241. Elementary Wolof, I.** Same as African Languages 241. See African Languages 241.
- 242. Elementary Wolof, II.** Same as African Languages 242. See African Languages 242.
- 303. Intermediate Hausa, I.** Same as African Languages 303. See African Languages 303.
- 304. Intermediate Hausa, II.** Same as African Languages 304. See African Languages 304.
- 310. Modern African Fiction.** Same as Comparative Literature and French 310 and English 370. Examines selected major African novels along thematic and formal lines; literary responses to colonialism and political independence and the crises that accompanied both in Africa; and study of critical approaches to the African novel and African characteristics of and contribution to the novel as a genre. Readings in English. Prerequisite: African Studies 210 or 222, or junior standing. 3 hours or 1 unit.
- 313. Intermediate Lingala, I.** Same as African Languages 313. See African Languages 313.
- 314. Intermediate Lingala, II.** Same as African Languages 314. See African Languages 314.
- 325. Southern Africa: Race and Power.** Same as History 325 and Political Science 333. An interdisciplinary survey of both the internal and international dimensions of the changing situation in Africa south of the Zambezi; focuses on the historical background to, and a political, economic, and social analysis of current events in the Republic of South Africa, Mozambique, Namibia, and Zimbabwe, emphasizing the central significance of race and power in this region. Prerequisite: History 216 or African Studies 222. 3 hours or 1 unit.
- 333. Intermediate Swahili, I.** Same as African Languages 333. See African Languages 333.
- 334. Intermediate Swahili, II.** Same as African Languages 334. See African Languages 334.
- 335. Advanced Swahili, I.** Same as African Languages 335. See African Languages 335.
- 336. Advanced Swahili, II.** Same as African Languages 336. See African Languages 336.
- 343. Intermediate Wolof, I.** Same as African Languages 343. See African Languages 343.
- 344. Intermediate Wolof, II.** Same as African Languages 344. See African Languages 344.
- 450. Seminar on Selected Topics in African Studies.** Topics vary with the disciplinary focus. Prerequisite: Consent of instructor. 3 or 1 unit. May be repeated to a maximum of 3 units.

AFRO-AMERICAN STUDIES

Director of Program: Professor M. A. Lewis

Program Office: 1204 West Oregon Street, Urbana

- 100. Introduction to Afro-American Studies.** An interdisciplinary introduction to the basic concepts and literature in the disciplines covered by Afro-American studies; stresses the role of historical, political, and economic forces in shaping cultural expression. 3 hours.
- 161. Black Folk Culture.** Same as Anthropology 161. See Anthropology 161.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 224. Humanistic Perspectives of the Afro-American Experience.** A multidisciplinary study of major aspects, events, and periods of the Afro-American experience; includes a series of topics each focusing on one movement or historical event as reflected in Afro-American literature, art, and music. Prerequisite: Afro-American Studies 100 or consent of instructor. 3 hours.
- 227. Black Experience in Hispanic Literatures.** Same as Spanish 227. See Spanish 227.
- 253. Afro-American History to 1877.** Same as History 253. See History 253.
- 254. Afro-American History Since 1877.** Same as History 254. See History 254.
- 259. Afro-American Literature, I.** Same as English 259. See English 259.
- 260. Afro-American Literature, II.** Same as English 260. See English 260.
- 261. Afro-American Societies and Cultures.** Same as Anthropology 261. See Anthropology 261.

- 298. Special Topics in Afro-American Studies.** Advanced seminar on selected topics with particular emphasis on current research trends. Prerequisite: Junior status and one of the following: Afro American Studies 224, or History 253 or 254, or English 259 or 260. 3 hours. May be repeated to a maximum of 6 hours.
- 327. Black Political Participation in the American Political Process.** Same as Political Science 327. See Political Science 327.
- 353. Afro-American Intellectual History.** Same as History 353. See History 353.
- 368. The South in American History.** Same as History 368. See History 368.
- 379. Slavery and Race Relations in Latin America.** Same as History 379. See History 379.

AGRICULTURAL COMMUNICATIONS

Head of Office: Professor D. T. Dahl

Office: 67 Mumford Hall, 1301 West Gregory, Urbana

- 106. Functional Writing.** Instruction and practice in functional writing related to unique interests of students in the College of Agriculture; designed primarily to be taken with freshman rhetoric by students with special needs for improvement in their use of English. Prerequisite: Restricted to students in the College of Agriculture. 1 to 2 hours.
- 114. Agricultural Communications Media and Methods.** Same as Journalism 114. Introduction to print, broadcast, visual, and other major communications media used to convey agricultural information; development of basic skills in communicating through those media. Prerequisite: Completion of rhetoric requirement. 3 hours.
- 214. Agricultural Communications Strategy.** Same as Journalism 214. Coordinated approach to planning and carrying out programs of agricultural information and education using a variety of communications media; students apply principles of strategy to actual communications problems of their choice. Prerequisite: Agricultural Communications 114 or consent of instructor. 3 hours.
- 240. Photography in Agriculture.** Application of visual communications principles to agriculture using the photograph as medium; emphasizes communicative, creative, and technical aspects. See Timetable for approximate cost of materials. Prerequisite: Agricultural Communications 114; consent of instructor. 4 hours.
- 290. Professional Seminar.** Professional developments and issues in agricultural communications; the agricultural communicator today; and avenues for continuing professional growth. Prerequisite: Junior-senior standing in agricultural communications. 1 hour.
- 300. Special Problems in Agricultural Communications.** Special projects, research, and independent study in agricultural communications. Prerequisite: Agricultural Communications 114 or equivalent; written consent of instructor and authorized departmental approval prior to advance enrollment and registration; not open to students on probation. Specific approval of the associate dean is required in advance of registration for a second and/or third special problems course. 1 to 5 hours, or $\frac{1}{2}$ to 2 units.
- 310. Information for Agriculture.** Examines the role, value, kinds, channels, sources, and uses of information in U.S. agriculture; changes in channels, emerging communications technologies and other forces that may affect them; also examines outlook and issues concerning information for agriculture. Prerequisite: Agricultural Communications 114 and 214. 3 hours or $\frac{3}{4}$ unit.
- 320. Agriculture and Its Publics.** Communications analysis of major interactions between agriculture and other segments of American society. Prerequisite: Six hours of social science. 3 hours or $\frac{3}{4}$ unit.
- 330. Promotion of Farm Products.** Studies producer-sponsored efforts to promote consumption of farm products; includes consumption trends and forces, current promotion activities, uniqueness and effects of commodity promotion, funding and organization, export promotion, and principles in promotion planning. Prerequisite: Economics 101 or Agricultural Economics 100; Agricultural Communications 114. 3 hours or $\frac{3}{4}$ unit.

- 460. Teaching of College-Level Agriculture.** Analysis and preparation for the problems encountered in the effective teaching of college-level agriculture and home economics, systems approach, including instructional objectives, preassessment of students, instructional strategies, materials, and student performance evaluation, and detailed study of individual problems supplements class work. Prerequisite: Master's standing. 3 unit.
- 461. Extension Communications Management.** Analysis and management of effective extension communications based on present communication and educational concepts. 1 unit.

AGRICULTURAL ECONOMICS

(Including Rural Sociology)

Head of Department: Professor W. D. Seitz

Department Office: 304 Mumford Hall, 1301 W. Gregory, Urbana

Agricultural Economics

- 100. Introductory Agricultural Economics.** Principles of production, supply, and demand applied to economic problems of agriculture and agriculturally related industries and to decisions in farm management, marketing, foreign trade, and agricultural policy; the role in economic growth of natural resources, population, and capital. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Problems in Agricultural Economics.** Individual research work under the supervision of senior members of the staff in the following fields: agricultural credit and finance; agricultural law; agricultural marketing; agricultural policy; agricultural prices; farm management; land economics; rural organization; and statistical analysis. Students may receive credit for research in preparing for intercollegiate debating and speaking on problems in agricultural economics when such opportunities exist. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
- 203. Farm Taxation.** Federal, state, and local taxation with emphasis on their application to farm income, farm property, farm property transfers, and agricultural cooperatives; introductory material on the uses and sources of revenue. 2 hours.
- 220. Farm Management.** Economic principles applied to management of farms; budgeting; crop and livestock systems; record analysis; financial management; farm leases, and problems in resource appraisal and business reorganization. Field trip required; see Time table for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. Three hours credit without home farm problem or 4 hours credit with home farm problem. 3 or 4 hours.
- 225. Farm Business Accounting and Organization.** The legal structure of farm business organizations, including individual proprietorships, partnerships, corporations, and land trusts; accounting principles and methods as applied to farm businesses; financial and management analysis from accounting records; and accounting systems commercially available to farm businesses. Prerequisite: Accountancy 200 or 201, Agricultural Economics 203 and 220. 2 hours.
- 230. Marketing of Agricultural Products.** Examines factors affecting the size of the market for agricultural products and the scope of marketing activities, functions and services performed, pricing agricultural products, including the nature and causes of price fluctua-

- tions; and costs of marketing and efforts to reduce costs and improve the marketing system. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
- 235. Agricultural Cooperative Organization and Management.** Theory of cooperation; growth and distinguishing organizational characteristics of agricultural cooperatives; control and management of cooperatives with emphasis on financial and other management problems; and legal aspects of cooperatives. See Timetable for approximate cost of field trips. Prerequisite: Agricultural Economics 100 or Economics 101. 2 hours.
- 250. Agricultural Economics Internship.** A supervised, off-campus experience in a field directly pertaining to a subject matter in agricultural economics; typically the internship is with an agriculturally-oriented firm or governmental agency. Prerequisite: Junior standing, cumulative grade point average of 3.4 or above at the time the internship is arranged, and consent of instructor. 1 to 4 hours.
- 261. Agricultural Economic Statistics.** Statistical methods applied to agricultural economics, including graphic presentation, frequency distributions, index numbers, statistical inference, hypothesis testing, sampling, survey design, simple analysis of variance, basic linear regression, and correlation. Prerequisite: Mathematics 124. 3 hours.
- 301. Economics of Agricultural Development.** The economics of agricultural development and the relationships between agriculture and other sectors of the economy in developing nations; agricultural productivity and levels of living in the less developed areas of the world; and studies of agricultural development in different world regions including Africa, Asia, and Latin America. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 302. Agricultural Finance.** Introduction to agricultural finance including study of financial markets and institutions providing debt and equity capital to agricultural firms, development of skills in applying principles and methods of financial management to agricultural firms. Prerequisite: Agricultural Economics 220 or Accountancy 201, or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 303. Agricultural Law.** Relation of common-law principles and statutory law to land tenure, farm tenancy, farm labor, farm management, taxation, and other problems involving agriculture. Prerequisite: Senior standing or consent of instructor. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 304. Intermediate Agricultural Finance.** Examines finance principles applied to commercial agriculture at an intermediate level; farm financial and investment analysis, risk and liquidity analysis, capital structure and leasing in agriculture; and organization, structure, and analysis of rural financial markets and institutions. Prerequisite: Agricultural Economics 302 and 261, or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 305. Agricultural Policies and Programs.** The problems of agriculture as an industry; analysis of past and current federal and state governmental policies and programs affecting agriculture; objectives and development of policies; the use of economic concepts in evaluating possible future agricultural policies and programs; and forces in policy formation. Field trip; see Timetable for approximate cost. Prerequisite: Economics 101. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 312. Rural Real Estate Appraisal.** Same as Soils 312. Valuation methods and value bases of rural real estate; legal aspects of property rights, appraisal theory and procedures, condemnation appraisal, characteristics of the rural land market, soil identification and productivity, and other legal, economic, agronomic, and engineering aspects of real estate valuation. Laboratory field trips, including a practice appraisal; see Timetable for approximate cost. Prerequisite: Soils 101 and Agricultural Economics 220, or equivalent. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 317. Introduction to Natural Resource Economics.** Same as Environmental Studies and Forestry 317. Examines economic aspects of natural resources and their implications for public policy development; discusses economic growth, resource scarcity, property rights, stock vs. flow resources, conservation, investment decisions, discounting, and the institutional framework for decision-making; and applies the above to agricultural problems. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{1}{4}$ unit.
- 318. Land Economics.** Physical, economic, and institutional factors that affect the role of land

in economic life; population and resource requirements; principles of land utilization; returns from land; land value; property rights and tenure rights; social controls; land development. Prerequisite: Economics 101 or equivalent; graduate students must also have consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 324. Decision Making for Farm Operators.** Analyzes decision procedures for common farm operation problems, decision making under uncertainty, control procedures for the farm firm, evaluation of farm investments, and labor management. Prerequisite: Agricultural Economics 220; credit or concurrent registration in Agricultural Economics 302. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 325. Economics of Agricultural Production.** Examines economic theory relevant to the analysis of agricultural production: factor-product, factor-factor, and product-product relationships; technical versus economic efficiency concepts; cost functions, their use and derivation; time in the production process; risk and uncertainty; and the use of mathematical programming in production economic analysis. Prerequisite: Agricultural Economics 261 and 324; Economics 300; Mathematics 134. 3 hours or $\frac{1}{2}$ unit.
- 326. Professional Farm Management.** Examines principles of farm management applied to problems of those managing farms for others as a profession; business practices and procedures; professional ethics; relationships with clients and farm operators; division of inputs and returns between owner and operator; and direct operation of farms with hired labor. Case studies and field trips; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Agricultural Economics 324 or 325. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 331. Grain Marketing.** Economic and marketing problems associated with grain at farm and country elevator; the utilization of grain; pricing arrangements for grain; operational problems at country and interior points; factors affecting grain prices and seasonal variation; problems of transportation and grades and standards. Field trips; see Timetable for approximate cost. Prerequisite: Agricultural Economics 230, or an elementary marketing course. 3 hours or $\frac{1}{2}$ unit.
- 332. Livestock and Meat Marketing.** Same as Animal Science 332. Examines the nature, function, structure, and operation of livestock and livestock product markets; economic principles applied to prices, costs, and margins; market information, regulation, and controls; evaluation of alternative marketing methods; current, past, and potential changes in livestock and meat marketing. Field trip; see Timetable for approximate cost. Prerequisite: Agricultural Economics 230, or an elementary marketing course. 3 hours or $\frac{1}{2}$ unit.
- 335. Food Marketing.** Same as Food Science 335. Economics of food manufacturing and distribution; food purchasing behavior; structure of food industries; managerial decision making in food product development and marketing; and governmental and public interest in the food system. Prerequisite: Economics 101. 4 hours or 1 unit.
- 338. Agribusiness Management.** Covers financial analysis, business operations, and management functions of agribusiness firms through the integration of lecture discussions, field trips to agribusinesses, and a business management game in which the class divides into decision making teams representing competing firms in an industry. Field trips; see Timetable for approximate cost. Prerequisite: Accountancy 200 or 201, and Economics 101 or Agricultural Economics 100. 3 hours or $\frac{1}{2}$ unit.
- 340. Commodity Futures Markets and Trading.** Development of futures trading; operation and governance of commodity exchanges; economic functions of futures trading; operational procedures and problems in using futures markets; public regulation of futures trading; evaluation of market performance. Field trips required; see Timetable for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{1}{2}$ unit.
- 342. Agricultural Prices.** Studies the factors affecting prices of agricultural products, longtime cyclical, seasonal, and other price movements; sources of information relating to production and demand factors; government activities as they relate to prices of agricultural products; and methods and problems in price analysis and forecasting. Prerequisite: Economics 101 and Agricultural Economics 261; or equivalents. 3 hours or $\frac{1}{2}$ unit.
- 352. Economic Development in Latin America.** Same as Economics 352. See Economics 352.

- 353. Economic Development in India and Southeast Asia.** Same as Economics 353. Analysis of plans and progress toward economic development in India and southeast Asia; economic characteristics of the area and their significance for economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Economic Development of Tropical Africa.** Same as Economics 354. Types of African economies and growth of the exchange economy; development of natural resources, industry, trade, finance, and education; analysis of economic integration, governmental planning, and development projects; and demographic, land tenure, and institutional influences on development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. International Agricultural Trade.** Examines trends and patterns of exports and imports of major agricultural commodities, and evaluates the economic and institutional factors having a bearing on this trade. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 361. Agricultural Surveys and Statistical Analysis.** Reviews methods of survey statistics used with agricultural producers and others in agriculture; studies survey instruments, interviewing, coding, sample design, sampling, survey statistics, and tests of significance; and includes a class problem survey conducted by students. Field trip to the Illinois Crop Reporting Service; see Timetable for approximate cost. 8 week course. Prerequisite: Agricultural Economics 261. 2 hours or $\frac{1}{2}$ unit.
- 362. Applications of Regression Models in Agricultural Economics.** Emphasizes the application of single equation regression methods to problems in agricultural economics; techniques include ordinary least squares, maximum likelihood estimators, estimators with heteroskedastic, serially correlated, and multicollinear data; and uses of binary independent variables. Prerequisite: Agricultural Economics 261 and Mathematics 134, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 363. Optimization Methods in Agricultural Economics.** Application of mathematical programming methods to discrete models in agricultural economics: Kuhn-Tucker theorem, Lagrange multipliers, duality, simplex method as applied to linear and quadratic programming, and input-output analysis models in agriculture. Prerequisite: Mathematics 124 and 134. 2 hours or $\frac{1}{2}$ unit.
- 370. Family Economics.** Same as Economics 346 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
- 401. International Comparative Agriculture.** Agricultural and food problems of the world and of selected countries viewed in the world setting; resources and institutional factors affecting production; and national and international policies and plans for developing agricultural production and improving levels of living. Emphasis is given to a comparative approach to agricultural development of countries on different economic levels. 1 unit.
- 402. Agricultural Finance.** Financial planning applied to farms and farm-related firms and sectors; financial aspects of risks and risk management in the food production/distribution system and related financial markets; and cash flow, capital budgeting, and liquidity management. Prerequisite: Agricultural Economics 302 or consent of instructor. 1 unit.
- 403. Macro Agricultural Finance.** Analyzes farm sector financial statements, demand and supply of physical and financial assets and liabilities, effects of monetary and fiscal policies on agriculture, and effects of the structure of financial institutions on agriculture. Offered every other year. Prerequisite: Agricultural Economics 302 and 362, or equivalent. $\frac{1}{2}$ unit.
- 405. Economic Policies and Programs Affecting Agriculture.** Economic analysis of state, national, and international policies and programs, including proposed legislation having important bearing on the well-being of farm people. Prerequisite: One semester of graduate work or consent of instructor. 1 unit.
- 406. Research Methodology in Agricultural Economics.** The use of theory and observations in the formulation and resolution of research problems in agricultural economics, including criteria for choice in modeling options and observational methods. Prerequisite: Economics 300 or 301, or equivalent and Agricultural Economics 362. $\frac{1}{2}$ unit.
- 425. Microeconomics of Agricultural Production.** Examines analysis of agricultural produc-

tion at the enterprise or farm level; theory, estimation, and utilization of response analysis in agricultural production; estimation of firm production functions; evaluation of firm costs and size economies in agriculture; optimal replacement of durable assets, and theory of leasing and utilization of optimization techniques in firm level analysis. Prerequisite: Economics 300, and an introductory knowledge of multiple regression and linear programming. 1 unit.

- 426. Macroeconomics of Agricultural Production.** Evaluation of efficiency in the use of agricultural resources at aggregative level; supply response analysis; evaluation of technological change in agriculture; concepts of productivity and capacity of agriculture and their application; externalities resulting from agricultural production; and research approaches to production analysis. Prerequisite: Economics 300 and 301, and an introductory knowledge of multiple regression and linear programming. 1 unit.
- 436. Problems in Marketing Agricultural Products.** Examines selected economic problems in marketing agricultural products and discusses relevant theory and empirical methodologies for analyzing and interpreting research results; topics include: operational efficiency in marketing firms and industries; efficient allocation over space, form, and time; price-making institutions; and research in demand stimulation and selected issues in trade. Prerequisite: Agricultural Economics 362 and 363, and Economics 400; or equivalent. 1 unit.
- 437. Public Issues in Food Marketing.** Analyzes structure and economic behavior in food processing and distribution, including consideration of marketing costs, competition, food safety, consumer protection, and public regulation of the food industries. Prerequisite: Economics 400 or equivalent. 1 unit.
- 442. Agricultural Price Analysis.** Studies the methods used to analyze factors affecting agricultural prices; analyzes agricultural prices and price movements with respect to time, space, and form; and examines methods of price forecasting and techniques of time series analysis. Prerequisite: Agricultural Economics 362 or Economics 471, and Economics 400, or equivalent. 1 unit.
- 461. Multivariate Techniques in Agricultural Economics.** Basic theory and use of simultaneous systems of equations in agricultural economics, including identification, multipliers, and estimators; principal components, factor analysis, and models with limited dependent variables as these techniques apply to agricultural economics research. Prerequisite: Agricultural Economics 362 or equivalent. ½ unit.
- 463. Natural Resource Economics.** Same as Economics, Environmental Studies, and Forestry 463. Emphasizes the role of public policy in natural resource use; theory of allocating renewable and non-renewable natural resources over time; effects of institutions on resource use; causes and consequences of technological change; natural resources and economic growth, and applications of concepts to current natural resource issues. Prerequisite: Economics 300 or equivalent. 1 unit.
- 464. Environmental Economics: Theory and Applications.** Same as Economics and Environmental Studies 464. See Economics 464.
- 470. Seminar in Family and Consumption Economics.** Same as Family and Consumer Economics 470. See Family and Consumer Economics 470.
- 491. Seminar and Special Topics.** All graduate students majoring in agricultural economics must register in the noncredit section of this course. In addition, students may register for credit for individual research or group instruction on special topics under the supervision of one or more staff members. 0 to 2 units.
- 499. Thesis Research.** Individual research under supervision of members of the graduate teaching staff in their respective fields. 0 to 4 units.

Rural Sociology

- 199. Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
- 270. Population Issues.** Same as Sociology 270. See Sociology 270.

- 277. Rural Social Change.** Same as Sociology 277. Social forces retarding or accelerating change (traditions, beliefs, attitudes, innovations, social movements, and social planning) as related to rural social organizations and institutions. Field trip to be arranged; for costs see Timetable. Prerequisite: Sociology 100. 3 hours.
- 343. Social Change in Developing Areas.** Same as Sociology 343. Description and analysis of recent social and cultural changes occurring in new nations and developing economies; special attention given to problems of traditional social structure undergoing modernization; and social factors in economic growth, caste and class, nation-building, urbanization and population composition, education, family, and religion. Prerequisite: Sociology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies and Leisure Studies 344. See Environmental Studies 344.
- 346. Energy, Environment, and Society.** Same as Environmental Studies 346. See Environmental Studies 346.
- 378. Sociocultural Factors in African Economic Development.** Same as Anthropology 378. See Anthropology 378.
- 407. Techniques in Demographic Analysis.** Same as Sociology 407. See Sociology 407.
- 477. Seminar on Community Organization.** Same as Sociology 477. See Sociology 477.
- 487. Special Problems in Rural Sociology.** Same as Sociology 487. Prerequisite: One unit of graduate credit in sociology; consent of instructor. $\frac{1}{2}$ or 1 unit.

AGRICULTURAL ENGINEERING

(Including Agricultural Mechanization)

Head of Department: Professor Roscoe L. Pershing

Department Office: 338 Agricultural Engineering Science Building, 1208 West Peabody, Urbana

Agricultural Engineering

- 126. Engineering in Agriculture.** The role of the agricultural engineer in the development of agricultural production facilities; includes resources for production, design loads, material and equipment performance characteristics, and crop and livestock production facilities. Prerequisite: Credit or concurrent registration in Mathematics 120. 4 hours.
- 127. Production Systems in Agriculture.** Mathematical models of equipment performance; analysis of operational, power, weather, and economic constraints; and elementary design of equipment systems using concepts of probability and optimization. Prerequisite: Agricultural Engineering 126 and credit or concurrent registration in Computer Science 101. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 236. Machine Characteristics and Mechanisms.** Design and development concepts of agricultural and industrial machines; includes analysis and synthesis of tillage, planting, harvesting, and material handling mechanisms. Prerequisite: Agricultural Engineering 127 and Theoretical and Applied Mechanics 212. 3 hours.
- 256. Surveying Agricultural and Forest Lands.** Same as Forestry 256. Basic surveying procedures as applied to practices in soil and water conservation engineering, forest management, and forest engineering; lecture and laboratory. Prerequisite: Mathematics 114 and sophomore standing. 3 hours.
- 277. Design of Agricultural Structures.** Design of timber, concrete, and steel agricultural structures; engineering properties of wood, concrete, and steel materials; design of compression members, tension members, and beams and connections; and complete design of a

few structural frames. Includes laboratory. Prerequisite: Credit or concurrent registration in Civil Engineering 261. 3 hours.

287. **Environmental Control for Plants and Animals.** Application of engineering and biological principles to controlling agricultural building environments. Methods for maintaining environments to meet specific biological requirements are investigated through the integration of engineering principles for environmental control with the thermodynamic properties of animals, plants, and their related biological needs. Prerequisite: Agricultural Engineering 127. 3 hours.
296. **Honors Project.** A special problem in engineering is selected for bibliographical, theoretical, and/or experimental research. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
298. **Undergraduate Seminar.** Professional engineering concepts; relationship of agricultural engineering to other engineering and agricultural disciplines; and preparation and presentation of an undergraduate thesis proposal. Thesis to be completed in Agricultural Engineering 299. Two-day field trip: See Timetable for approximate cost. Prerequisite: Junior standing in engineering. 1 hour.
299. **Undergraduate Thesis.** The agricultural engineering problem selected in Agricultural Engineering 298 is investigated and a detailed engineering report is prepared. Prerequisite: Agricultural Engineering 298; senior standing in engineering. 2 to 4 hours.
311. **Instrumentation and Measurements.** Same as Mechanical Engineering 311. Accuracy, precision, and statistical consideration of measurement data; dynamics of measurement; displacement, velocity, acceleration, force, torque, pressure, and temperature measurements; mechanical impedance; measurements on fluids, and instrumentation systems. Prerequisite: Senior standing in engineering or science. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
336. **Design of Agricultural Machinery.** Emphasizes design projects which utilize the principles of machine design, engineering analysis, and functional operation of machinery systems; projects are selected, concepts visualized and tested, and design layouts made; and emphasizes unique aspects of agricultural machinery design in selection of drive trains and material conveyors and in weldment design. Prerequisite: Agricultural Engineering 236; credit or concurrent registration in Mechanical Engineering 270. 3 hours or $\frac{3}{4}$ unit.
340. **Introduction to Applied Statistics.** Same as Agronomy, Animal Science, Dairy Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
345. **Statistical Methods.** Same as Animal Science, Dairy Science, and Forestry 345. See Dairy Science 345.
346. **Tractors and Prime Movers.** Examines engineering aspects of design and application of tractors for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; and operator environment. Prerequisite: Mechanical Engineering 209 or equivalent. 3 hours or $\frac{3}{4}$ unit.
356. **Soil and Water Conservation Structures.** Hydrology, hydraulics, design, construction, and cost estimation of structures for the conservation and quality control of soil and water; relationship of topography, soils, crops, climate, and cultural practices in the conservation and quality control of soil and water for agriculture. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **Land Drainage.** Design, construction, performance, and maintenance of surface, subsurface, and open ditch agricultural drainage systems. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $\frac{3}{4}$ or 1 unit.
387. **Grain Drying and Conditioning.** Examines the psychrometric principles of air modification for dehydration and conditioning of moist products, emphasizing the drying of cereal grains; fundamentals of and design criteria for drying, cooling, and aeration systems. Prerequisite: Agricultural Engineering 127 or consent of instructor; Mechanical Engineering 209 recommended. 3 hours or $\frac{3}{4}$ unit.
396. **Special Problems.** Individual investigation and report of any phase of agricultural engineering approved by the department. Prerequisite: Senior standing in engineering. 1 to 4 hours, or $\frac{3}{4}$ to 1 unit.
400. **Research Orientation.** Discussion of the philosophy and methods of research, thesis preparation, and publication of research findings. 0 units.

- 436. Dynamics of Farm Machine Elements.** Advanced study of the dynamics of farm machine elements with specific reference to functional operation, stresses, and fatigue life. Prerequisite: Agricultural Engineering 236 and 336, or equivalent. 1 unit.
- 490. Seminar.** Presentation and discussion of current research and literature in agricultural engineering. ¼ unit.
- 496. Problems in Agricultural Engineering.** Investigation and report on problems in farm machinery, farm power, rural electrification, soil and water control, rural housing, and farm structures. Prerequisite: Consent of head of department. 1 unit.
- 499. Thesis Research.** 0 to 4 units.

Agricultural Mechanization

- 100. Engineering Applications in Agriculture.** Examples, problems, discussions, and laboratory exercises pointing to present and potential engineering applications in agriculture; emphasis on farm power and machinery, soil and water control, farm electrification, and farm structures. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Agricultural Mechanics Shop: Construction Technology.** Selection, use, and maintenance of hand and power tools; shop safety; selection of building and roofing materials; concrete masonry construction; and farm surveying. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
- 201. Agricultural Mechanics Shop: Electrical and Metal Work.** Selection and application of electrical wiring materials; principles of operation and application of electric motors and controls to agricultural heating, ventilating, and materials handling problems; and selection and use of shielded metal-arc, metallic inert gas, tungsten inert gas, submerged arc, and acetylene welding for agricultural construction and repair. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
- 221. Farm Power and Machinery Management.** Performance, costs, application, selection, and replacement of farm tractors and field implements; optimization of mechanized agricultural field operations. Laboratory. Prerequisite: Agricultural Mechanization 100. 4 hours.
- 241. Farm Tractor Power.** Construction and performance of internal combustion engines; power transmission, control, fuel, electrical, and hydraulic systems; and analysis of methods and equipment for performance testing. Laboratory. Prerequisite: Physics 101 recommended. 3 hours.
- 250. Agricultural Mechanization Internship.** Supervised off-campus learning experience with a business firm engaged in production or technological service to agriculture. Prerequisite: Junior standing with a 3.0 cumulative grade point average; Agricultural Mechanization 221, 252, 272, or 281; and consent of the coordinator of program. 2 hours.
- 252. Mechanics of Soil and Water Conservation.** Principles of planning, constructing, and adapting soil conservation and drainage practices for Illinois farms, and the application of surveying to these practices. Lectures, field work, and laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
- 272. Farm Buildings.** Requirements of farm buildings; problem analysis and planning; building plans; materials, construction methods; and costs. Lectures, discussions, and laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
- 281. Grain Drying, Handling, and Storage.** Grain drying fundamentals, air-moisture relationships, grain drying systems for efficient energy use, fans, grain handling devices and systems, planning of grain handling systems, grain standards, moisture measurement, grain storage, fungi and insect problems, aeration, processing and milling of corn and soybeans. Prerequisite: Junior standing. 3 hours.
- 299. Agricultural Mechanization Seminar.** The role of the mechanization of agriculture in

society and the part of the individual graduate in this role; directed toward the study of the interplay of developments in agriculture and agricultural mechanization; topics selected from technical and popular journals. A tour of farms, industry, and business is required; see Timetable for approximate cost. Prerequisite: Junior standing. 1 hour.

- 300. Special Problems.** A technical agricultural problem is selected for study, investigation, and report, wherein a satisfactory solution does not require a background of engineering education. Prerequisite: Minimum grade point average of 3.5; consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 331. Farm Machinery Technology.** The role of forces, motions, and strengths in the operation and performance of common farm machinery mechanisms; study of mechanism illustrations, machinery testing, service problems, and other aspects of the equipment distribution industry. Laboratory. Prerequisite: Physics 101 recommended. 4 hours or 1 unit.
- 333. Agricultural Chemical Application Systems.** Hydraulic principles; liquid application systems including pumps, controls, and agricultural spray nozzles; granular application systems; safe storage, handling, and disposal of pesticides and fertilizers; and federal and state legal requirements. Laboratory. Prerequisite: Agricultural Mechanization 221, or Agronomy 326, or Horticulture 242 or 262, or Plant Pathology 305 or 377, or Entomology 319 or 322. 3 hours or $\frac{1}{4}$ unit.
- 361. Development and Function of Family Housing.** Same as Family and Consumer Economics and Interior Design 361. Study of principles and problem solutions in family housing; basic functions, plan patterns, types, materials, and structure; economic influences, costs, and adaptations; and personal and public interests. Prerequisite: Interior Design 160 or consent of department (agricultural mechanization students, no prerequisite). 3 hours or $\frac{1}{4}$ unit.
- 372. Livestock Waste Management.** Principles and practices of managing wastes from livestock production facilities; includes collection, storage, transport, runoff control, odor control, aerobic and anaerobic treatment, utilization as crop nutrients, animal nutrients, and fuels, and regulations. Prerequisite: Junior standing and one 200-level animal production course. 3 hours or $\frac{1}{4}$ unit.
- 381. Electrical and Microcomputer Controls for Agriculture.** Microcomputer and electrical control applications; electrical fundamentals; solid state devices; relays; sensors; motor types and characteristics; three phase power; logic devices, analog digital converters; single board microprocessors and interfacing for agricultural control applications. Prerequisite: Agricultural Mechanization 100; and Agricultural Mechanization 201 or consent of instructor. 3 hours or $\frac{1}{4}$ unit.

AGRICULTURE

Program Administrator: Dean J. R. Campbell

Program Office: 104 Mumford Hall, 1301 West Gregory Avenue, Urbana

- 100. Agriculture in Modern Society.** Analysis of agriculture in contemporary society and introduction to problems and challenges related to agriculture, includes a brief orientation to the University and the College of Agriculture. Required of all freshmen in agriculture. 1 hour.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Human Resources and Family Studies 268. Introduction to the organization, philosophy, financing, personnel, clientele, and programs of cooperative extension. Prerequisite: A course in the principles of psychology or sociology or consent of instructor. 3 hours.
- 269. Cooperative Extension: Summer Experience.** Same as Human Resources and Family Studies 269. Field experience to provide opportunity for students to become acquainted

with the roles of county personnel, office organization, and programs in cooperative extension. A living allowance is paid to students during the course. Prerequisite: Agriculture 268 or consent of instructor. 4 hours. Offered in the summer session only.

- 290. Leadership Development.** Same as Human Resources and Family Studies 290. Examines leadership theory, styles and roles of leaders, and exercises and activities to improve functional leadership skills. Field trip required; see Timetable for approximate cost. Prerequisite: Enrollment by petition to the College of Agriculture Office of Resident Instruction; Rhetoric 105 and Speech Communication 101, or equivalent. 3 hours.
- 298. International Experience.** Same as Human Resources and Family Studies 298. An international experience in agriculture or home economics related areas involving foreign travel and study without enrollment in another institution. Experience must be planned and approved in advance through consultation with a College of Agriculture faculty member. Prerequisite: Written consent of instructor; junior standing; not open to students on probation. 1 to 4 hours.
- 299. Agriculture Study Abroad.** Provides campus credit for study at accredited foreign institutions. Final determination of credit granted is made upon the student's successful completion of work. Prerequisite: Consent of major department, college, and Study Abroad Office. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 36 hours within one calendar year.
- 350. Education for Rural Development in Low Income Countries.** Same as Vocational and Technical Education 350. See Vocational and Technical Education 350.
- 369. Educational Programs in Cooperative Extension.** Same as Human Resources and Family Studies 369. The design and development of informal educational programs for youth and adults in an out-of-school setting. Prerequisite: Agriculture 268 or consent of instructor. 3 hours or 1 unit.

AGRONOMY

(Including Soils)

Head of Department: Professor L. E. Schrader (Acting)

Department Office: W-201 Turner Hall, 1102 S. Goodwin, Urbana

Agronomy

- 110. Plant and Animal Genetics.** Same as Animal Science, Dairy Science, and Horticulture 110. The principles of heredity in relation to plant and animal improvement. Prerequisite: Biology 110 and 111, or Plant Biology 100. 3 hours.
- 121. Principles of Field Crop Science.** An introductory course: kinds, origin, taxonomy, morphology, and physiological and ecological bases of growth, reproduction, improvement, and utilization of corn, soybeans, small grains, forage crops, and sorghums; cropping and tillage practices and principles; and field-crop production hazards. 4 hours.
- 190. Field-Crop Scouting.** Workshop on the scouting of field crops for major pests and physiological problems; identification of major weeds, diseases, and insects of field crops. Lecture and lab. 1 hour. Offered during spring break.
- 290. Undergraduate Agronomy Seminar.** The course includes reports and discussions of crops and soils research. Prerequisite: Senior standing. 1 hour.
- 299. Undergraduate Thesis.** Individual research problems in agronomy under the direction of a faculty member in agronomy. Normally the student enrolls during the summer between the junior and senior years and during the fall semester of the senior year, or during both semesters of the senior year. Recommended for those who plan to do research and/or graduate study. Thesis problems should be discussed with the supervising

faculty member in the semester preceding enrollment and must be approved by the Agronomy Undergraduate Thesis Committee before enrollment. An approved thesis must be presented for credit to be given. Prerequisite: Junior standing; minimum grade-point average of 4.0; consent of instructor. 2 to 5 hours. A maximum of 5 hours may be counted toward graduation.

- 300. Advanced Special Problems.** Individual problems in crops or soils. Graduate students majoring in agronomy do not receive graduate credit. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor. Approval of the agronomy teaching coordinator is required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours, or $\frac{1}{4}$ to 2 units.
- 318. Crop Growth and Production.** Crop production and management as influenced by environment, plant species, and cropping system; relates plant growth processes to management practices. Prerequisite: Soils 101 and Agronomy 121 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 319. Environment and Plant Ecosystems.** Same as Environmental Studies and Forestry 319. See Forestry 319.
- 321. Biological Control of Insect Pests.** Same as Entomology 321. See Entomology 321.
- 322. Forage Crops and Pastures.** Forages, their plant characteristics, ecology, and production; grasslands of farm and range as related to animal production and soil conservation. Prerequisite: Agronomy 121. 3 hours or $\frac{3}{4}$ unit.
- 323. Principles of Plant Breeding.** Same as Horticulture 323. Genetic and cytological variation in crop plants; the production and control of such variation in developing varieties and hybrids; and the maintenance of high quality seed stocks. Field trips; see Timetable for approximate cost. Prerequisite: Plant Biology 100; Agronomy 110 or equivalent. 4 hours or 1 unit.
- 326. Weeds and Their Control.** Weeds, their introduction, methods of dissemination, reproduction, and control; a characterization of the common weeds of the Midwest. Prerequisite: Agronomy 121. 3 hours or $\frac{3}{4}$ unit.
- 330. Plant Physiology.** Same as Plant Biology 330. See Plant Biology 330.
- 332. Genetic Toxicology.** Same as Environmental Studies 332 and Genetics and Development 332. See Environmental Studies 332.
- 333. Plant Physiology Laboratory.** Same as Plant Biology 333 and Horticulture 333. See Plant Biology 333.
- 336. Perennial Grass Ecosystems.** Same as Horticulture 336. See Horticulture 336.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Animal Science, Dairy Science, Food Science, Forestry, and Horticulture 340. Statistical methods involving relationships between populations and samples, collection, organization, and analysis of data, and techniques in testing hypotheses with an introduction to regression, correlation, and analyses of variance limited to the completely randomized design and the randomized complete-block design. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 4 hours or $\frac{1}{2}$ unit.
- 350. Crops and Man.** Interpretations of the role of crop plants in the development of cultures and civilizations; description of crops primarily in terms of their origins, evolution, and influences on man's technology, art, religion, and social and political institutions. Field trip; see Timetable for approximate cost. 3 hours or $\frac{3}{4}$ unit.
- 377. Diseases of Field Crops.** Same as Plant Pathology 377. See Plant Pathology 377.
- 400. Seminar.** Discussions of current literature in crops and soils. Required of all graduate majors in agronomy. Prerequisite: Graduate standing. 0 or $\frac{1}{2}$ unit.
- 422. Pasture, Range, and Soil Conservation Research.** Discussion and study of data and literature pertaining to pastures, range, and soil conservation; application of research methods to the evaluation of forage species in the management and utilization of pasture and range and to soil conservation. Prerequisite: Agronomy 151 or 322. 1 unit.
- 423. Cytogenetic and Evolutionary Basis of Plant Breeding.** Nature and origin of crop

- species; genetic and cytogenetic basis for developing special plant materials and the use of such materials in breeding programs; and emphasis on discontinuous variation. Prerequisite: Agronomy 323 or equivalent, or consent of instructor. 1 unit.
424. **Enzymes and Metabolic Pathways of Plants.** Same as Plant Biology and Horticulture 424. Study of uptake, transport, and metabolic utilization of mineral nutrients by plants. The scope of the course is to present the essentiality of various anions and cations in the light of metabolic activity and constituency in functional plant compounds; major emphasis on metabolic activity and function of the elements. Prerequisite: Plant Biology 330 or consent of instructor. 1 unit.
429. **The Evolution of Agricultural Economies.** Same as Anthropology 429 and Geography 429. See Anthropology 429.
431. **Plant Cell Metabolism.** Same as Biology, Forestry, Horticulture, and Plant Pathology 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Biology, Forestry, Horticulture, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Biology, Forestry, Horticulture, and Plant Pathology 433. See Biology 433.
434. **Regulation of Plant Development and Reproduction.** Same as Biology, Forestry, Horticulture, and Plant Pathology 434. See Biology 434.
435. **Mineral Nutrition of Plants.** Same as Plant Biology 435. See Plant Biology 435.
440. **Design and Analysis of Biological Experiments.** Statistical methods as tools for research; principles of designing experiments and methods of analysis for various kinds of designs, including factorial experiments, are considered from the viewpoint of when and how to use them. Prerequisite: Agronomy 340 or equivalent. $\frac{1}{4}$ unit.
441. **Advanced Design and Analysis of Biological Experiments.** Same as Dairy Science 441. Design and analysis of complex experiments; considers confounded factorials, lattices, and other incomplete block designs in terms of their characteristics, usefulness in biological research, and methods of analysis; and computational aspects of both regression and analysis of variance. Prerequisite: Agronomy 440 or equivalent. $\frac{1}{4}$ unit. Offered in alternate years.
442. **Environmental Plant Physiology.** Same as Plant Biology 442. See Plant Biology 442.
444. **Quantitative Aspects of Plant Breeding.** Studies the theoretical bases for plant breeding procedures with special emphasis on the relationship between type and source of genetic variability, mode of reproduction, and effectiveness of different selection procedures. Prerequisite: Agronomy 323 and 440, or equivalent. 1 unit.
445. **Biochemical Genetics of Higher Plants.** The biochemical description of genetic phenomena including genetic systems, mutagenesis, selection methods, mutant characterization, evolution, maternal inheritance, ploidy, heterosis, tumors, and tissue culture genetics. Prerequisite: Agronomy 110 and Biochemistry 350, or equivalent. 1 unit. Offered in alternate years.
462. **Origin of Variation in Plants.** Same as Plant Biology 462. Study of the principles of plant evolution; discussion of theoretical and descriptive aspects of origin of variation, mode of speciation, role of hybridization, natural and artificial selection, and adaptation. Prerequisite: Consent of instructor. 1 unit.
493. **Advanced Studies in Agronomy.** Directed and supervised detailed study of selected problems or topics. Prerequisite: Consent of instructor. Study may be in any one of the following fields: (a) soil chemistry; (b) soil fertility; (c) soil physics; (d) soil classification and pedology; (e) soil mineralogy; (f) soil microbiology; (g) plant breeding and genetics; (h) plant physiology; (i) weed control; (j) crop morphology; (k) crop production and ecology; or (l) statistical techniques and data processing. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

Soils

- 101. Introductory Soils.** The nature and properties of soil including origin, formation, and biological, chemical, and physical aspects. Prerequisite: Chemistry 100 or equivalent. 4 hours.
- 301. Soil Survey with Emphasis on Illinois Soils.** Properties and methods used in distinguishing soils; characteristics and distribution of different soils in Illinois; and the cause of these differences and their influence upon proper soil use and management. Laboratory work includes instruction in mapping soils and the use of soil maps, and field trips to examine representative soils. See Timetable for approximate cost. Prerequisite: Soils 101 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 302. Soil Testing Practicum.** Chemical procedures useful in assessing soil/plant relationships for field crops; involves lectures on agronomic principles, field work on sampling, and laboratory time to perform soil tests, interpret the analytical results, and formulate a nutrient management program. Field trip; see Timetable for approximate cost. Prerequisite: Soils 101. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Three hours or $\frac{3}{4}$ unit credit requires additional laboratory work and consent of instructor.
- 303. Soil Fertility and Fertilizers.** Factors affecting the supply of available major, secondary, and minor elements in soils and their influence on crop production; evaluating fertilizer and lime needs; and fertilizer manufacture, sources, and application methods. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
- 304. Soil Management and Conservation.** Application of principles of soil management to the solution of land-use and conservation problems; influence of soil characteristics on drainage, erosion control, cropping intensity, water management, and land-use planning. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
- 305. Biochemical Processes in Soil and Water Environments.** Metabolic processes leading to chemical transformations in soil and water environments; implications for soil fertility and environmental pollution. Prerequisite: Microbiology 100; Chemistry 102. 3 hours or $\frac{3}{4}$ unit.
- 307. Soil Chemistry.** Emphasizes the inorganic reactions involved in soil development and plant nutrition in soils; topics discussed include colloid systems, properties of water, ion exchange equilibria, plant nutrient forms, and methods of analyses. Prerequisite: Soils 101; Chemistry 102. 3 hours or $\frac{3}{4}$ unit.
- 308. The Physics of the Plant Environment.** The physics of transport processes in the soil and aerial environment of plants; exchanges of energy and gases in crop canopies and the retention of flow of water, gases, solutes, and heat in soils. Prerequisite: Physics 101 or 106; one semester of calculus; and Soils 101 or consent of instructor. 4 hours or 1 unit.
- 311. Laboratory Methods for Soils Research.** Uses traditional wet chemical and instrumental techniques in the characterization of soil properties; includes atomic absorption spectroscopy, gas chromatography, specific ion electrodes, and other techniques in the study of soils. Lecture and laboratory. Prerequisite: Soils 101 and Chemistry 102. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 312. Rural Real Estate Appraisal.** Same as Agricultural Economics 312. See Agricultural Economics 312.
- 313. Soil Mineral Analysis.** Specialized analytical procedures for determinations of soil minerals and their properties; mineralogy of soils and relationships to soil genesis and fertility. Prerequisite: Soils 101 or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
- 402. The Chemistry of Soil Fertility.** The chemistry of the essential plant nutrients in soils, their reactions, and their quantitative relationship to plant growth. Prerequisite: Soils 101; Chemistry 122. 1 unit. Offered in alternate years.
- 403. Genesis, Morphology, and Classification of Soils.** Historical review of soil genesis and classification; morphology and genesis of diagnostic soil horizons and features; soil genesis processes and reactions; classification of soils; and characteristics, geography, and production potentials of major soil groups of the world. Prerequisite: Soils 301 or consent of instructor. 1 unit. Offered in alternate years.

- 411. Soil Physics.** The derivation and application of the fundamental physical principles and laws which govern the behavior of soils; emphasis on transport phenomena and physical characteristics of soils. Prerequisite: Mathematics 345, Soils 308, or consent of instructor. 1 unit. Offered in alternate years.
- 412. Soil Organic Matter.** Basic considerations in organic matter transformation; geochemistry of organic matter; nature and origin of humic substances; and reactions of organic matter in soils and sediments. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
- 414. Physical Chemistry of Clays and Soils.** Same as Mining Engineering 414 and Ceramic Engineering 414. The application of physical-chemical principles and concepts to surfaces and adsorption on surfaces; emphasis on silicate surfaces and water adsorption. Prerequisite: Chemistry 245 or 344, or consent of instructor. 1 unit. Offered in alternate years.

AIR FORCE AEROSPACE STUDIES

Head of Department: Colonel J. R. Pond

Department Office: 223 Armory Building, 505 East Armory, Champaign

- 102. Leadership Laboratory.** Prerequisite: Concurrent registration in any Air Force Aerospace Studies course, or consent of professor of aerospace studies. No credit. May be repeated.
- 111. The Air Force Role in National Security, I.** First-year survey designed to familiarize the student with the organization and mission of the U.S. Air Force and its relation to the total defense structure; examines resources and functions of the United States strategic forces. Prerequisite: Concurrent registration in Air Force Aerospace Studies 102. 1 hour.
- 112. The Air Force Role in National Security, II.** Continuation of Air Force Aerospace Studies 111. Examines resources and functions of United States strategic forces, general-purpose military forces, and aerospace support organizations. Prerequisite: Air Force Aerospace Studies 111 or consent of instructor, and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
- 121. The Development of U.S. Air Power, I.** Introduces the history of the development of air power: the impact of technology, politics, controversy, and military conflict on the evolution of doctrine and concepts for military air power from man's first flights through the organization of a separate Air Force in 1947. Prerequisite: Air Force Aerospace Studies 112 or consent of professor of aerospace studies; and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
- 122. The Development of U.S. Air Power, II.** Introduces the history of U.S. air power since 1947: the peaceful uses of air power; the doctrine, concepts and role of U.S. air power in conflicts since 1947 through the international significance of the U.S. Air Force today. Prerequisite: Air Force Aerospace Studies 121 or consent of professor of aerospace studies; and concurrent enrollment in Air Force Aerospace Studies 102. 1 hour.
- 231. Leadership and Management for the Professional, I.** Studies professionalism, leadership and management, including the meaning of professionalism and professional responsibilities; communication skills and their application in the Air Force; leadership theory, functions, and practices; management principles; problem solving; and management tools, practices, and controls. Prerequisite: Air Force Aerospace Studies 111, 112, 121, and 122, or consent of professor of aerospace studies; successful completion of the Air Force Officer Qualification Test and a military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
- 232. Leadership and Management for the Professional, II.** Continuation of Air Force Aerospace Studies 231. Studies military leadership and management fundamentals; uses the case study method to examine Air Force leadership management situations. Prerequisite: Air Force Aerospace Studies 231, or consent of professor of aerospace studies;

successful completion of Air Force Officer Qualification Test and military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.

- 241. National Security Forces in Contemporary American Society, I.** Studies the military as a profession; military ethics; civil-military interaction; laws of armed conflict; the actual use of governmental and military power, the evolution of National Security Policy in the U.S.; the actors from military to Congress and the President, in the making of foreign policy and security policy; development of strategy; DOD planning/ budgeting; effective communication in the Air Force. Prerequisite: Air Force Aerospace Studies 232, or consent of professor of aerospace studies. 3 hours.
- 242. National Security Forces in Contemporary American Society, II.** In-depth study of military justice system; Air Force organization and policy decision making system; Air Force operations organizations; acquisition systems; new officer orientation; effective communication techniques for Air Force officers. Prerequisite: Air Force Aerospace Studies 241 or consent of professor of aerospace studies. 3 hours.

ANATOMICAL SCIENCES

Acting Head of Department: Professor D. L. Stocum

Department Office: 421 Medical Sciences Building, 506 South Mathews, Urbana

- 234. Functional Human Anatomy.** Studies the essentials of functional human anatomy with special reference to skeletal, muscular, splanchnic, circulatory, and nervous systems. Prerequisite: Biology 110 and 111, or Physiology 103; or consent of instructor. 5 hours. (Counts for advanced hours in LAS.)
- 290. Individual Topics.** Laboratory work and/or reading in fields selected in consultation with an appropriate faculty member. Prerequisite: 15 hours in Life Sciences courses including one course in Anatomical Sciences, and consent of instructor. 2 to 5 hours. May be repeated to a maximum of 6 hours.
- 304. Research Methods.** Problem-oriented laboratories in research techniques in the anatomical sciences. Students select up to six special topics representing different areas of anatomical sciences, such as microscopy (LM and EM), histological and histo-chemical techniques, tissue culture, radioautography, immunohistochemistry, and microsurgery. Emphasis placed on ability to work independently. Prerequisite: Consent of instructor. 1 hour or 1 unit.
- 319. Vertebrate Histology.** Microscopic anatomy of vertebrates with special reference to man, emphasis on developing an understanding of the structural organization of cells, tissues, and organs, together with functional relationships, and provides morphological approaches for comprehending and investigating biological problems at cellular and subcellular levels. Prerequisite: Biology 111 or 151, or equivalent and consent of instructor. 4 hours or 1 unit.
- 407. Functional Neuroanatomy.** Same as Psychology 407. Examines representative vertebrate and invertebrate nervous systems with primary reference to mammals; provides the student with a structural foundation for understanding and investigating the functions of the nervous system. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 412. Anatomical Sciences Seminar.** Invited speakers, faculty, and student presentations and discussions on current research topics. Prerequisite: Graduate standing. 1 unit. May be repeated to a maximum of 2 units.
- 421. Human Gross Anatomy.** Comprehensive study of the anatomy of the human body, emphasizing principles of structural and functional relationships of musculoskeletal, circulatory, nervous and splanchnic systems, and total dissection of the human cadaver. Prerequisite: Anatomical Sciences 234 or consent of instructor. 1 unit.
- 490. Individual Topics.** Individual topics in research and/or reading for graduate students to be conducted under the supervision of faculty members in anatomical sciences, designed to allow students to become more familiar with specialized fields of study prior to

committing themselves to a specific area for their graduate degree. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{4}$ to 4 units.

ANIMAL SCIENCES

(Including Animal Science and Dairy Science)

Head of Department: Professor D. E. Becker

Department Office: 328 Mumford Hall, 1301 W. Gregory, Urbana

Animal Science

100. **Introduction to Animal Science.** A survey of beef, dairy, poultry, sheep, swine, horse, and companion animal industries; includes the importance of product technology and the basic principles of nutrition, genetics, physiology, and behavior as they apply to breeding, selection, feeding, and management. Lecture and lab. 4 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students.
109. **Meat Purchasing and Preparation.** A general approach to meat utilization with emphasis on selecting, grading, cutting, and pricing meat for the home, restaurant, and food service industry; includes laboratory. When appropriate, field trips are taken to area commercial establishments; see Timetable for approximate cost. 2 hours. Offered in alternate years.
110. **Plant and Animal Genetics.** Same as Agronomy, Dairy Science, and Horticulture 110. See Agronomy 110.
119. **Meat Technology.** Student participation in the transformation of live animals through slaughter and carcass fabrication into food products for human consumption; includes laboratory. Purchase of personal equipment and a field trip are required; see Timetable for approximate cost. Prerequisite: Consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Individual research in animal science. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
202. **Domestic Animal Physiology.** A study of the basic physiology of domestic animals in relation to husbandry practices. Prerequisite: Animal Science 100, Dairy Science 100, or one semester of animal biology, or equivalent. 4 hours.
203. **Behavior of Domestic Animals.** Same as Dairy Science and Ecology, Ethology, and Evolution 203. Introduction to concepts of animal behavior with emphasis on domestic animals, lecture and lab. Prerequisite: Biology 104 and Animal Science 100 or Dairy Science 100, or equivalent. 3 hours. Credit is not given for both Animal Science 203 and Ecology, Ethology, and Evolution 346.
206. **Light Horse Management.** The horse industry; anatomy, selection, breed types, gaits, nutrition and feeding, breeding and reproduction, health and disease, tack and equipment, training and showing, and housing of pleasure horses. Prerequisite: Sophomore standing. 3 hours.
207. **Companion Animal Management.** Biological management of companion animals emphasizing the dog and cat as well as others such as the rabbit, the bird, and fish; subject matter includes anatomy, breeds and breed types, selection, nutrition, reproduction, genetics, training, health and disease, equipment needs, and showing of small animals. 3 hours.

- 209. Meat Animal and Carcass Evaluation.** Principles and techniques of meat animal and carcass evaluation and their relationship to current practices in industry. Includes demonstrations and student participation. Students planning to enroll in Animal Science 210 and 212 should take Animal Science 209 in their sophomore year. Prerequisite: Animal Science 100. 3 hours.
- 210. Meat Selection and Classification.** Characteristics associated with the value of carcasses and wholesale cuts from meat animals, grading and classification. Field trips to meat packing plants are required. See Timetable for approximate cost. Prerequisite: Animal Science 209. 2 hours.
- 211. Breeding Animal Evaluation.** The application of current scientific tools, methods, and performance programs available to livestock breeders for improving beef cattle, swine, sheep, and horses, emphasis on the changing nature of modern breeds of livestock as influenced by selection, economics, and consumer and market trends. Prerequisite: Sophomore standing; credit or concurrent registration in Animal Science 209 required for the food animal section only. 3 hours.
- 212. Advanced Livestock Evaluation.** Advanced instruction in evaluating meat animals for slaughter and selection of breeding animals, laboratory discussion. Prerequisite: Animal Science 211 or consent of instructor. 3 hours.
- 221. Animal Nutrition.** Same as Dairy Science 221. Principles of animal nutrition and their application to farm livestock and man. Credit is not given for both Animal Science 221 and 325. Prerequisite: Chemistry 102 or equivalent. 4 hours.
- 231. Comparative Physiology of Reproduction, Lactation, and Growth.** Same as Dairy Science 231. See Dairy Science 231.
- 283. Beef Cattle and Swine Management.** Examines basic principles of beef cattle and swine management for students other than animal science majors. Prerequisite: Animal Science 100. 3 hours. Credit is not given for both Animal Science 283 and Animal Science 301 or 303.
- 290. Introduction to Metabolism in Domestic Animals.** Principles and regulation of metabolism in animals, emphasizing energy derivation and its relationship to domestic animal production. Prerequisite: Chemistry 102 and credit or registration in Animal Science 221. 3 hours.
- 299. Seminar.** Individual oral presentations and written reports by senior students in animal science on subjects related to research in the animal sciences. 1 hour.
- 301. Beef Production.** The principles of feeding and management of beef cattle, financial aspects of beef production, and diseases, parasites, and breeding difficulties of beef cattle. Lectures, demonstrations, and discussions. Prerequisite: Animal Science 221 or equivalent. 3 hours or ½ unit (summer session, ½ or ¾ unit).
- 302. Sheep Science.** A study of the sheep as a biological entity and of factors which influence its responses; examination of the industry which utilizes the sheep's productive potential and of the role of sheep and the industry in animal agriculture and world welfare. Students may register for 3 hours credit without laboratory, for 4 hours credit with laboratory, or for ½ unit. Prerequisite: Animal Science 221 or equivalent. 3 or 4 hours, or ½ unit.
- 303. Pork Production.** Applies science and technology to the selection, breeding, feeding, housing and management of swine in a production enterprise; emphasizes use of research findings in decision making. Prerequisite: Animal Science 110, 221, and 307, and Animal Science 230 or 330. 3 hours or ½ unit. Credit is not given for both Animal Science 283 and 303.
- 304. Poultry Management.** The application of science and technology in solving the breeding, feeding, housing, and various management problems encountered in commercial egg and poultry meat production. Three hours credit without or 4 hours credit with individual study and conference, or ½ unit. Prerequisite: Animal Science 221 or 325, or equivalent. 3 or 4 hours, or ½ unit.
- 305. Genetics and Animal Improvement.** Same as Dairy Science 305. See Dairy Science 305.
- 307. Environmental Aspects of Animal Management.** Animal environmental interactions including thermal, air, microbe, photo, sound, and behavioral factors; as bases for

- prescribing practical environments for production of animals. Prerequisite: Animal Science 202. Courses in physiology, nutrition, microbiology, and genetics respectively are recommended. 3 hours or $\frac{1}{4}$ unit.
- 309. Meat Science.** Fundamental biological principles that influence growth, composition, processing, preservation, and quality of meat and meat products. Prerequisite: Chemistry 102; Microbiology 100 and 101, or 200 and 201. Field trip required; see Timetable for approximate cost. 4 hours or 1 unit.
- 310. Genetics of Domestic Animals.** Genetics of domestic animals and genetic mechanisms involved in reproduction, growth, metabolism, behavior, and disease resistance; applications in animal production. Prerequisite: Agronomy 110 and Animal Science 202, or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 320. Nutrition and Digestive Physiology of Ruminants.** Same as Dairy Science 320. See Dairy Science 320.
- 323. Advanced Swine Management.** Applies principles of swine management and pork production, including participation in the operation of a farrow-to-finish pork production unit. Prerequisite: Animal Science 303, senior standing, and consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 325. Principles of Animal Nutrition.** Principles of animal nutrition and their application to veterinary practice; designed primarily for students in veterinary medicine. Lecture and laboratory. Credit is not given for both Animal Science 325 and 221. Prerequisite: Biochemistry 350, or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 331. Physiology of Reproduction in Domestic Animals.** Same as Dairy Science 331. Examines anatomy and physiology of reproduction and application to animal production; discusses topics which include endocrinology, ovarian and testicular function, estrous cycles, fertilization, implantation, and pregnancy and environmental and management factors influencing reproduction. Prerequisite: Dairy Science 231 or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 332. Livestock Marketing.** Same as Agricultural Economics 332. See Agricultural Economics 332.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Dairy Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
- 341. Human Evolution, II.** Same as Anthropology 341. See Anthropology 341.
- 345. Statistical Methods.** Same as Agricultural Engineering, Dairy Science, and Forestry 345. See Dairy Science 345.
- 346. Animal Behavior.** Same as Anthropology and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
- 347. Animal Behavior Laboratory.** Same as Anthropology and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
- 350. World Animal Agriculture.** Same as Dairy Science 350. Surveys the role of animal agriculture and associated activity in relation to resources and environment in representative geographic and cultural areas of the world; provides orientation for agriculturally oriented study tours such as Agriculture 299 and similar international experiences. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 360. Introduction to Biochemical Toxicology.** A biochemical approach to the mechanisms and effects of both natural and synthetic toxicants affecting the nutrition and performance of domestic animals and man. Prerequisite: Biochemistry 350 or 352, or Animal Science 290. 4 hours or 1 unit.
- 400. Animal Science Graduate Seminar.** Discussion of current literature in animal science. Required of all graduate majors in animal science. Sections offered in animal breeding and genetics, environmental management, meat science and muscle biology, behavior, non-ruminant nutrition, reproductive physiology and ruminant nutrition. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 401. Animal Bionomics.** Discussion of the current literature and research techniques pertaining to adaptation of domestic animals to their environments. Prerequisite: Animal Science 307 or consent of instructor. $\frac{1}{4}$ unit.

- 403. Techniques in Animal Nutrition Research.** Discusses and applies methods of laboratory analysis and animal experimentation frequently used in nutrition research. Prerequisite: Courses in nutrition, physiology, and biochemistry and consent of instructor. ½ unit.
- 404. Concepts in Nonruminant Nutrition.** A review of current literature in nonruminant nutrition. Prerequisite: Consent of instructor. ½ unit.
- 409. Muscle Biology.** Microstructure and chemical composition of muscle tissue; chemistry and biosynthesis of muscle and connective tissue proteins; and biochemical aspects of muscle contraction and rigor mortis. Prerequisite: Biochemistry 350 and 355. ½ unit.
- 410. Research Methods in Animal Science.** Designed to give students training and experience in research and techniques related to animal nutrition, biological management, environmental physiology, genetics, meat science, muscle biology, nutritional biochemistry, or reproductive physiology. Prerequisite: Consent of instructor. ¾ to 1 unit. May be repeated to a maximum of 1 unit.
- 412. Advanced Endocrinology.** Same as Dairy Science, Physiology, and Veterinary Biosciences 412. See Physiology 412.
- 415. Linear and Non-Linear Statistical Models for Biologists.** Same as Dairy Science and Forestry 415. Studies advanced statistical methods: survey sampling; fixed, random, and mixed linear models with unequal numbers; categorical data; non linear deterministic and stochastic models; growth curves and time series. Examines applications to biology and agriculture. Offered in alternate years. Prerequisite: Mathematics 130 and Dairy Science 345, or equivalent. 1 unit.
- 416. Statistical Genetics and Breeding Plans.** Same as Dairy Science 416. Selection theory, including maternal effects, multivariate selection, constrained and nonlinear cases, and retrospective indexes; estimation of genetic parameters from mixed and random models, including the unbalanced case; and applications to economic and laboratory species. Offered in odd numbered years. Prerequisite: Dairy Science 317, Biology 373, or Agronomy 440; and Mathematics 315 or consent of instructor. ¾ unit.
- 420. Comparative Protein and Energy Nutrition.** Physiological aspects of protein and amino acids, fats and fatty acids, and carbohydrates as applied to higher animals; includes classification, digestion, absorption, utilization, metabolism, and dietary deficiencies and excesses. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. ¾ unit.
- 421. Minerals and Vitamins in Metabolism.** Nutritional implications and metabolic roles of minerals and vitamins in animal metabolism. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. ¾ unit.
- 431. Advanced Reproductive Endocrinology.** Same as Dairy Science 431, Physiology 431, and Veterinary Biosciences 431. The reproductive endocrinology of domestic and laboratory animals. Topics include neuroendocrinology, chemistry, metabolism, and action of hormones; regulation of gonadal function; endocrine changes during puberty, aging, pregnancy, and parturition; external factors affecting reproduction; infertility; and hormones and behavior. Prerequisite: Animal Science 331, Physiology 312, Biochemistry 350 or equivalent. ¾ unit.
- 432. Advanced Reproductive Physiology.** Same as Dairy Science 432. See Dairy Science 432.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Dairy Science 433, Physiology 433, and Veterinary Biosciences 433. Introduces laboratory methods involving surgery, collection and handling of blood and tissues for research, gamete and embryo recovery and manipulation, techniques of hormone measurements, and directed individual research problems. Prerequisite: Animal Science 331 or Dairy Science 332. ¾ unit.
- 460. Enzymatic Basis of Detoxication.** Examines specific mechanisms and enzymes affecting xenobiotic metabolism and toxication/detoxication, with emphasis on research methods. Prerequisite: Animal Science 360, or consent of instructor. 1 unit.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Biophysics and Veterinary Biosciences 463. See Veterinary Biosciences 463.
- 481. Animal Biochemical Laboratory Techniques.** Same as Dairy Science 481. See Dairy Science 481.
- 499. Thesis Research.** 0 to 4 units.

Dairy Science

- 100. Introduction to Dairy Production.** Survey of industry; breeds of cattle; and selection, feeding, and management of herds. Lecture, quiz, and laboratory. 3 hours.
- 110. Plant and Animal Genetics.** Same as Agronomy, Animal Science, and Horticulture 110. See Agronomy 110.
- 203. Behavior of Domestic Animals.** Same as Animal Science and Ecology, Ethology, and Evolution 203. See Animal Science 203.
- 204. Dairy Cattle Evaluation.** Evaluation of physical traits of dairy cattle in relation to economic value and genetic improvement; sire selection, mating systems, and breed families in relation to the organization of genetic improvement programs for dairy cattle; and lecture and laboratory. Prerequisite: Dairy Science 100 or consent of instructor. 3 hours.
- 206. Dairy Management Field Studies.** Field studies during spring break of dairy farms and dairy service industries; discussions and demonstrations of management practices of commercial dairy farms; and written report required. See Timetable for approximate cost. 1 hour. May be repeated to a maximum of 4 hours.
- 221. Animal Nutrition.** Same as Animal Science 221. See Animal Science 221.
- 231. Comparative Physiology of Reproduction, Lactation, and Growth.** Same as Animal Science 231. Introduces the growth, reproduction, and lactation of domestic animals with application to livestock production. Prerequisite: One course in animal biology, and Animal Science 100 or Dairy Science 100. 3 hours.
- 250. Dairy Science Internship.** A supervised off-campus learning experience in a dairy-related enterprise. Prerequisite: Junior standing in dairy science or agricultural science with dairy science emphasis; good academic standing; Dairy Science 100 and a 200-level course in dairy science. 2 to 4 hours.
- 300. Special Problems.** Supervised research on any phase of dairy science, including biochemistry, genetics, management, microbiology, nutrition, and physiology. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in dairy science subject to approval of the instructor. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. 1 to 5 hours, or $\frac{1}{2}$ to 1 unit.
- 301. Dairy Herd Management.** The technology of modern milk production practices; application of principles in nutrition, physiology, economics, health and hygiene, waste management, and facilities design for efficient dairy herd management systems. See Timetable for approximate cost of field trip. Appropriate for students in veterinary medicine interested in large animal practice. Prerequisite: Animal Science 221 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 305. Genetics and Animal Improvement.** Same as Animal Science 305. Principles of heredity and their application to the problems of animal improvement. Prerequisite: Agronomy 110 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ unit).
- 308. Physiology of Lactation.** Examines the anatomy, development, and physiology of the mammary gland; environmental, endocrine, and biochemical factors which affect milk yield and composition. Prerequisite: Dairy Science 231. 4 hours or 1 unit.
- 316. Population Genetics.** Same as Genetics and Development 316. Mathematical theory of the genetics of populations: estimation of gene frequency, Hardy-Weinberg principle, systems of mating, relationship between relatives, and forces that change gene frequency; applications to man, animals, and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of population genetics. Prerequisite: Agronomy 110, or Genetics and Development 210 and college algebra, or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 317. Quantitative Genetics.** Same as Genetics and Development 317. The mathematical theory of the genetics of quantitative traits: properties of random-mating populations; estimation of repeatability, heritability, and genetic correlation; genetic results of selec-

tion; selection methods; correlated response; and selection for more than one trait. Application to animals and plants. Students desiring 4 hours or 1 unit credit will do additional work in some area of quantitative genetics. Prerequisite: Dairy Science 316, and credit or concurrent registration in Dairy Science 345, or Agronomy 440, or Biology 575, or consent of instructor. 3 or 4 hours, or $\frac{1}{2}$ or 1 unit.

320. **Nutrition and Digestive Physiology of Ruminants.** Same as Animal Science 320. Physiology and microbiology of digestion in the ruminant, and biochemical pathways of utilization of the absorbed nutrients for productive purposes. Prerequisite: Animal Science 221. 3 hours or $\frac{1}{2}$ unit.
331. **Physiology of Reproduction in Domestic Animals.** Same as Animal Science 331. See Animal Science 331.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
345. **Statistical Methods.** Same as Agricultural Engineering, Animal Science, Forestry and Veterinary Biosciences 345. Studies the design and analysis of experiments: multiple regression, method of fitting constants, factorial experiments with unequal subclass numbers, analysis of covariance, experimental design, examines computer applications to agricultural experiments using statistical packages. Prerequisite: Agronomy 340, or Mathematics 263, or equivalent. 4 hours or 1 unit.
350. **World Animal Agriculture.** Same as Animal Science 350. See Animal Science 350.
385. **Gastrointestinal and Methanogenic Microbial Fermentations.** Fundamental aspects of the ecology of microorganisms and their biochemical activities related to the anaerobic degradation of organic matter, emphasizes anaerobic ecosystems of the mammalian gastrointestinal tract and methanogenic organic residue fermentations: animal wastes, sediments. Prerequisite: Biochemistry 350 or Biochemistry 352 and 353, and Microbiology 100, or Microbiology 200 or 309, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
402. **The Microbiology and Physiology of Ruminant Nutrition.** Physiological and microbiological aspects of ruminant digestion and their influence on the metabolism of the extraruminal tissues, interpretation of nutritive requirements in terms of rumen microbial activities, and evaluation of research techniques. Prerequisite: Biochemistry 350 or equivalent. $\frac{1}{2}$ unit. Offered in alternate years.
408. **Physiology and Biochemistry of Milk Secretion.** Biological structure and function of lactating mammary tissue, ruminant and nonruminant, emphasizes mammary secretory cell biochemical pathways, ultrastructure, and transport mechanisms pertaining to milk synthesis. Prerequisite: Dairy Science 308 and Biochemistry 350, or equivalent, or consent of instructor. $\frac{1}{2}$ unit.
410. **Current Topics in Nutritional Research.** Same as Food Science and Nutritional Sciences 410. See Nutritional Sciences 410.
411. **Chemistry of Nutritional Processes.** Same as Food Science and Nutritional Sciences 411. See Nutritional Sciences 411.
412. **Advanced Endocrinology.** Same as Animal Science, Physiology, and Veterinary Biosciences 412. See Physiology 412.
415. **Linear and Non-Linear Statistical Models for Biologists.** Same as Animal Science and Forestry 415. See Animal Science 415.
416. **Statistical Genetics and Breeding Plans.** Same as Animal Science 416. See Animal Science 416.
417. **Advanced Quantitative Genetics.** Same as Genetics and Development 417. Advanced theory of the genetics of quantitative traits, lectures, student presentations, and discussions on selected readings, and application to biological systems. Offered in alternate years. Prerequisite: Dairy Science 317 or Agronomy 444, or consent of instructor. 1 unit.
431. **Advanced Reproductive Endocrinology.** Same as Animal Science 431. Physiology 431, and Veterinary Biosciences 431. See Animal Science 431.
432. **Advanced Reproductive Physiology.** Same as Animal Science 432, and Veterinary Biosciences 432. Comparative physiology of reproduction of domestic and laboratory animals, including gametogenesis, fertilization, embryonic development, and factors influencing

reproduction. Prerequisite: Animal Science 331 and Biochemistry 350; or equivalent. $\frac{1}{2}$ unit.

- 433. Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433, Physiology 433, and Veterinary Biosciences 433. See Animal Science 433.
- 441. Advanced Design and Analysis of Biological Experiments.** Same as Agronomy 441. See Agronomy 441.
- 481. Animal Biochemical Laboratory Techniques.** Same as Animal Science 481. Theory and application of biochemical laboratory techniques to research in the animal-oriented biological sciences; isolation, characterization, and analysis of biological compounds including enzymes, metabolic intermediates, and cellular components; and determination of metabolic pathways and processes. Offered in even-numbered years. Prerequisite: Biochemistry 355 and consent of instructor. 1 unit.
- 490. Dairy Science Seminar.** Discussions of current research and literature. Registration for 0 or $\frac{1}{2}$ unit every semester is required for graduate students majoring in dairy science. 0 or $\frac{1}{2}$ unit.
- 493. Special Problems.** Individual investigation in any phase of dairy science. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

ANTHROPOLOGY

Head of Department: Professor Norman E. Whitten, Jr.

Department Office: 109 Davenport Hall, 607 S. Mathews, Urbana

- 102. Introduction to Anthropology: The Origin of Man and Culture.** An introduction to and survey of human origins and early man, physical anthropology, race and racism, archaeology, and the beginning of human civilization. Recommended though not required to be taken with Anthropology 103 as a survey of the field of anthropology. Credit is not given for both the Anthropology 102-103 sequence and Anthropology 110. 4 hours.
- 103. Introduction to Cultural Anthropology.** Survey of cultural anthropology; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are seen among contemporary primitive or preliterate peoples; and some attention also given to distinctive theoretical approaches and to problems of culture change. Credit is not given for both the Anthropology 102-103 sequence and Anthropology 110. 4 hours.
- 105. Introductory World Archaeology.** Using archaeological data, traces our prehistoric heritage and the processes which led to the evolution of agriculture, settled villages, and civilization in many areas of the world; lectures range from Australopithecus to Homo sapiens and from Sumeria and Egypt to Mexico, Peru, and the United States. 3 hours.
- 110. General Anthropology.** A concentrated alternative to the Anthropology 102-103 sequence, introducing fundamental concepts in human biology, prehistory, linguistics, and culture and society through a survey of the whole field of general anthropology. Designed to prepare prospective concentrators and other serious students for more advanced anthropology courses. Credit is not given for both Anthropology 110 and the Anthropology 102-103 sequence. 4 hours.
- 115. Other Peoples' Calendars.** Reviews developments in the study of time, emphasizing archaeoastronomy, ethnoastronomy, and the comparative analysis of calendar systems and calendrical rituals. 3 hours.
- 132. Culture, Aging, and Maturity.** Comparative study of human maturity, aging, and death as they are given form and meaning in different cultural and social settings. 3 hours.
- 141. Race: The Concept in Anthropology.** Examines the biological concept of race as applied and misapplied to Homo sapiens by anthropologists and others from the 18th century to the present and of the origin, nature, and significance of so-called racial variation. 3 hours.

143. **Biological Bases of Human Behavior.** Same as Ecology, Ethology, and Evolution and Human Development and Family Ecology 143. Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. 3 hours.
161. **Black Folk Culture.** Same as Afro-American Studies 161. A topical introduction to Pan-Africanist thought and ideology as expressed in the folklore, literature, music, and sociocultural movements of Afro-Americans in the New World. 4 hours. May be repeated to a maximum of 8 hours.
165. **Native North Americans.** Surveys Native North American peoples and cultures from the time of European contact to the present with emphasis on contemporary issues and their historical antecedents. 4 hours.
168. **Indian Civilization and Society.** Same as History 168. An introductory survey course on an interdisciplinary basis dealing with the evolution of Indian religion, politics, culture, and social organization. 4 hours.
169. **South Asia in the Modern Period.** Same as History 169. See History 169.
179. **Culture and Ecology in Human Health.** An overview of health and illness in human societies emphasizing interactions among stress, adaptability, and culture. Case studies of differing cultural and ecological settings, past and present, and of differing health care systems are related to alternative theories of health and illness, including contemporary cosmopolitan medicine. 3 hours.
182. **Peoples and Cultures of South America.** Considers South America as a theater of conflict and cultural experimentation among Native American, African, and Iberian peoples, their survival and transformation as reported in selected ethnographies and eyewitness sources, and some modern theories and controversies about their experience. 3 hours.
183. **Archaeology and the Public.** An examination of the roles of archaeology in society; topics include public service archaeology, "colonial" and "national" archaeologies, the role of the archaeologist in Euro-American conceptions of the American Indian, and the archaeologist as creator and dispeller of myths. 3 hours.
186. **Southeast Asian Civilizations.** Same as Asian Studies 186 and History 172. Overviews the cultural and institutional history of the Indianized states and Vietnam, with attention to dominant commercial, political, religious, artistic, and social traditions of Southeast Asia. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Comparative Family Organization.** Same as Human Development and Family Ecology 210. See Human Development and Family Ecology 210.
220. **Introduction to Archaeology.** An introduction to the problems of studying past cultures, special attention given to the ranges of techniques available and the adequacy of various methodologies as bases for sound inference about the structure of extinct cultures. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours.
222. **Introduction to Modern Africa.** Same as African Studies, Political Science, and Sociology 222. See African Studies 222.
230. **Introduction to Social Anthropology and Ethnology.** An introduction to the anthropological study of contemporary human societies, emphasis on the comparative study of social organization, interpersonal relations, cultural ecology, and processes of sociocultural change, but also includes some consideration of the method and theory of ethnological field research. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.
240. **Introduction to Biological Anthropology.** The past and present evolution of man and his populational and individual biological variation; topics include genetic principles relevant to human evolution; primate phylogeny and behavior; fossil evidence for human evolution; and the origin and significance of biological diversity in modern man. Prerequisite: Anthropology 102, 110, or 143, or an introductory life sciences course, or consent of instructor. 3 hours.
244. **Anthropology of Play.** Same as Physical Education 244. See Physical Education 244.

- 246. Vertebrate Social Organization.** Same as Ecology, Ethology, and Evolution, Psychology, and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 250. Introduction to Primitive Technology.** Introduction to the technology of nonindustrial societies; relationships of technology to society; and influence of social and cultural factors on technological innovation. Uses ethnographic, historical, and archaeological data. 3 hours.
- 258. People of the Ice Age.** Explores a vast period of human prehistory—2 million to 10,000 years ago—before the first cities arose and before people domesticated plants and animals in the Old World; uses archaeological and paleoanthropological data to understand past life ways as well as reasons for change through time in human adaptation. Prerequisite: Anthropology 102. 3 hours.
- 259. Spanish-Speaking Peoples in the United States.** Introduction to the Spanish-speaking population of the United States, including demography, history, economics, and aspects of the sociocultural milieu; emphasis on Mexican-Americans and Puerto Ricans, although other Spanish-speaking groups are also considered. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.
- 260. Peoples of the World: Introduction to Ethnography.** The study and criticism of ethnographic descriptions of exotic ways of life, both as scientific reporting and as a literary art form. Readings include examples from several major culture areas: Africa, the Americas, the Middle East, Oceania, southern and eastern Asia, and Western civilization. Prerequisite: Anthropology 102, 103, or 110, or consent of instructor. 3 hours.
- 261. Afro-American Societies and Cultures.** Same as Afro-American Studies 261. Designed to examine the breadth of the black Americas in South America, Central America, the Caribbean (including Spanish, Gallic, Dutch, and English subareas), and Canada, with specific comparisons to rural and urban United States; the African slave trade with reference to black-white relations in the trade; the development of Creole cultures in West Africa and in Spain and subsequent cultural elaboration in the New World; conditions of slavery, slave revolts, migrations of black people in the New World; and examination of selected ethnographic material. Prerequisite: Anthropology 102, 103, or 110, or consent of instructor. 4 hours.
- 262. Cultural Images of Women.** Same as Women's Studies 262. Perceptions of women, their perceptions of themselves, and their varying roles and statuses in several contemporary societies in diverse countries; supervised ethnographic observation of women's behavior. 3 hours.
- 270. Introduction to Linguistic Anthropology.** Introduction to linguistic anthropology as a major subdiscipline within the field of anthropology; problems of elicitation and analysis of language as faced by anthropologists; and the role of language in the other major subdisciplines: biological, archaeological, and social anthropology. Prerequisite: Anthropology 103 or 110 or Linguistics 200, or consent of instructor. 3 hours.
- 278. Hunter-Gatherers Today.** Introduces students to contemporary hunter-gathers with a particular emphasis on critical evaluation of ethnographic, ethnohistoric, and ethnoarchaeological sources; examines economic, social, and political aspects of this lifestyle in different environments, and emphasizes questions of cultural change. Prerequisite: Anthropology 103 or 110. 3 hours.
- 280. Personal Anthropology.** Anthropological approaches and methods related to the student's everyday life situation; explanation and use of ritual, ideology, myth, communication, media images, rites of passage, structure, symbols, and other concepts so that the student may develop a more critical understanding of contemporary American society and his or her position in it. 3 hours.
- 290. Individual Study.** Supervised reading and research on anthropological topics chosen by the student with staff approval. Especially (but not exclusively) for students who are preparing for a summer field-work project, or who have some justifiable reason for doing independent study, but who do not qualify for the honors (departmental distinction) courses. Prerequisite: Junior or senior standing; 12 hours in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 291 or 293.

- 291. Honors Individual Study.** Individual study and research projects for those students who are candidates for departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. Counts for advanced hours in LAS.
- 293. Honors Senior Thesis.** Preparation and completion of a senior honors thesis, research paper, or equivalent project for those students who are candidates for high or highest departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Topics are given on a one time only, experimental basis. Faculty offer special topics in their areas of expertise that provide an opportunity for undergraduates to be exposed to some of the most current developments in faculty research. 1 to 3 hours.
- 297. Honors Seminar.** Each seminar considers a topic or issue of current interest in anthropology. Prerequisite: Anthropology 102 and 103 or Anthropology 110, two additional anthropology courses, a grade point average of 4.25 in anthropology courses, and consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours. Counts for advanced hours in LAS.)
- 300. Introduction to Linguistic Structure.** Same as Linguistics 300. See Linguistics 300.
- 307. Introduction to Mathematical Linguistics.** Same as Linguistics 307. See Linguistics 307.
- 308. Comparative Primate Anatomy.** Same as Veterinary Biosciences 307. See Veterinary Biosciences 307.
- 315. Area Studies in Ethnomusicology.** Same as Music 317. See Music 317.
- 316. Anthropology of Music.** Same as Music 316. See Music 316.
- 317. Anthropological Study of Verbal Art.** Analysis of several genres of verbal art (for example, riddles, stories, proverbs, nonsense, and oral literatures) from the perspective of contemporary theory, emphasizing cross-cultural data. Prerequisite: Introductory courses in literary criticism, general anthropology, or analysis of literary texts, or consent of instructor. 3 hours or 3/4 or 1 unit.
- 318. Anthropological Research Design.** Lecture and laboratory on the design and implementation of anthropological research; emphasizes different approaches to framing questions and designing research, sampling, questionnaire design, research ethics, data collection techniques, coding and general problems of quantification. Prerequisite: Anthropology 220, 230, 240, or 260 and a course in statistics, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 320. Political Anthropology.** The analysis of political behavior and the comparison of political systems from an anthropological perspective; emphasis on local level political processes and the evolution of governmental forms. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 321. Social Organization and Structure.** An introduction to anthropological concepts of social organization and structure; considers kinship theory, descent and alliance systems, social stratification, nonkin association, social networks, group identification and boundaries, structural functional interpretations of society, and the meaning of social or cultural structure. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 324. Late Cenozoic Geology.** Same as Geology 324. See Geology 324.
- 328. North American Archaeology.** Methods, techniques, and results of archaeology in North America; focuses on divergent approaches to the regional archaeology of North America, and surveys and synthesizes the archaeology of the subcontinent. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 329. The Philosophy of Social Science.** Same as Philosophy 375 and Sociology 325. See Philosophy 375.
- 331. Aboriginal North America.** Deals with three major topics: the nature and structure of aboriginal North America as a cultural province and its ecological base; distinctive and common features of American Indian cultures; and responses to the stresses of white contact. Selected type cultures and their adaptations to varying ecological situations are examined in detail. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or 3/4 or 1 unit.

- 332. Native Peoples of Lowland South America.** Develops cross cultural understanding of contemporary native peoples in the moist tropics of South America and provides relevant historical, cultural, and ecological information necessary to comprehend their enduring lifeways and adaptive versatility. Ecology, social organization, cosmology, power, ritual, and cultural transformation in selected areas provides case studies leading to novel interpretations of the "state of the art" of South American ethnology. Prerequisite: Anthropology 103 or 182; or consent of instructor. 3 hours or 1 unit.
- 333. South American Indians of the Andean Region.** A survey of Andean cultures at the time of the Spanish conquest, of their subsequent history, and of modern Indian culture in the Andean countries. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 337. Behavior Genetics Laboratory.** Same as Psychology 347 and Ecology, Ethology, and Evolution 352. See Psychology 347.
- 339. Anthropological Theory in Contemporary Perspective.** An exploration of current theory in social and cultural anthropology, with emphasis on examining theories in the light of contemporary ideas about theoretical adequacy and of the historical development of anthropological thought; designed especially for anthropology concentrators and anthropology graduate students. Prerequisite: Anthropology 230 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 340. Human Evolution, I.** Principles of evolution and a survey of the evolution of man and his progenitors from the early primates through the Pleistocene epoch; emphasis on evolutionary theory as applied to man and interpretation of the fossil record. Prerequisite: Anthropology 240 or an introductory zoology course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Human Evolution, II.** Same as Animal Science 341. The principles of human genetics; anthropological aspects of race and race formation; and hereditary and environmental factors in the biological variation of modern man. Prerequisite: Anthropology 240 or an introductory zoology course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 342. Behavior-Genetic Analysis.** Same as Ecology, Ethology, and Evolution 350 and Psychology 342. See Psychology 342.
- 343. Introduction to Primate Morphology and Behavior.** Same as Ecology, Ethology, and Evolution 344. Survey of primate social behavior and the classification, morphology, and distribution of living and extinct species; emphasis on interrelationships with aspects of anthropological study. Prerequisite: Anthropology 240 or Ecology, Ethology, and Evolution 246; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Field and Laboratory Techniques in Biological Anthropology.** Supervised participation in biological anthropology research projects; techniques, methods, and procedures discussed and practiced under actual field or laboratory working conditions. Normally taken concurrently with Anthropology 345. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 345. Analysis of Research Data in Biological Anthropology.** Analysis, interpretation, evaluation, and organization of field and laboratory data in biological anthropology; preparation of written reports on research. May be taken concurrently with Anthropology 344 or subsequently. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 346. Animal Behavior.** Same as Animal Science and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
- 347. Animal Behavior Laboratory.** Same as Animal Science and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
- 348. The Prehistory of Africa.** The study of cultural development in Africa from the appearance of hominids to the time of European domination. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 349. South American Culture History, I.** An examination of the factors influencing the initial

peopling of South America; the spread and diversification of hunting and gathering economies; and the development and spread of the tropical forest cultural pattern. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 350. South American Culture History, II.** An examination of the factors leading to the rise of civilization in the central Andes, including the evolution of agricultural systems, the elaboration of technology, and the emergence of extensive and complex political units. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 351. Archaeological Surveying: Techniques and Applications.** Familiarization with methods used in the location and recording of archaeological sites, including techniques of mapping especially adapted to the needs of archaeology; attention given to means of presenting results and interpreting data derived from this work, and work both in the field and in the laboratory. Prerequisite: Anthropology 102 or 110; or consent of instructor. 3 hours or 1 unit.

- 352. Theory and Methods of Lithic Analysis.** Lecture and laboratory on the principles and techniques of stone and bone artifact manufacture, identification, classification, metrical analysis, interpretation, and integration with other classes of archaeological evidence. Emphasis on the use of lithics to test human behavioral models. Prerequisite: Anthropology 220. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 354. Field Techniques in Archaeology.** Participation in archaeological excavations; techniques, methods, and procedures discussed and practiced under actual working conditions. Normally taken concurrently with Anthropology 355. May be repeated as topics vary. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours or 1 unit. Usually offered in the summer session only.

- 355. Laboratory Techniques in Archaeology.** Laboratory work including processing, classifying, dating, interpretation, evaluation, and preparation of written reports of archaeological research. May be taken concurrently with Anthropology 354 or subsequent. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.

- 356. Human Osteology.** Identification of human skeletal material and basic techniques of measurement; methods of determining age, sex, race, and stature from the human skeleton; and analysis of skeletal populations. Prerequisite: Anthropology 102 or 110, or a course in anatomy, physiology, or introductory zoology and consent of instructor. 3 hours or 1 unit.

- 357. Midwestern Archaeology.** A detailed study of the midwestern archaeological area covering the broad cultures with regional variations considered chronologically and stressing their interrelationships. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 360. Peoples and Cultures of Oceania.** Same as Asian Studies 360. A survey of the Pacific Islands, regional geography, human ecology, culture history, and ethnography of Melanesia, New Guinea, Polynesia, New Zealand, Micronesia, and Australia, and some consideration of Pacific ethnohistory and the role of Oceania in the modern world. Prerequisite: Anthropology 102 and 103, or 110, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 361. Peoples and Cultures of Mexico and Guatemala.** A survey of the peoples and cultures of Middle America with special emphasis upon Mexico and Guatemala; begins by placing Middle America geographically, historically, and culturally within the broader Latin American scene, countries first viewed as a whole and then selected ethnographic studies of specific communities considered for comparative purposes. The Caribbean is not included in this survey. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 363. Religion in Anthropological Perspective.** Same as Religious Studies 363. An introduction to the study of magical and religious beliefs and practices in tribal and peasant societies; considers theories of the nature, origin, and function of magic and religion; myth, ritual, and symbolism; the relationship between great folk religious traditions; and socioreligious movements. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 364. Field Work in Cultural Anthropology.** Supervised participation in field research in ethnography, ethnology, linguistics, or social anthropology; techniques, methods, and procedures discussed and practiced under actual working conditions. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. Normally taken concurrently with Anthropology 365. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 365. Analysis of Field Data in Cultural Anthropology.** Analysis, interpretation, evaluation, and organization of field data in cultural anthropology; preparation of written reports on research in ethnography, ethnology, linguistics, or social anthropology. May be taken concurrently with Anthropology 364 or subsequently. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
- 367. Cultures of Africa.** Culture and social organization in traditional African societies with emphasis on the politics, kinship, and religion of a small sample of societies illustrating the main cultural variations found in sub-Saharan Africa; some discussion of ecological factors and ethnic group relations in precolonial times. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 368. Peoples and Cultures of India.** Same as Asian Studies 368. A description and analysis of the social, economic, and religious life of the tribal and peasant peoples of contemporary India considered against the background of Indian geography, population, language distribution, the caste system, and highlights of Indian cultural development. Prerequisite: Anthropology 168 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Language, Culture, and Society.** Same as Communications 370 and Linguistics 370. An examination of the social and cultural functions of language with particular emphasis on the application of linguistic methods and findings to selected problems in the social sciences. Prerequisite: Anthropology 230, or one course in communications or linguistics, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 372. The Anthropological Study of Art.** A review of the anthropological approach to art with emphasis on structural analysis and the relationship of the artist to his culture; consideration of problems of stylistic development within the framework of cultural dynamics and a survey of the major art styles outside of the Western tradition and the Orient. Prerequisite: Three hours of anthropology or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 373. Theory and Method in the Cross-Cultural Study of Individual Behavior.** Same as Psychology 373. See Psychology 373.
- 375. The Prehistory and Archaeology of Mexico.** Discusses the ancient cultures and civilizations of Mexico as reconstructed from archaeological data; begins with the earliest evidence of human occupation and traces the development of agricultural societies and ultimately large urban civilizations to c. 1300 A. D. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
- 376. The Aztec and Maya Civilizations.** Discusses two ancient civilizations, the Aztecs of Mexico and the Maya of Guatemala; uses archaeological data and documentary sources to reconstruct political and social organization, religion, writing systems, calendars, agricultural techniques, and aspects of the daily life of the people. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
- 379. Medical Anthropology: The Culture of Health and Illness.** An introduction to concepts and social aspects of health, illness, and curing in different cultures with consideration also of the interaction between folk and modern medicine in developing nations and the delivery of health care as an international social problem. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 381. Russian Culture History and Ethnology.** Same as Geography 381. A historical and structural analysis of the development of Russian culture, especially the peasant traditions, from Danubian to contemporary times. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 382. Siberian Culture History and Ethnology.** Same as Geography 382. An ecological analysis of historic and present day Siberian cultures, with comparisons to arctic America. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 383. Self and Society in Japan.** Same as Asian Studies 383. The lifecourse and the growth of the self in modern Japanese civilization. Prerequisite: Anthropology 230 or a course in East Asian history, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 384. Modern Chinese Society and Culture.** Same as Asian Studies 384. See Asian Studies 384.
- 385. Anthropology of Education.** Same as Educational Psychology 385 and Educational Policy Studies 385. See Educational Policy Studies 385.
- 386. Peoples and Cultures of Mainland Southeast Asia.** Same as Asian Studies 386. The culture, cultural history, and social systems of mainland Southeast Asia: Burma, Thailand, Cambodia, Vietnam, Laos, Assam Hills, upland southwestern China, and Malaya; emphasis on the interaction of complementary ethnic types in the context of local ecology and the Hindu-Buddhist systems of religion and politics of the lowland states. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 387. Peoples and Cultures of Insular Southeast Asia.** Same as Asian Studies 387. A survey of the cultures and social systems of Indonesia, Malaysia, and the Philippines in the context of the region's history and geographical, economic, political, and religious situation. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 388. Prehistory of Oceania.** Same as Asian Studies 388. Archaeology and physical anthropology of the Pacific Islands; early hominids in Australia and New Guinea; evolution and genetics of Oceania populations; origins of Pacific Islanders; traditional voyaging; and settlement and culture history of aboriginal Australia, Melanesia, Micronesia, and Polynesia. Prerequisite: Anthropology 220, 240, or 360. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 394. Human Paleopathology.** Comprehensive study of the evidence of human disease in antiquity, emphasizing diagnosis of skeletal pathologies, and the anthropological interpretation of historic and prehistoric disease patterns. Prerequisite: Anthropology 356, a course in human anatomy, or equivalent. 3 hours or $\frac{3}{4}$ or 1 unit.
- 398. Combined Graduate and Undergraduate Seminar.** A research seminar on specialized topics in anthropology. Prerequisite: Consent of instructor. 4 hours or 1 unit. Students may register in different sections to a maximum of 8 hours or 2 units; may be repeated in the same semester.
- 400. Introduction to General Linguistics.** Same as English as a Second Language 402 and Linguistics 400. See Linguistics 400.
- 429. The Evolution of Agricultural Economies.** Same as Agronomy 429 and Geography 429. The problems concerning the development of the several basic food crop economies studied from the point of view of geographical environment, the available archaeological and ethnographic evidence, and agronomy and plant genetics; regional emphasis varies from year to year. Prerequisite: Consent of instructor. 1 unit.
- 440. Problems in Physical Anthropology.** A seminar designed to involve students in the theoretical and methodological approaches to problem areas in physical anthropology. May be repeated for additional credit. Prerequisite: Anthropology 340, 341, or 343. consent of instructor. 1 unit.
- 443. Problems in Primate Behavior and Ecology.** Same as Ecology, Ethology, and Evolution 443. Group discussions and individual presentations of research reports and problems in fields of primate ethology, ecology, evolution, and related subjects; topics vary each semester. Prerequisite: Consent of instructor. $\frac{3}{4}$ or 1 unit. May be repeated.
- 450. Seminar in Anthropology.** Analysis of selected topics of special interest in anthropology. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units.
- 451. Social Structure.** Intended to deepen training of advanced students in the descriptive techniques and methods of structural and functional analysis currently employed by social anthropologists. Prerequisite: Consent of instructor. 1 unit.
- 452. Research Problems in Archaeology.** Seminar oriented to current research problems in archaeology, designed to acquaint students with theoretical and methodological aspects of particular problems and to develop a critical perspective of archaeological research. May be repeated. Prerequisite: Consent of instructor. 1 unit.
- 453. The Formal Analysis of Kinship Systems.** A survey of a variety of the world's systems

- of kinship, marriage, and family organization; concentration on the distinctive properties of kinship systems as a species of social structure; on the formal apparatus for describing and understanding them and their functions; and on the theory of kinship that arises from the use of such formal apparatus. Prerequisite: Consent of instructor. 3 to 1 unit.
- 454. Ritual and Power in Social Life.** A systematic examination of the relationship between power structure and ritual by reference to anthropological theory and through consideration of select ethnographies; social stratification, social networks, cultural symbolism, and ethnicity. Prerequisite: Consent of instructor. 1 unit.
- 460. History of Anthropological Theory.** A consideration of the development of anthropological thought, particularly in ethnology and social anthropology; special attention to major figures, problem shifts, and new paradigmatic approaches. Prerequisite: Graduate standing in anthropology or consent of instructor. 1 unit.
- 467. Kinship and Social Organization in Africa.** Explores a variety of systems of kinship and social organization in sub-Saharan Africa; covers classic statements on African kinship, which provide a foundation of modern kinship theory, as well as contemporary critiques. Then explores the nature of political authority and stratification systems; presents topical and theoretical issues as well as selected case studies. Prerequisite: Graduate standing. 1 unit.
- 489. Readings in Anthropology.** Individual guidance in intensive readings in the literature of one or more subdivisions of the field of anthropology, selected in consultation with the adviser in accordance with the needs and interest of the student. Prerequisite: One semester of graduate work in anthropology; consent of adviser. 3 or 1 unit.
- 490. Individual Topics in Anthropology.** Supervised individual investigation or study of a topic not covered by regular courses. The topic selected by the student and the proposed plan of study are approved by the adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. 1 to 4 units.
- 499. Thesis Research.** Preparation of theses. 0 to 4 units.

ARCHITECTURE, SCHOOL OF

Director: R. Alan Forrester

School Office: 106 Architecture Building, 608 E. Lorado Taft Drive, Champaign

- 171. Architectural Design, I.** Formal fundamentals of architectural design; formal vocabulary, principles, and concepts of architectural design; basic design methods, skills development in sketching, drafting, rendering, layout, diagramming, modeling, and lettering; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: General Professional Courses in Art and Design 187 or equivalent and sophomore standing. 3 hours.
- 172. Architectural Design, II.** Functional fundamentals of architectural design; functional vocabulary, principles, and concepts of architectural design; basic design and programming methods, skills development in drafting, modeling, layout, rendering, and sketching; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: Architecture 171; General Professional Courses in Art and Design 188 or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
- 200. Senior Honors in Architecture.** For candidates for honors in architecture. Independent guided study and research in a selected area of architecture. Prerequisite: Senior standing in architecture; a University grade-point average of 3.0 or, in special cases, consent of Director of School. 3 hours (summer session, 1 to 3 hours). May be repeated to a total of 6 hours with consent of Director of School.
- 210. Introduction to the History of Architecture.** Visual and cultural analysis of selected buildings, urban spaces, and sites from ancient Greece to modern times; emphasizes the architectural traditions of Western Civilization, especially as they affect the built environ-

ment of America and the Middle West. Prerequisite: Sophomore standing or consent of instructor. 3 hours.

220. **Introduction to Architectural Theory.** Overview of the purpose and means of architecture in relation to other human endeavors and the goals of society; professional alternatives; introduction to research, cognitive processes in design, information handling, communication, and evaluation. Prerequisite: Consent of instructor. 3 hours.
231. **Anatomy of Buildings.** First course in Administration, Communication, and Technology; introduces building science and the profession of architecture; emphasizes the anatomy of buildings, including function, physical makeup, and working principles of various building systems, components and materials, their inter relationships and design implications. Prerequisite: Sophomore standing or consent of instructor. 4 hours.
232. **Construction of Buildings.** Second course in Administration, Communication, and Technology; emphasizing the processes of project execution from the initiation of design to completion of construction; includes in depth study of construction of the building and its systems, materials and methods, and their implications for decision making. Prerequisite: Architecture 231 or consent of instructor. 4 hours.
241. **Environmental Technology, I.** The integration of environmental control systems in architecture. Includes factors affecting comfort, health, safety, and energy conservation; the fundamentals of atmospheric conditioning of buildings and the equipment and controls systems for varying functions and sizes of buildings, and water supply, waste sewage, and storm water disposal systems for buildings. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
242. **Environmental Technology, II.** The integration of environmental control systems in architecture. Includes the nature of light illumination and vision, quality and quantity, and sources; integration of illumination and architecture; power distribution systems and equipment; and the nature of sound and architectural acoustics, room acoustics, and sound isolation. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
251. **Statics and Dynamics.** Introduction to basic statics and dynamics with emphasis on architectural applications. Prerequisite: One year of calculus and analytical geometry. 4 hours.
252. **Strength of Materials and Design Applications.** Introduction to strength of materials with emphasis on architectural applications. Prerequisite: Architecture 231. 4 hours.
271. **Architectural Design, III.** The building in its environmental setting; introductory building design and site planning theory; principles of energy efficient building design; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 172; General Professional Courses in Art and Design 189 or equivalent. 3 hours.
272. **Architectural Design, IV.** Buildings in the community setting; introductory urban design and site planning theory; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 271. 3 hours.
299. **Study in Versailles, France.** Study in the University of Illinois Architectural Program at Versailles, France. Prerequisite: Concurrent registration in the full time program at Versailles through the Chicago or Urbana-Champaign Campus. 0 hours.
300. **Independent Studies in Urban Design.** The individual study of selected topics involving the history, design, and function of significant European cities. Prerequisite: One year of history of architecture or history of art, consent of instructor. 3 hours or 3 unit.
301. **Independent Study.** Independent guided study and investigation in a selected area of architecture. Prerequisite: Junior standing in architecture, written proposal approved by sponsoring faculty member and approval of Director of School. 0 to 4 hours, or 0 to 4 unit.
310. **Ancient Architecture.** Architecture and urban design in ancient Egypt, Greece, and Rome. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or 3 unit.
311. **Early Christian and Byzantine Architecture.** Architecture and urban design of the early Christian era, the Byzantine Empire, southeastern European lands under Byzantine culture.

- al influence, and medieval Russia; from circa 300 to circa 1500. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 312. Medieval Architecture.** The development of Romanesque and Gothic architecture and urban design. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 313. Renaissance Architecture.** Developments in architecture, urban design, and garden art in Italy and northern Europe in the fifteenth through the sixteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Baroque and Rococo Architecture.** Developments in architecture, urban design, and garden art in Italy, France, Germany, and England in the seventeenth and eighteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 315. Modern European Architecture.** The evolution of continental and British architecture and urban planning from 1750 to the present; includes some allusion to Japanese and American architecture of the same period. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
- 316. Modern American Architecture.** The development of American architecture and urban planning from the seventeenth century to the present. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Seminar on Great Modern Architects and Their Work.** Seminar on selected topics addressing the philosophy, theory, personality, and work of famous architects since the mid-eighteenth century. Prerequisite: Architecture 210; and Architecture 315 or 316, or equivalent; and consent of instructor. 3 hours or 1 unit.
- 318. History of the Urban Environment.** Examines the evolution of town planning and urban design in Western civilization from prehistory to the present; studies cultural and technical advancements affecting the form of the urban environment. 3 hours or $\frac{3}{4}$ unit.
- 319. Historic Building Preservation.** Introduces historic preservation: legal, financial, and administrative assistance, graphic examination of restored buildings and sites, and application of conservation technology. 3 hours or $\frac{3}{4}$ unit.
- 323. Social and Behavioral Factors for Design.** A research-oriented introduction to existing social and behavioral knowledge, methods, and tools for relating man to his physical and social environment, with implications for theories and a philosophy of architectural design. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 330. Architectural Practice.** The role of the architect, professional ethics, and the conduct of professional practice; legal aspects of architectural practice and building construction; business management, operational procedures, financial planning, and cost control; and the administration of construction contracts and professional construction management. Prerequisite: Professional degree candidacy or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 331. Design Development and Construction Documents.** Network diagram scheduling of professional services; preliminary project investigations of site conditions and facilities, building law, and economic considerations; the integration of materials, structure, mechanical equipment, illumination, and acoustics; design development outline specifications and drawings; the production planning, scheduling, and budgeting for working drawings and specifications; and preparation of portions of these documents. Prerequisite: Architecture 241, 242, and 352. 3 hours or $\frac{3}{4}$ unit.
- 335. Computer Applications in Architecture, I.** Introduces the application of computer-aided design to architecture; programming methods using FORTRAN, database concepts using the Relational Information Management (RIM) system, and basic computer graphics concepts using the Graphic Compatibility System (GCS) graphic package. Prerequisite: Computer Science 102 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.
- 336. Computer Applications in Architecture, II.** Applies advanced computer-aided design to architecture; advanced programming methods using FORTRAN, advanced database concepts using the Relational Information Management (RIM) system, and advanced

computer graphics concepts using the Graphic Compatability System (GCS) graphic package. Prerequisite: Architecture 335 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.

- 341. Solar Thermal Systems in Architectural Design.** The effects of solar energy collection and storage devices and techniques on building geometries; includes passive and active solar thermal systems in the architectural design process. Prerequisite: Architecture 241 or 242 or equivalent, and consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. Students seeking 4 hours or 1 unit of credit must participate in research teams pursuing prearranged topics related to the course of study.
- 342. Energy Management in Architecture.** Energy management; energy alternatives, and the influence of energy regulation on the architectural design, operation, maintenance, use, and re-use of buildings. Prerequisite: Architecture 241 and 242. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. Students seeking 4 hours or 1 unit credit must participate in research teams pursuing prearranged topics related to the course of study.
- 351. Theory and Design of Metal Structures.** Analysis and design of structures in metal. Beams; open-web joists; metal deck; columns; riveted, bolted, and welded trusses; plate girders and connections; lateral loads and bracing; and design of a simple steel frame building. Prerequisite: Architecture 252. 4 hours or 1 unit.
- 352. Theory of Reinforced Concrete.** Concrete materials; behavior of reinforced concrete construction; behavior and design of structural elements, one-way slabs, beams, and girders; columns; ACI code requirements; and introduction to continuity in reinforced concrete structures. Prerequisite: Architecture 252. 4 hours or 1 unit.
- 353. Reinforced Concrete Design.** Selection, design, and comparison of reinforced concrete floor systems for buildings; study and design of columns and footings, and prestressed concrete. Prerequisite: Architecture 352. 4 hours or 1 unit.
- 354. Structural Planning.** General problems in the selection and design of structural systems for buildings; methods of analysis; site explorations, soils, and foundations; bracing, and special systems. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
- 355. Structural Analysis.** Advanced problems in the analysis of statically determinate structures; general theories and methods of analysis of statically indeterminate structures by geometric and energy methods; and introduction to theory of plastic design. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
- 371. Architectural Design V.** Intermediate building and environmental design, issue oriented building problems; urban design theory; intermediate building design and site planning theory; human environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 272. 6 hours. No graduate credit.
- 372. Architectural Design and Construction Documentation.** Schematic design, design development, and construction documents of a small scale (10,000 square feet) public building emphasizing the integration of the basic elements of building, structural, and environmental technologies. Prerequisite: Architecture 371, credit or concurrent registration in Architecture 241 and 242. 6 hours. No graduate credit.
- 373. Architectural Design Studio.** Design studies of intermediate size building types, planned communities, civic and social facilities at the community and urban scale, and collaboration among the several disciplines involved in planning the human habitat: urban planning, landscape architecture, sociology, and economics. Prerequisite: Architecture 372. 6 hours or 1 $\frac{1}{2}$ units.
- 374. Architectural Design Studio.** Research and individual comprehensive design study for a selected architectural project, special emphasis on site development and the integration of construction technology, structure, and environmental systems. Prerequisite: Architecture 373, or consent of instructor. 6 hours or 1 $\frac{1}{2}$ units.
- 379. Urban Housing.** Examines issues affecting the design of urban housing including the perceptions and needs of residents, the needs of special user groups, and the roles of governments, reviews selected principles of housing in other countries. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 398. Directed Research in Architecture.** Participation in ongoing research projects which

may include energy management, environmental perception, facilities development, building science, and other topics. Prerequisite: Approval of written proposal by instructor and Director of School. 4 hours or 1 unit. Students may register in different sections of this course to a maximum of 8 hours or 2 units.

399. **Off-Campus Study.** Provides opportunity for approved off-campus study. A detailed proposal for study off campus must be submitted for approval to the appropriate committee in the School prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the Director of School. Prerequisite: Senior or graduate standing in architecture and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.
410. **Seminar in Architectural History.** Seminar in the history of architecture dealing with various themes related to two or more historical periods or cultures. Prerequisite: Three 300-level history of architecture courses, or equivalent as determined by the instructor. 1 unit. May be repeated to a maximum of 3 units.
411. **Seminar in History of Ancient and Medieval Architecture.** Seminar on topics in ancient, early Christian, Byzantine, and Medieval Architecture. Prerequisite: Architecture 310, 311, or 312, or equivalent as determined by the instructor. 1 unit.
413. **Seminar in History of Renaissance and Baroque Architecture.** Seminar on topics in European architecture from the fifteenth through the eighteenth centuries. Prerequisite: Architecture 313 and 314, or equivalent as determined by the instructor. 1 unit.
415. **Seminar on the Architectural History of American Communities.** Advanced historic study of the architectural design and aesthetics of individual buildings and their relationship to each other in selected small-scale American communities. Prerequisite: Architecture 316 or equivalent, and consent of instructor. 1 unit.
417. **Seminar in the Development of Contemporary Architectural Thought.** An examination of the development of the philosophy of significant modern and contemporary architectural writers and architects in relation to their projects and executed work. Prerequisite: Architecture 315 and 316, or equivalent as determined by the instructor. 1 unit.
418. **Recording Historic Buildings.** Examines techniques for recording historic buildings and sites: measuring, photographing, and drawing to Historic American Building Survey standards; taking field notes and investigating public records to document reports. Prerequisite: Architecture 319 and demonstrated ability in architectural graphics; or consent of instructor. $\frac{3}{4}$ unit.
430. **Architectural Management Theory.** Application of the systems approach and organization theory to the study of organizational behavior in the architectural process; the sources and objectives of dynamic change in that process; and the effects of the change. 1 unit.
431. **Administration of Construction.** Critical analysis of that phase of architectural practice related directly to the construction of buildings; the building industry; policy, organization, procedures, and techniques for construction management; the architect, engineer, management and cost consultants, contractor, and the owner; and administration of the construction contract and professional construction management. Prerequisite: Architecture 330 or consent of instructor. $\frac{3}{4}$ or 1 unit. Students taking the course for 1 unit are required to perform independent study which results in a written paper and formal class presentation.
432. **Architectural Administration.** Critical analysis of that part of professional practice related to the organization of the architectural firm and the conduct of the internal aspects of business; administrative policy, management functions, and procedures; and general development, contract negotiation, production, personnel, insurance, financial planning, accounting, and cost control. Prerequisite: Architecture 330 or consent of instructor. $\frac{3}{4}$ or 1 unit. Students taking the course for 1 unit are required to perform independent study which results in a written paper and formal class presentation.
434. **Building Economics.** Principles of economics as they apply to individual and large-scale building projects; factors affecting the cost of buildings, including the building market, building investment and finance, land acquisition, government assistance, and taxation; first costs, operating costs, and ultimate costs; cost analysis and cost models; and construc-

- tion costs, estimates, and cost control. Prerequisite: Architecture 330 or consent of instructor. 1 unit.
- 438. Architectural Problems in Organization Theory.** Individual or group examination and analysis of the application of the theory of complex organizations in the architectural process; analysis of the interaction of architectural and other building organizations as subsystems; and investigation of this interaction through research or project analysis. Prerequisite: Architecture 430 or consent of instructor. Concurrent registration in an architectural studio course not permitted. 1 or 1 ½ units.
- 439. Architectural Process Internship.** Individual internship for one summer session or one semester in an approved office of practice in the architectural process; analysis of this work in coordinated university coursework. Residence at the university is not required during internship. Prerequisite: Consent of joint program advisory committee. 1 or 1 ½ units.
- 451. Advanced Structural Analysis.** Advanced theory and methods of analysis of statically indeterminate structures; secondary stresses; torsion; buckling and stability; and advanced theory and application of plastic design in building structures. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
- 452. Foundation Engineering.** Soil mechanics and site exploration; design of spread footings, combined footings, piles, and caissons; and foundation walls and retaining walls in reinforced concrete. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
- 453. Advanced Reinforced Concrete Design.** Critical review of the analysis, methods, and specifications involved in the design and behavior of reinforced concrete structures for buildings, including tall buildings, plates, and shells; computer applications. Prerequisite: Architecture 355; credit or concurrent registration in Architecture 451 or consent of instructor. 1 unit.
- 454. Advanced Steel Design.** Advanced topics in the design of steel structures; critical study of the AISC specification; design of steel members and their connections; composite structures; and the analysis and design of continuous structures and tall buildings. Prerequisite: Architecture 451 or consent of instructor. 1 unit.
- 455. Prestressed Concrete Design.** Theory and design of prestressed concrete structures; and suspension shell structures. Prerequisite: Architecture 453 or consent of instructor. 1 unit.
- 456. Advanced Structural Planning.** Study of the loads, functional and spatial requirements, and construction problems in the selection and design of structural systems for buildings; cost estimates; and integration of mechanical and electrical equipment. Prerequisite: Architecture 452 and 453; credit or concurrent registration in Architecture 454 and 455; or consent of instructor. 1 unit.
- 461. Housing Environments Design Studio, I.** Emphasizes comprehensive design studies on individually selected housing problems; the study process includes programmatic development, environmental analysis, definitive design development and comprehensive project documentation. Prerequisite: Architecture 374 and 460. 1 to 2 units.
- 462. Housing Environments Design Studio, II.** Terminal design studio studies on individually selected housing problems; emphasizes definitive design development and process documentation for final project in the Master of Architecture Housing Environments option. Prerequisite: Architecture 461. 1 to 2 units.
- 463. Methods of Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 463. Introduction to methods and techniques of systematically generating social and behavioral information relevant to the programming, design, and evaluation of physical environments. Prerequisite: Graduate standing in architecture, landscape architecture, or urban and regional planning. 1 unit.
- 464. Conducting Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 464. See Landscape Architecture 464.
- 465. Design-Behavior Studio.** Same as Landscape Architecture 465. See Landscape Architecture 465.
- 466. Problems and Processes in Housing Design.** Analyzes issues confronting architects in the design of housing environments; emphasizing new and emerging problems; examines processes in problem solutions. Prerequisite: Concurrent registration in Architecture 374 or consent of instructor. 1 unit.

- 467. Critical Issues in Designing for the Elderly.** Examines issues related to the design of housing and community facilities for older people; stresses the development of strategies for design decision making and a comprehensive theoretical knowledge base for understanding how the design of the environment affects the aged. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
- 468. Site and Environmental Issues in Housing Design.** Examines issues involving housing environments as related to site, landscape, land planning, and buildings; also examines design values, processes, analysis techniques, and standards involving natural and human made interactions. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
- 471. Architectural Design Studio.** Definitive design of various building types with optional choices related to the student's particular interests, talents, and capacities; emphasis on human need, structural, mechanical, and tectonic integration. Prerequisite: Architecture 374 or consent of instructor. 1 to 2 units.
- 472. Architectural Design Studio.** Continuation of Architecture 471. Prerequisite: Architecture 471 or consent of instructor. 1 to 2 units.
- 476. Architectural Design Seminar.** Presentations and discussions relative to various areas of architectural and environmental design concerns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 3 units.
- 477. Theory of Architecture.** A review of principles of architectural design; factors in programming architectural requirements; design development; and evaluation and criticism. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 478. Architectural Criticism.** Analysis and criticism of selected buildings; individual reports and discussions. Prerequisite: Architecture 477 or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 479. Architectural Design Methods.** Examination of the architectural design process: identification, investigation, and evaluation of design methods. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 1 unit.
- 481. Urban Design Studio, I.** Same as Landscape Architecture 481. Design of large building types and building complexes; megastructures; and collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 374; credit or concurrent registration in Urban Planning 326 or consent of instructor. 1 to 2 units.
- 482. Urban Design Studio, II.** Same as Landscape Architecture 482. Design development studies of central business districts, movement systems, and residential communities; collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 481, Urban Planning 326, or consent of instructor. 1 to 2 units.
- 488. Urban Design Seminar.** Analysis and criticism of urban development projects; individual reports and discussions. Prerequisite: Architecture 374, Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 491. Special Problems in Architectural History and Preservation.** Individual investigation of the work of particular architects, of specific buildings, and of the architecture of periods or regions; comparative studies; and aesthetic problems. Prerequisite: Twelve hours of architectural history or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 493. Special Problems in Architectural Administration and Building Construction.** Studies of building projects at large and small scales; investigations in feasibility and cost control, material and system selection, construction techniques and processes, legal and business procedures, and related aspects of professional practice; and independent study or study in conjunction with architectural and urban design projects. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 495. Special Problems in Structural Theory and Design.** Individual or group investigation and study in architectural engineering application; research in economy and design in correlation with architectural, mechanical, and structural requirements. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 496. Special Problems in Housing Environments.** Individual investigation or research in housing environments involving special issues such as energy conscious design, human environmental relations, aesthetic theory, government policy, and cultural patterns. Pre-

requisite: Architecture 374 or consent of instructor. 3 to 1 1/2 units. May be repeated to a maximum of 3 units.

- 497. Special Problems in Architectural Design.** Individual investigation of building types and systems, aesthetic theories, and other problems in architectural design. Prerequisite: Architecture 374 or consent of instructor. 3 to 3 units. May be repeated to a maximum of 4 units.
- 498. Special Problems in Urban Design.** Individual investigation of problems at the community and urban scale; collaboration with other disciplines. Prerequisite: Credit or concurrent registration in Architecture 481 or Urban Planning 326, or consent of instructor. 3 to 3 units. May be repeated to a maximum of 3 units.
- 499. Thesis Research.** Prerequisite: Consent of instructor and graduate program coordinator. 0 to 4 units. May be repeated to a maximum of 4 units.

ART AND DESIGN, SCHOOL OF

(Including Introduction to Art and Design, General Professional Courses in Art and Design, Art Education, Cinematography, Crafts, Graphic Design, History of Art, Industrial Design, Painting, Photography, Printmaking, and Sculpture)

Director of School: E. C. Wicks

School Office: 143 Art and Design Building, 408 E. Peabody, Champaign

Introduction to Art and Design

- 103. Introduction to Studio Arts.** Introductory studio experiences with a variety of art materials and techniques accompanied by visitations to artists' studios and museum tours. Not open to students majoring in art and design. 3 hours. Credit is not given for both Introduction to Art and Design 103 and 190.
- 105. Introduction to Watercolor Painting.** A basic watercolor class that includes an introduction to the tools, materials, and techniques of the medium; landscape, still life, and figure experiences. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
- 106. Introduction to Oil Painting.** Elementary oil and acrylic painting and sketches from still life and landscape; includes basics such as stretching canvas, preparing surfaces, and varied painting techniques. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
- 107. Elementary Drawing.** A basic drawing course using a variety of media and techniques including charcoal, conte, pencil, pen and India ink, and studies in perspective, line, value, composition, and the figure. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
- 108. Ikebana: The Japanese Art of Flower Arrangement.** Introduces Japanese arts and cultural heritage through Ikebana (Japanese flower arranging). 2 hours.
- 109. Sumi-E (Japanese and Chinese Black Ink Painting).** Introduction to the ancient abstract Chinese art of black ink painting through the study and practice of Chinese and Japanese Sumi-E; students discover the foundation of twentieth-century visual arts and discuss the philosophy of Chinese and Japanese art. 2 hours.
- 140. Introduction to Art.** A broadly based conceptual foundation for a critical understanding of the visual arts in contemporary society. Not open to students in art and design and architecture. 3 hours.
- 150. Beginning Sculpture.** Clay modeling from the human figure; casting in plaster and other materials as well as production of sculpture involving materials other than plaster and clay. Not open to students majoring in art. 3 hours.

- 185. Design, I.** Design elements and principles with emphasis on color and painting exercises; uses a variety of media to explore the different aspects of design, emphasizing two-dimensional problems. Not open to students majoring in art and design. 3 hours.
- 186. Design, II.** A second course in design with emphasis on graphic communication; students gain experience using modern graphics equipment. Not open to students majoring in art and design. Prerequisite: Introduction to Art and Design 185. 3 hours.
- 190. Recreational Crafts, I.** Introduction to design and execution in crafts particularly adapted to work with children in schools, playgrounds, and summer camps. Primarily for recreation majors in physical education. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 209. Japanese Tea Ceremony and Zen Aesthetics.** The tea ceremony and culinary arts of Japan practiced as the physical discipline necessary for Zen aesthetic experience. Prerequisite: Introduction to Art and Design 108 or 109. 2 hours. May be repeated to a maximum of 4 hours.

General Professional Courses in Art and Design

- 113. Orientation to Art and Design.** An overview of art and design professions in today's society. 0 hours.
- 117. Drawing, I.** Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
- 118. Drawing, II.** Continuation of General Professional Courses in Art and Design 117. Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 117. 3 hours.
- 119. Design, I.** Theory and practice in the elements of two-dimensional design and the study of color. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
- 120. Design, II.** Theory and practice in the elements of three-dimensional design. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 119. 3 hours.
- 121. Drawing Theory.** Orthographic, oblique, and isometric projections and perspective. 2 hours.
- 122. Drawing Theory.** Continuation of General Professional Courses in Art and Design 121. The science of shades and shadows in orthographic and isometric projections and perspective. Prerequisite: General Professional Courses in Art and Design 121. 2 hours.
- 131. Elementary Composition.** Pictorial composition in line, pattern, and color. Prerequisite: General Professional Courses in Art and Design 119. 2 hours.
- 187. Fundamentals of Drawing.** Basic drafting techniques; orthographic and oblique projections; perspective, shade and shadows, architectural and topographic forms. Prerequisite: Enrollment in Architecture curriculum. 2 hours.
- 188. Freehand Drawing, I.** For students in architecture. Drawing three-dimensional form and space on a two-dimensional surface; introduction to the use of perspective in freehand drawing; and construction of geometric solids in space and drawing from nature in pencil, pen, and charcoal. Prerequisite: General Professional Courses in Art and Design 187 or equivalent; enrollment in architecture curriculum. 2 hours.
- 189. Freehand Drawing, II.** For students in architecture. Continuation of General Professional Courses in Art and Design 188. Introduction to life drawing and abstract drawing problems utilizing watercolor, acrylics, and other color media. Prerequisite: General Professional Courses in Art and Design 188, enrollment in architecture curriculum. 2 hours.

- 191. Unit One Studio/Seminar in Art and Design.** Topics vary; consult Timetable or Unit One office. 1 to 3 hours. May be repeated as topics vary.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 391. Individual Studio Problems.** Directed independent creative activity or research. Prerequisite: Junior or graduate standing; consent of instructor, student's advisor, and Associate Director of the School. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 398. Art and Design Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see Timetable for medium/topic. Prerequisite: Junior, Senior, or Graduate standing in art and design, or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated as topics vary.
- 493. Seminar: Introduction to Methods and Criticism.** Prerequisite: Graduate standing in art. $\frac{1}{2}$ to 1 unit.

Art Education

- 203. Art in the Elementary Grades, I.** Introductory laboratory experiences with the elements of design in the visual arts and with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. 3 hours.
- 204. Art Education Laboratory.** Art in the elementary and secondary schools; studio activities in a variety of materials and processes appropriate for use in the schools. Prerequisite: General Professional Courses in Art and Design 132 or Industrial Design 134, or consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.
- 205. Art in the Elementary Grades, II.** A continuation of laboratory experiences begun in Art Education 203 with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. Prerequisite: Art Education 203. 3 hours.
- 206. Practicum in Teaching Art.** Supervised teaching of art to children augmented by a seminar; includes classroom preparation and evaluation. Prerequisite: Art Education 207 or consent of instructor. 4 hours.
- 207. Art Curriculum Development and Practicum in the Elementary Schools.** Develops productive and appreciative art curricula for the elementary schools and provides class members with a weekly half day visitation to the local elementary schools to observe and assist classroom teachers and art consultants in teaching art to children. For art education majors only. 3 hours.
- 208. Organization of Public School Art Programs.** The selection and arrangement of content for different educational levels; study and evaluation of curricula, equipment, and supplies; and program supervision. Prerequisite: Art Education 207 or junior standing in art, or consent of instructor. 3 hours.
- 280. Professional Seminar in Art Education.** Examines professional responsibilities, methods, and techniques specific to teaching art in elementary and secondary education; features practical application of methods and techniques appropriate for the exceptional child and youth in special and mainstreamed classrooms. Prerequisite: Concurrent registration in Educational Practice 235 and 242; art education sections only. 4 hours.
- 290. Senior Honors in Art Education.** Independent guided research and study for honors. Prerequisite: Senior standing in art education; a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 3 hours. May be repeated to a maximum of 3 hours.
- 291. Individual Problems in Art Education.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design, and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 389. Aesthetic Inquiry and Criticism in Art Education.** Studies the theories of art, techniques of criticism, the meaning of artistic expression, and their relationship to the visual arts and art education. Prerequisite: Advanced standing in art education curriculum; or consent of instructor. 4 hours or 1 unit.

- 390. Advanced Art for Elementary Grades.** Advanced laboratory experiences in two-dimensional visual art techniques for elementary teachers, supervisors, and principals. Prerequisite: Art Education 205 or consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated for a maximum of 4 hours or 2 units.
- 489. Issues in Art Education.** A study of fundamental issues affecting education in the visual arts; examines and explores the educational implications of the nature and value of art, the nature of the artist, and the development of the child as an artist and connoisseur. 1 unit.
- 490. Curriculum Development in Art.** An analysis of curriculum organization in the visual arts; particular emphasis given to a range of curriculum positions in education and general research related to curriculum design. Prerequisite: Consent of instructor. 1 unit.
- 491. Special Problems in Art Education.** Individual direction in research and in creative activity; thesis. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in art education. 0 to 4 units.

Cinematography

- 180. Introduction to Cinematography.** Introduction to the principles and techniques of cinematography as applied to individual expression. 3 hours.
- 280. Basic Cinematography.** Fundamentals of the theory and practice of motion pictures as an art form, with emphasis on principles, tools, and techniques. Prerequisite: Cinematography 180 or consent of instructor. 3 hours.
- 291. Individual Cinematography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 380. Cinematography.** Theory and practice of motion pictures as an art form; emphasis on individual creative production. Anticipated cost to the student for each semester is \$75 to \$200. Costs should be discussed with the instructor before enrollment. Prerequisite: Cinematography 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 12 hours or 4 units.
- 480. Cinematography Studio.** Individually directed research; expression through the cinema medium. Prerequisite: Enrollment in M.F.A. program and major in photography/cinematography, or consent of the departmental graduate committee. $\frac{1}{2}$ to 2 units. May be repeated.
- 491. Special Problems in Cinematography.** Directed individual creative activity or research. Prerequisite: Graduate standing in cinematography. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Crafts

- 160. Jewelry, I.** The design and execution of simple jewelry and related metal forms, including study of characteristics of base and precious metals through forming, fabrication, decoration, and finishing processes. 2 hours.
- 161. Jewelry, II.** Continuation of Crafts 160; further experience and experimentation with manipulative techniques, materials, and processes, emphasizing the lost wax casting technique. Prerequisite: Crafts 160. 2 hours.
- 170. Ceramics, I.** The design and production of pottery by hand methods. Work covers the basic processes of forming, decorating, and firing. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
- 171. Ceramics, II.** Advanced work in studio pottery, including expanded experience in forming methods and glaze compounds. Prerequisite: Crafts 170. 2 hours.

- 260. Jewelry, III.** The design and production of jewelry and metal work for majors in crafts with further experience in manipulative techniques such as casting, electroforming, surface decoration, enamelling, complex construction and forming. Prerequisite: Crafts 160 and enrollment in the crafts curriculum. 3 hours.
- 261. Jewelry, IV.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style through advanced techniques of holloware, complex construction, enamelling, electroforming and plating, forging and the use of varied materials. Prerequisite: Crafts 260. 3 hours.
- 262. Metal Technology.** Understanding of the working properties of a number of nonferrous metals, their alloys, and their patination; such areas as electroforming on organic and inorganic materials, working with rigid and thermosetting plastics, and experimentation with little known processes of metalwork to be subjects of individual research. Prerequisite: Junior standing in crafts or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 264. Jewelry, V.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style and ability to work independently with regular faculty consultation. Prerequisite: Crafts 261. 5 hours.
- 265. Jewelry, VI.** Continuation of Crafts 264; emphasis on experimentation and development of personal style, a portfolio, and a senior exhibition. Prerequisite: Crafts 264. 5 hours.
- 270. Ceramics, III.** Introduction to ceramic design for developing basic skills in designing and producing clay products by various hand processes including throwing, handbuilding, and casting. Prerequisite: Junior standing in curriculum in crafts. 3 hours.
- 271. Ceramics, IV.** Introduction to ceramic glaze calculation, concern with the understanding and application of the knowledge of glaze calculation in a creative way and with applications of creative experiments in glaze and clay bodies. Prerequisite: Crafts 270. 5 hours.
- 272. Clay Technology.** An introduction to the nature and understanding of basic inorganic raw materials in relation to ceramic processes, laboratory testing of clay types, bodies, slips of earthenware, stoneware, and porcelain temperatures. Prerequisite: Junior standing in art and design or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 274. Ceramics, V.** The application of the combined skills of throwing and creative glaze procedures to produce thrown ceramic products with the emphasis on creative experimentation; also covers plaster and mold making as a creative procedure in producing clay products. Prerequisite: Crafts 271. 5 hours.
- 275. Ceramics VI.** Technical and creative research in ceramic design, with emphasis on reappraisal of the traditional media and the traditional limited production method used by artist potters. Prerequisite: Crafts 274. 5 hours.
- 288. Glass, I.** The design and production of glasswork by the offhand methods, work covers the basic processes of blowing and molding. Prerequisite: Industrial Design 184, junior standing in art or consent of instructor. 2 hours.
- 289. Glass, II.** Advanced work in glassworking by the offhand methods including blowing, casting, burning, and etching. Prerequisite: Crafts 288. 2 hours.
- 290. Senior Honors in Crafts.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in crafts, a cumulative grade point average of 4.0, and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Crafts Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design, and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 364. Metal.** For graduate students not specializing in crafts, an additional creative experience for students who are aesthetically advanced in another medium. Prerequisite: Consent of instructor and associate director of School, open only to seniors and graduate students in art and design curricula other than crafts. 2 hours or 1/2 unit. May be repeated to a maximum of 2 units.
- 374. Ceramics.** Ceramic design with emphasis on the development of professional style and

personal expression. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 2 units. May be repeated to a total of 6 hours.

- 384. Glass.** Advanced glass design with emphasis on professional development and personal style. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 491. Special Problems in Crafts.** Directed individual creative activity or research. Prerequisite: Graduate standing in crafts. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 498. Ceramic-Glass-Metal Laboratory.** Individually directed research and personal expression in ceramic, glass, or metal medium. Prerequisite: Enrollment in the M.F.A. program with a major in ceramics, glass, or metal, or consent of departmental graduate committee. $\frac{1}{2}$ to 2 units. May be repeated.

Graphic Design

- 100. Design History Survey.** Studies the history of design from 1850 to the present, showing the relationships between graphic design, industrial design, interiors, and architecture; gives attention to major historical movements as well as to the emergence of modern and contemporary design. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 120 by students in graphic design. 3 hours.
- 120. Visual Organization.** Introduces the discipline and function of graphic design; explores the organization and structure of two-dimensional space as context for visual communication; includes practical exercises in visual perception, visual organization, and visual communication. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 100 by students in graphic design. 3 hours.
- 130. Production.** Basic information and current methods in the production of multiple printed communications, including printing processes, papermaking, binding and other practices, and the preparation of art work for the various methods of reproduction; field trips required. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 140 by students in graphic design. 3 hours.
- 140. Typography.** Introduces the discipline, function, and tradition of typography as it relates to visual-verbal communication; explores both technical and formal aspects. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 130 by students in graphic design. 3 hours.
- 210. Photo/Graphics.** Explores the design potential of photographic and related processes in the generation of imagery for visual communication, employing in-camera, darkroom, and graphic arts equipment manipulations. Prerequisite: Concurrent registration in Graphic Design 230 or 240. 3 hours.
- 220. Image Making.** The understanding and application of the image making process in graphic design, with emphasis on hand-generated images; covers historical, cultural, and technological influences on concept, content, and visual style. Prerequisite: Graphic Design 130 and 140; concurrent registration in Graphic Design 230 or 240. 3 hours.
- 230. Methodology.** Goal-directed graphic design problem of thinking and research which precede the making of design; develops systems for objective problem solving. Prerequisite: Junior standing in graphic design curriculum; Graphic Design 130 and 140. 3 hours.
- 240. Advanced Typography.** Further exploration of typographic form and manipulation of variables which affect content, stresses the importance of typographic composition as an integral component of contemporary visual communication design. Prerequisite: Graphic Design 230. 3 hours.
- 290. Senior Honors in Graphic Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in graphic design, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Graphic Design Problems.** Directed independent creative activity or re-

search. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.

370. **Advanced Graphic Design, I.** Research in, and analysis and synthesis of, complex visual problems; emphasizes modular sequence, symbolic systems, and image making for visual communication. Students prepare comprehensive portfolio and consider professional requirements encountered by the designer in the visual communications industry. Prerequisite: Graphic Design 240, for graduate credit, consent of graphic design program chair. 3 hours or $\frac{1}{2}$ unit.
380. **Advanced Graphic Design, II.** Continuation of Graphic Design 370. Prerequisite: Graphic Design 370, for graduate credit, consent of graphic design program chair. 3 hours or $\frac{1}{2}$ unit.
467. **Graphic Design Laboratory.** Individually directed research in the studio with concentration in graphic design. Prerequisite: Enrollment in the M.F.A. program in graphic design or consent of departmental graduate committee. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
491. **Special Problems in Graphic Design.** Directed individual creative activity or research. Prerequisite: Graduate standing in graphic design. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

History of Art

101. **Introduction to Non-Western Art: East Asia.** Cultural analysis of the interrelated fields of architecture, sculpture, and painting, and other humanistic studies of East Asian civilizations; emphasizes India, China, and Japan. 3 hours.
110. **Introduction to Non-Western Art: Africa, the Americas, and Oceania.** Highlights of visual arts traditions in black Africa, pre-Columbian America, and the South Pacific; a cross-cultural analysis of non-Western aesthetic systems and forms with a focus on thematic problems rather than style surveys. 3 hours.
111. **Ancient and Medieval Art.** The development of the visual arts in Western Europe and the Near East in their cultural contexts from prehistoric times until the early fifteenth century; includes Egyptian, Greek, Roman, and medieval art and architecture. 4 hours.
112. **Renaissance and Modern Art.** The development of the visual arts in Western Europe and the United States in their cultural contexts from the early fifteenth century to the present. Prerequisite: History of Art 111 or consent of instructor. 4 hours.
115. **Art Appreciation.** A liberal introduction to the visual arts; surveys media representing the major cultural and historical periods, both Western and non-Western. In addition to required lectures and readings, campus art collections and exhibitions are visited periodically. 3 hours.
116. **Masterpieces of Art.** Studies selected Western and non-Western masterpieces of art and architecture, considered both as aesthetic objects and as expressions of the ideals and beliefs of the societies for which they were created. 3 hours.
210. **African Art and Society, I.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multimedia framework and a social/religious context; surveys the art styles of the Dogon, Senegal, Mende, and Ashanti peoples. 4 hours.
211. **African Art and Society, II.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multimedia framework and a social/religious context; focuses on Yoruba art and surveys the art traditions of southeastern Nigeria, Cameroon, Gabon, Central Africa, and East Africa. 3 hours.
215. **Greek Art.** Same as Classical Civilization 117. Survey of architecture, sculpture, and painting of the Greek world from the geometric period to the beginning of the Christian era. 3 hours.
216. **Roman Art.** Same as Classical Civilization 118. Survey of architecture, sculpture, and painting of the Roman world from republican times to the age of Constantine, with brief treatment of later Roman art leading to Byzantine. 3 hours.

217. **The Development of the Ancient City.** Same as Classical Civilization 231. See Classical Civilization 231.
218. **Ancient Greek Sanctuaries.** Same as Classical Civilization and Religious Studies 232. See Classical Civilization 232.
219. **The Classical Tradition in Art from the Renaissance to the Modern Age.** Examines the effect of the art of classical antiquity upon the works of some of the greatest artists from the Renaissance to the modern age; discusses works of art as much as possible in the language of comparison employed by their creators and the poets and critics of their time. 3 hours.
222. **Medieval Art.** The arts of Byzantium and Western Europe from the early Christian era to the Renaissance. 3 hours.
230. **Italian Renaissance Art.** Architecture, painting, sculpture, and minor arts of Italy during the Renaissance. 3 hours.
231. **Northern Renaissance Art.** Architecture, painting, sculpture, and minor arts of Europe outside Italy in the fifteenth and sixteenth centuries. 3 hours.
235. **Baroque and Rococo Art.** Studies European painting, sculpture, and graphic work during the period 1580 to 1750 with emphasis on major masters such as Bernini, Caravaggio, Poussin, Rembrandt, Rubens, Velazquez, and Watteau. 3 hours.
240. **Art of the Nineteenth Century.** Architecture, painting, sculpture, and minor arts of France, Germany, Spain, and England in the nineteenth century. 3 hours.
241. **Twentieth-Century European Art.** A survey of the major artists and artistic movements in European painting and sculpture from postimpressionism to the present. 3 hours.
250. **American Art.** Surveys American art and architecture from the colonial period to the present. 3 hours.
289. **Senior Honors in Art History-BA.** Independent guided research and study in a selected area of art history for candidates for the Bachelor of Arts in Art History with departmental distinction. Prerequisite: Senior standing in the Art History curriculum, a cumulative grade point average of 4.25, an art history grade point average of 4.5, and consent of instructor, department advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours. (Counts for advanced hours in LAS.)
290. **Senior Honors in Art History-BFA.** Directed independent research and study for honors. Prerequisite: Senior standing in FAA art history, a cumulative grade point average of 4.0, and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Art History Topics.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
301. **Chinese Art.** History of Chinese art from earliest times to the present. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Japanese Art.** History of Japanese art from earliest times to the twentieth century. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
303. **Intellectual Artists of China.** Studies selected artists including struggling recluses, fantasies, eccentrics, and individualists; examines the aesthetic and expressive content of their works within the content of their social and intellectual environment. 3 hours, or $\frac{3}{4}$ or 1 unit.
304. **Space and Design in Japanese Art and Architecture.** Studies basic design principles in Japanese painting, pottery, costumes, architecture, gardens, and other crafts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
310. **West African Art.** A study in depth of West African art styles in time perspective and cultural context, with a special interest in the use of interdisciplinary source materials. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Traditional Art of Pacific Ocean Cultures.** A survey of traditional art in Polynesia, Melanesia, and Micronesia, including New Zealand and Australia; emphasizes major style areas and their historical and cultural significance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

315. **The Archaeology of Greece.** Same as Classical Civilization 343. See Classical Civilization 343.
316. **The Archaeology of Italy.** Same as Classical Civilization 344. See Classical Civilization 344.
317. **The Ancient Ideal in Art and Literature.** Same as Classical Civilization 332 and Comparative Literature 306. See Classical Civilization 332.
322. **Early Christian and Byzantine Art.** The arts of Byzantine and of western Europe from the early Christian Era through the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
323. **Romanesque Art.** Art and architecture of the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
324. **Gothic Art.** The arts of western Europe from the end of the Romanesque period until the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
325. **Medieval Manuscripts and Early Printed Books.** Surveys manuscript illumination and early book production from 500 to 1500 A.D.; topics include techniques of manuscript illustration and printing production in such masterpieces as the Vatican Virgil, the Utrecht Psalter, the Book of Kells, the Tres Riches Heures, the Gutenberg Bible, and Brant's Ship of Fools. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
330. **Problems in Italian Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of Italy during the Renaissance selected for intensive study; special emphasis given to the study of the lives of artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
331. **Problems in Northern Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of France, Germany, Spain, and England during the Renaissance selected for intensive study; special emphasis given to the study of the lives of the artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
332. **Italian Art of the Sixteenth Century.** Painting, sculpture, and minor arts in Italy from 1520 to 1590. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
335. **Baroque Art in Italy and France.** Studies painting, sculpture, and graphic work in Italy and France during the period 1580-1700 emphasizing such major masters as Bernini, Caravaggio, the Carracci, Cortona, La Tour, and Poussin. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
336. **The Age of Rembrandt and Rubens.** Studies seventeenth century art in the Low Countries with extensive treatments of the careers of Rubens and Rembrandt. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
337. **Spanish Art from El Greco to Goya.** Studies art and architecture in Spain from the sixteenth through the nineteenth centuries, with emphasis on the masters of the Golden Age, includes El Greco, Velazquez, Zurbaran, Montanes, Ribera, Cano, Murillo, and Goya. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
340. **Romantic Art.** Studies English, French, and German art from the end of the eighteenth century through 1840, focuses on revivalist movements, historicism, landscape art, and changing conceptions of art and artist during the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
341. **Realism to Post-Impressionism.** Studies European art from 1850 to 1900, with emphasis on French painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
342. **German and Austrian Painting of the Late Nineteenth and Early Twentieth Centuries.** A survey of modern German and Austrian painters and pictorial movements from the 1890s to the period of Hitler, with special emphasis on the expressionist period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
343. **The Art Nouveau in Europe.** A survey of the principal artists and artistic currents in

the applied arts during the 1890s in Europe; emphasis on individual figures, with an attempt to define the common stylistic and theoretical assumptions of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

344. **The Beginnings of Modernism: European Art from Post-Impressionism to World War I.** The pioneer movements in modern painting and sculpture, emphasizing the work and ideas of individual major figures. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Twentieth-Century Art in Europe: 1915-1945.** A study of the leading personalities and movements in European painting, sculpture, and architecture, with emphasis on painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
346. **Recent American Painting and Sculpture.** A critical survey of developments since World War II with emphasis on questions of quality and personal content and with consideration of the most current tendencies. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
347. **Modern Sculpture.** Development of the modern sculptural revolution from the late nineteenth century to recent times, with emphasis on the work of Rodin, Brancusi, Picasso, Lipschitz, Moore, and David Smith. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
350. **American Art to 1840.** Architecture, painting, sculpture, and minor arts of the colonies and the United States to 1840. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **American Art: 1840-1900.** Architecture, painting, sculpture, and minor arts of the United States. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
352. **American Art: 1900-40.** Architecture, painting, sculpture, and photography in the United States. Additional work in the form of research papers is required of graduate students. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **History of Photography.** Examines a history of photography from its origin to the present, including both documentary and artistic approaches; considers relationships with other arts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
361. **Old Master Drawings.** An historical and critical survey of drawings from the late Middle Ages to the end of the nineteenth century; emphasis on drawings by artists such as Pisanello, Leonardo, Michelangelo, Raphael, Rembrandt, Rubens, Watteau, Goya, Degas, and Van Gogh. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Historiography of Art and the History of Art Criticism.** Origins and the development of the history of art criticism. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
366. **Introduction to Art Museology.** Survey of the art museum as a professional institution, its history, and present orientation; designed to acquaint prospective graduate students with the field of museum operation and to serve as background for students entering graduate courses in special fields of art museum practice: museology. Prerequisite: Consent of instructor. 4 hours or 1 unit.
391. **Topics in Art History.** Variable content; consult the Timetable for current topics. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated as topics vary.
401. **Seminar in Chinese Art.** Investigation of selected phases, concepts, and problems of the art of China; intensive reading and reports. Prerequisite: History of Art 301 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
402. **Seminar in Japanese Art.** Investigation of selected phases, concepts, and problems of the art of Japan; intensive reading and reports. Prerequisite: History of Art 302 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
410. **Seminar: African Art.** An intensive investigation of selected problems in the sculpture and other arts of Negro Africa. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.

- 422. Studies in Medieval Art.** Research seminar in subjects selected from the art and architecture of the medieval period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 430. Seminar in Renaissance Art.** Special problems in the history of Renaissance art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 435. Seminar in Baroque Art.** Research seminar in problems selected from the art of seveneenth-century Europe. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 440. Seminar in the Art of the Period 1750-1900.** An intensive study of selected problems in European art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 441. Seminar in Modern Art.** Investigation of special problems in the history of twentieth-century art. Students present reports of their research. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 446. Seminar in Contemporary Art.** Intensive study of selected problems or artists. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 450. Seminar in American Art.** Investigation of selected problems in the history of American art. Prerequisite: History of Art 350 and 351, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 465. Seminar: Studies in the Development of Art History and Criticism.** The relation of art history and criticism; changing standards and criteria; intensive reading of selected critical works; and the writing of art criticism. Prerequisite: Consent of instructor. 1 unit.
- 466. Art Curatorial Techniques.** An intensive course in the role, responsibilities, and duties of the art museum curator; demonstration and practice of curatorial techniques in researching, documenting, acquiring, transporting, handling, and conservation of works of art. Prerequisite: History of Art 366. 1 unit.
- 467. Art Museum Administration and Education.** Two aspects of art museum work: 1. administration, covers trustee relations, methods of serving the public, fund raising, budgeting, staff organization, and program planning; 2. museum education. Students receive practice in the preparation of educational exhibitions and related educational materials. Prerequisite: History of Art 366. 1 unit.
- 468. Art Museum Internship.** Introduction to actual supervised practice in one specialized department in an art museum: curatorial, educational, or administrative department. Prerequisite: History of Art 466 and 467. 1 unit.
- 492. Individual Readings in the History of Art.** Directed readings in special fields or aspects of history of art not provided in depth by the current course offerings. Prerequisite: Consent of instructor. Sections A and B may be taken simultaneously. Registration allowed for each section is 0 to 1 unit.
- 499. Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in history of art. 0 to 4 units.

Industrial Design

- 133. Design Workshop.** Fundamentals of three-dimensional design. Primarily for students majoring in the industrial design curriculum. Prerequisite: General Professional Courses in Art and Design 118, 120, and 121. 2 hours.
- 134. Introduction to Industrial Design.** Fundamentals of two and three-dimensional design as applied to industrial design. Prerequisite: Industrial Design 133 and General Professional courses in Art and Design 122. 3 hours.
- 175. Design Management and Methods.** Introduction to comprehensive aspects of professional practice including professional ethics, types of offices, general management rules, contacts and fees, work promotion, and project administration; lecture and discussion with one outside paper required. Prerequisite: Sophomore standing in industrial design, or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.

- 210. History of Furniture and Interior Design.** A historical survey of furniture and interiors from Egypt to the present day. Emphasizes the American development; analysis of its cultural, social, psychological, and structural differences; includes a survey of stylistic decorative techniques. Prerequisite: Sophomore standing. 3 hours.
- 270. Drawing and Rendering.** Quick delineation of industrial objects, interiors, and architecture; emphasis on drawing in perspective with color using pastels, markers, and other media. Prerequisite: Concurrent registration in Industrial Design 275, 276, 277, or 278; or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 271. Materials and Processes, I.** Use and manipulation of basic materials in modern industry. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
- 272. Materials and Processes, II.** Continuation of Industrial Design 271. Prerequisite: Industrial Design 271. 3 hours.
- 275. Industrial Design, I.** Designing of objects for manufacture by the machine industries. Field trip required. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
- 276. Industrial Design, II.** Continuation of Industrial Design 275. Field trip required. Prerequisite: Industrial Design 275. 3 hours.
- 277. Advanced Industrial Design, I.** Prerequisite: Industrial Design 276. 4 hours.
- 278. Advanced Industrial Design, II.** Prerequisite: Industrial Design 277. 4 hours.
- 280. Professional Practices.** Focuses on the preparation of a design portfolio and resume; examines operations of professional design offices; and includes presentations and discussions by visiting designers. 2 hours.
- 290. Senior Honors in Industrial Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in industrial design, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Industrial Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 477. Industrial Design Laboratory.** Individually directed research in the drafting room or workshop with concentration on industrial design. Prerequisite: Enrollment in the M.F.A. program in industrial design or consent of departmental graduate committee. ½ to 3 units. May be repeated.
- 491. Special Problems in Industrial Design.** Directed individual creative activity or design. Prerequisite: Graduate standing in industrial design. ½ to 2 units. May be repeated to a maximum of 8 units.

Painting

- 125. Life Drawing.** Prerequisite: General Professional Courses in Art and Design 118. 2 hours.
- 126. Life Drawing.** Prerequisite: Painting 125. 2 hours.
- 141. Beginning Painting, I.** Painting in oil from arranged groups. Prerequisite: Freshman standing in art. 2 hours.
- 142. Beginning Painting, II.** Continuation of Painting 141. Prerequisite: Painting 141. 2 hours.
- 143. Painting Composition, I.** Problems of non-literal content for painters, with special consideration of materials and techniques. Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
- 144. Painting Composition, II.** Continuation of Painting 143 with special emphasis on formal organization in painting. Prerequisite: Painting 143. 2 hours.
- 201. Watercolor, I.** Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
- 202. Watercolor, II.** Continuation of Painting 201. Prerequisite: Painting 201. 2 hours.

- 225. Intermediate Drawing.** Study from life in drawing media. Prerequisite: Painting 126 and junior standing in art. 2 hours.
- 226. Intermediate Drawing.** Continuation of Painting 225. Prerequisite: Painting 225. 2 hours.
- 229. Anatomical Drawing.** Advanced drawing emphasizing human anatomy including the skeletal and muscular structure of the human figure. Prerequisite: General Professional Courses in Art and Design 118 and Painting 126. 3 hours.
- 231. Intermediate Composition.** Prerequisite: Painting 126, 142, and 144. 3 hours.
- 232. Intermediate Composition.** Prerequisite: Painting 231. 3 hours.
- 233. Advanced Composition.** Prerequisite: Painting 226, 232, and 244. 3 hours.
- 234. Advanced Composition.** Prerequisite: Painting 233. 3 hours.
- 243. Figure Painting.** Painting in oil from the head and full figure. Prerequisite: Painting 126 and 142. 2 hours.
- 244. Figure Painting.** Continuation of Painting 243. Prerequisite: Painting 243. 2 hours.
- 245. Advanced Painting and Drawing.** Advanced creative study from nature and the model in various painting and drawing media. Prerequisite: Painting 226, 232, and 244. 3 hours.
- 246. Advanced Painting and Drawing.** Continuation of Painting 245. Prerequisite: Painting 245. 3 hours.
- 290. Senior Honors in Painting.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in painting, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Painting Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design, and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 380. Drawing.** Advanced drawing in several media. Prerequisite: For undergraduates, consent of instructor; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{2}{3}$ to 1 unit.
- 381. Painting.** Advanced painting in oil and other media. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Painting 142 or equivalent; for graduates, consent of departmental graduate committee. 2 to 4 hours, or $\frac{2}{3}$ to 1 unit. May be repeated to a total of 2 units.
- 382. Painting Materials and Techniques.** Study of the materials and techniques used in the various media: oil, watercolor, tempera, gouache, encaustic, etc. Prerequisite: Painting 142 or graduate standing in art. 2 hours or $\frac{2}{3}$ unit.
- 491. Special Problems in Painting and Drawing.** Directed individual creative activity or research. Prerequisite: Graduate standing in painting. $\frac{2}{3}$ to 2 units. May be repeated to a maximum of 5 units.
- 495. Painting Laboratory.** Professional and experimental painting with emphasis on the development of maturity of style and personal expression. Prerequisite: Enrollment in the M.F.A. program in painting. $\frac{2}{3}$ to 5 units.

Photography

- 115. Basic Photography.** Investigates basic elements comprising a photograph; explores the photograph, tone, and texture as expressive media; and works with the camera, exposure meter, and film and print developing in black and white. See Timetable for average cost; student must furnish camera. Prerequisite: Freshman standing in art and design or consent of instructor. 5 hours.
- 215. Photography, II.** Uses hand-held cameras 35mm and 2 $\frac{1}{2}$ " and black and white processes to express ideas and emotions with emphasis on the development of a personal aesthetic. See Timetable for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 216. View Camera and Studio.** Includes work with camera movements, black and white exposure, and development relationships as tools of creative expression; covers basic

- lighting techniques and studio procedures. Most equipment furnished. Prerequisite: Photography 215 or consent of instructor. 3 hours.
220. **Color Photography.** Explores the potential of color prints and transparencies as media for creative expression. See Timetable for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
230. **Alternative Photographic Processes.** Explores cyanotype (blue printing), Van Dyke, gumprinting, and other less common processes as methods of creative expression. Prerequisite: Photography 115. 3 hours.
281. **Generative Systems.** Problem solving in current image generating technology such as electrostatics, offset lithography, computer graphics, and basic video; uses available systems hands on for creative expression. Prerequisite: Photography 215 or 230; or consent of instructor. 3 hours.
291. **Individual Photography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
315. **Photography, III.** Explores creative expression through the medium of photography. Students select format and process i.e., black and white, color, mixed media/ based on prior experience; group critiques held frequently; initial opportunity to experiment in personally selected directions which will be refined and amplified in Photography 316. Prerequisite: Photography 215; History of Art 357; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
316. **Advanced Photography.** Concentrated use of photographic processes for creative expression with emphasis on professionalism and the production of a photographic portfolio. Prerequisite: Photography 216 and 315; and minimum one other photography elective course. 3 hours or 1 unit.
387. **Photography.** Emphasizes development of mature creative attitudes through use of personal images and interpretations; work in black and white and in color. Prerequisite: Any two of Photography 215, 216, 220, or 230, or equivalent; consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated.
398. **Photography Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see Timetable for topic. Prerequisite: Junior, Senior, or Graduate standing in art and design, or consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topics vary.
486. **Photography Studio.** Individually directed research; personal expression through the photographic medium. Prerequisite: Enrollment in M.F.A. program and major in photography, cinematography, or consent of the departmental graduate committee. $\frac{1}{2}$ to 2 units. May be repeated.
491. **Special Problems in Photography.** Directed individual creative activity or research. Prerequisite: Graduate standing in photography. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

Printmaking

271. **Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Sophomore standing in art and design or consent of instructor. 2 hours.
272. **Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Printmaking 271. 2 hours.
281. **Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Sophomore standing in art and design or consent of instructor. 2 hours.
282. **Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Printmaking 281. 2 hours.

- 291. Individual Printmaking Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 371. Etching.** Advanced work in various printmaking techniques. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Printmaking 272 or equivalent; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.
- 381. Lithography.** Laboratory course in lithography. Course of study includes a complete development of the process, exploiting its potential as a fine art medium. Prerequisite: For undergraduates, Printmaking 282; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.
- 491. Special Problems in Printmaking.** Directed individual creative activity or research $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 497. Print Workshop.** Intaglio, relief, and planographic print media; includes etching, engraving, aquatint, wood, paper, and plastic relief printing, and lithography. Prerequisite: Graduate standing in art. $\frac{1}{2}$ to 3 units.

Sculpture

- 151. Sculpture.** Anatomical and ornamental forms; plaster molds and models; and wood and stone sculpture. Prerequisite: Freshman standing in art. 2 hours.
- 152. Sculpture.** Continuation of Sculpture 151. Prerequisite: Sculpture 151. 2 hours.
- 228. Introduction to Handmade and Cast Paper.** Introduces the techniques of handmaking paper of various materials and of casting paper as sculpture, including molding techniques, investigations into various uses, and applications of the two techniques. 3 hours.
- 253. Intermediate Sculpture, I.** A free, experimental, and creative use of permanent and impermanent sculpture materials, clays, wood, pastelnes, and plasters. Prerequisite: Sculpture 152. 2 hours.
- 254. Intermediate Sculpture, II.** Special projects in stone carving and malleable sheet metal, lead, copper, brass, and aluminum. Prerequisite: Sculpture 253. 2 hours.
- 255. Sculpture Materials and Techniques, I.** Special projects for cast bronze; model preparations, investments, melting, pouring, chasing, and developing of patinas. Prerequisite: Sculpture 152; junior standing in curriculum in sculpture. 3 hours.
- 256. Sculpture Materials and Techniques, II.** Special projects in terra cotta, use of various clays, preparation and construction methods, special problems in casting methods and materials, kiln operation, fuels, and glazing. Prerequisite: Sculpture 255. 3 hours.
- 257. Advanced Sculpture, I.** Introduction to plastics and welded metals; projects utilizing the special qualities of these materials. Prerequisite: Sculpture 254. 2 hours.
- 258. Advanced Sculpture, II.** Projects in permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 257. 2 hours.
- 259. Advanced Sculpture Materials and Techniques, I.** Projects in various permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 256. 3 hours.
- 260. Advanced Sculpture Materials and Techniques, II.** Continuation of Sculpture 259. Prerequisite: Sculpture 259. 3 hours.
- 290. Senior Honors in Sculpture.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in sculpture, a cumulative grade point average of 4.0, and consent of instructor, advisor, and associate director of the School. 2 to 4 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Sculpture Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 328. Handmade and Cast Paper.** Examines advanced techniques of handmaking paper of various materials and of casting paper as sculpture; includes sheet forming, studies of

molding techniques, plant fibers, and dyes appropriate for papermaking. Prerequisite: Sculpture 228 or graduate standing in art and design curricula. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.

- 391. Advanced Sculpture Techniques.** Advanced work in various sculptural media. Prerequisite: Consent of instructor. 2 hours, or ½ to 1 unit.
- 491. Special Problems in Sculpture.** Directed individual creative activity or research. Prerequisite: Graduate standing in sculpture. ½ to 2 units. May be repeated to a maximum of 5 units.
- 496. Sculpture Laboratory.** Experience at a professional level in sculptural techniques including metals casting, welding, stone carving, wood carving, clay modeling, and ceramic sculpture, with emphasis on the development of creative achievement. Prerequisite: Enrollment in the M.F.A. program in sculpture or consent of departmental graduate committee. 1 to 3 units.

ART EDUCATION

(See Art and Design)

ASIAN STUDIES

(Including Chinese, Japanese, and Korean)

Director of Center for East Asian and Pacific Studies: Professor P. Schran
Center Office: Room 201, 1208 West California Avenue, Urbana

All 200-level language courses, Chinese 301 and 302, Japanese 301 and 302, and Korean 301 and 302 are open to freshmen.

Asian Studies

- 104. Asian Mythology.** Same as Religious Studies 104. See Religious Studies 104.
- 122. History of East Asian Religions.** Same as Religious Studies 122. See Religious Studies 122.
- 132. Zen.** Same as Religious Studies 132. See Religious Studies 132.
- 135. Korean Personalities.** Same as Korean 135. See Korean 135.
- 150. Introduction to Japanese Culture.** Same as Japanese 150. See Japanese 150.
- 175. Masterpieces of East Asian Literature.** Same as Chinese 175, Japanese 175, and Comparative Literature 175. Study of major works in the literary traditions of China and Japan, including haiku, Noh, Tale of Genji, kabuki, Tang poetry, Dream of the Red Chamber, Ming theatre, and the colloquial tale. No knowledge of Chinese or Japanese language required. 3 hours.
- 185. Kabuki.** Same as Fine and Applied Arts 185. See Fine and Applied Arts 185.
- 186. Southeast Asian Civilizations.** Same as Anthropology 186 and History 172. See Anthropology 186.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Japanese Literature in Translation, I.** Same as Comparative Literature 211 and Japanese 205. See Japanese 205.
- 206. Japanese Literature in Translation, II.** Same as Comparative Literature 212 and Japanese 206. See Japanese 206.
- 207. Classical Chinese Literature.** Same as Chinese 207. See Chinese 207.
- 208. Chinese Popular Literature.** Same as Chinese 208. See Chinese 208.

218. **Japanese Hero Types.** Same as Comparative Literature and Japanese 218. See Japanese 218.
219. **Women in Japanese Literature.** Same as Comparative Literature and Japanese 219. See Japanese 219.
238. **Hiroshima/Nagasaki and the Literature of Survival.** Same as Comparative Literature and Japanese 238. See Japanese 238.
261. **Family and Community in China and Japan.** An introduction to Chinese and Japanese societies at the family, village, and city levels; examines traditional marriage, child rearing, women's roles, farming, and community leadership as well as modern trends in these areas using a variety of documentary, fictional, and visual sources. 3 hours.
262. **Popular Culture in China and Japan.** An introduction to the popular cultural traditions of China and Japan; examines popular morality, cosmology, religion, secret societies, the "way of the samurai," body and health (acupuncture, meditation, Zen, T'ai-chi chuan), aesthetics (poetry, painting, tea ceremony), and the world of the courtesan using a variety of documentary, fictional, and visual sources. 3 hours.
265. **Contemporary Korean Society.** Same as Sociology 265. Introduces contemporary Korean society: the twentieth century struggle of Korea for an individual identity; the Korean road to modernization and its significance for the United States and the developing world. 3 hours.
266. **Tracing Turkish Traditions.** Examines tradition formation among Turkish-speaking peoples over the past 2,000 years with varied cultural contexts, from China to the Balkans, Siberia to India, Central Asia to Asia Minor and North Africa. Interdisciplinary in nature—including, but not limited to anthropology, fine arts, history, literature, religion—with selected topics. 3 hours.
267. **History of Korea.** Same as History 267. An historical examination of the Korean experience, from the earliest times to the present day: basic political, social, economic patterns; examination of the cultural and intellectual tradition; Korea's historical role in Asia; the Korean colonial experience; Korea in the modern world. 3 hours.
285. **Premodern Japanese History.** Same as History 285. See History 285.
286. **Modern Japanese History.** Same as History 286. See History 286.
287. **Introduction to Buddhism.** Same as Religious Studies 287. See Religious Studies 287.
288. **Religion in Asian Society.** Same as Religious Studies 288 and Sociology 288. A comparative study of the inter-influences of religion and society of Asian countries concentrating on the problems of social change and development with special attention to the religions and social systems of major Asian nations such as Iran, India, China, and Japan. 3 hours.
290. **Individual Study.** Directed readings in the languages and literatures of East Asia, South Asia, Southeast Asia, or the Near East. The area selected depends on the student's interest. Prerequisite: Consent of instructor. 2 to 4 hours.
291. **Honors Tutorial.** A tutorial in the civilizations of East Asia, South Asia, Southeast Asia, or the Near East. The geographical area or nation and discipline depend on student interests. All students submit a substantial paper. Prerequisite: Prior completion of two honors activities, prior completion of work in Asian studies, and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 6 hours.
295. **Topics in Asian Religions.** Same as Religious Studies 295. See Religious Studies 295.
298. **Colloquium in Asian Studies.** 3 hours.
303. **Japanese Society.** Same as Sociology 327. See Sociology 327.
311. **The Chinese Novel.** Same as Chinese and Comparative Literature 311. See Chinese 311.
312. **Modern Chinese Literature in Translation.** Same as Chinese and Comparative Literature 312. See Chinese 312.
315. **Modern Japanese Fiction in Translation.** Same as Comparative Literature and Japanese 315. See Japanese 315.
325. **Modern Japanese Drama.** Same as Japanese 325 and Theatre 320. See Japanese 325.
328. **Sociology of Asian Religions.** Same as Religious Studies and Sociology 328. See Sociology 328.
337. **Government and Politics of China.** Same as Political Science 337. See Political Science 337.

- 338. Governments and Politics in the Middle East.** Same as Political Science 338. See Political Science 338.
- 345. Tutorials in East and Southeast Asian Languages.** Tutorials at the elementary, intermediate, and advanced levels in special Asian languages not regularly offered are available with the consent of the director of the Center for Asian Studies. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of director of the Center for Asian Studies. 2 to 5 hours, or $\frac{1}{2}$ to 1 unit. May be repeated up to six semesters successively, but no more than 4 units of graduate credit may be accumulated in any one language.
- 347. Governments and Politics of Southeast Asia.** Same as Political Science 347. See Political Science 347.
- 348. Government and Politics of Japan.** Same as Political Science 348. See Political Science 348.
- 349. Governments and Politics of South Asia.** Same as Political Science 349. See Political Science 349.
- 350. East Asian Bibliography and Research Methods.** Introduces research methods and reference works for East Asian studies through practical exercises and assignments. Students registering for 2 hours or $\frac{1}{2}$ unit (Part I) use only Western sources; students registering for 4 hours or 1 unit (Parts I and II) use Chinese or Japanese sources for the second part of the course. Prerequisite: (Part II) Chinese 204 or Japanese 204; Part I requires no prerequisite. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 360. Peoples and Cultures of Oceania.** Same as Anthropology 360. See Anthropology 360.
- 362. Asian Prehistory.** Same as Anthropology 362. See Anthropology 362.
- 366. Japanese Cinema.** Same as Humanities 366. See Humanities 366.
- 368. Peoples and Cultures of India.** Same as Anthropology 368. See Anthropology 368.
- 371. Comparative Social Institutions.** Same as Sociology 371. See Sociology 371.
- 380. Buddhist Meditation.** Same as Religious Studies 384. See Religious Studies 384.
- 383. Self and Society in Japan.** Same as Anthropology 383. See Anthropology 383.
- 384. Modern Chinese Society and Culture.** Same as Anthropology 384. Studies the culture and society of modern China and its socialist transformation after 1949; emphasizes rural society and peasant culture. Prerequisite: One course in East Asian Studies or Anthropology; or consent of instructor. 3 hours or 1 unit.
- 385. Chinese Foreign Policy.** Same as Political Science 389. See Political Science 389.
- 386. Peoples and Cultures of Mainland Southeast Asia.** Same as Anthropology 386. See Anthropology 386.
- 387. Peoples and Cultures of Insular Southeast Asia.** Same as Anthropology 387. See Anthropology 387.
- 388. Prehistory of Oceania.** Same as Anthropology 388. See Anthropology 388.
- 437. Problems in Chinese Politics and Government.** Same as Political Science 437. See Political Science 437.
- 448. Problems in Japanese Politics and Government.** Same as Political Science 448. See Political Science 448.
- 450. Seminar in Asian Studies.** Seminar on selected Asian and Middle Eastern topics. The topic will vary with the instructor and the seminar may be repeated for a maximum of 3 units. Prerequisite: Consent of instructor. 1 unit.
- 490. Individual Study and Research in Special Topics.** Supervised individual investigation or study of a topic not covered by regular course offerings. The topic selected by the student and the proposed plan of study must be approved by the Asian studies curriculum adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 3 units.

Chinese

- 101. Elementary Chinese, I.** An introduction to Mandarin Chinese, including conversation

with a native Chinese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.

102. **Elementary Chinese, II.** Second term of spoken Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist instructor; formal grammar based on conversational materials; and work on written Chinese. Prerequisite: Chinese 101. 5 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175. Japanese 175, and Comparative Literature 175. See Asian Studies 175.
203. **Intermediate Chinese, I.** First term of second year of the Chinese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Chinese 102 or 301, or equivalent. 5 hours.
204. **Intermediate Chinese, II.** Concentration on ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on ability to read ordinary simple text in Chinese. Prerequisite: Chinese 203 or equivalent. 5 hours.
207. **Classical Chinese Literature.** Same as Asian Studies 207. Surveys Chinese literary works from the classical tradition (history, philosophy, poetry, literary criticism) with attention to intellectual and artistic values. No knowledge of Chinese is required. 3 hours.
208. **Chinese Popular Literature.** Same as Asian Studies 208. Surveys Chinese popular literary works written in the vernacular language (short story, novel, and drama, with attention to cultural and artistic values. No knowledge of Chinese is required. 3 hours.
211. **Chinese Calligraphy.** Brief history of Chinese calligraphy; practice of regular and grass forms with Chinese brush pens. Prerequisite: Chinese 102 or equivalent. 1 hour.
301. **Intensive Chinese, I.** Intensive introduction to the spoken and written Chinese language; emphasizes the introduction of basic vocabulary and sentence patterns. This course is equivalent to Chinese 101 and 102. For all students who have no previous Chinese and who want to learn at a rapid rate. 10 hours or 2 units.
302. **Intensive Chinese, II.** Continuation of Chinese 301. Emphasizes conversation and reading. This course is equivalent to Chinese 203 and 204. Prerequisite: Chinese 102 or 301, or equivalent. 10 hours or 2 units.
305. **Advanced Chinese, I.** Continuation of intermediate level Chinese with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 204 or 302. 5 hours or 1 unit.
306. **Advanced Chinese, II.** Continuation of Chinese 305 with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 305. 5 hours or 1 unit.
307. **Introduction to Literary Chinese.** An introduction to literary language, style, and structural patterns as reflected in the Confucian classics and other literary, philosophical, and historical texts. Prerequisite: Chinese 306 or equivalent. 3 hours or 1 unit.
308. **Readings in Literary Chinese.** Readings in texts selected from the Confucian classics and other literary, philosophical, and historical texts. Attention is given to linguistic and intellectual patterns and to problems of translation. Prerequisite: Chinese 307 or equivalent. 3 hours or 1 unit. May be repeated for a maximum of 9 hours or 3 units.
309. **Social Science Readings in Chinese.** Reading and translation of selected Chinese texts in the social sciences with emphasis on specialized terminology and prose style. Prerequisite: Three years of modern Chinese. 3 hours or 1 unit. May be repeated for a maximum of 9 hours or 3 units.
311. **The Chinese Novel.** Same as Asian Studies and Comparative Literature 311. Reading and analysis of representative pieces of Chinese fiction from the fourth century B.C. to 1900 with emphasis on the development of Chinese fiction, its place in the literary tradition, and its role in society. No knowledge of Chinese is required. 3 hours or 1 unit.
312. **Modern Chinese Literature in Translation.** Same as Asian Studies and Comparative Literature 312. Reading and analysis of representative selections from Chinese literature since the May 4 Movement, with special attention to the relationship between literature and ideology in twentieth-century China. No knowledge of Chinese is required. 3 hours or 1 unit.

- 321. Oral Chinese, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 204 or 302, or equivalent. 3 hours or 1 unit.
- 322. Oral Chinese, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 321 or consent of instructor. 3 hours or 1 unit.
- 330. Introduction to Far Eastern Linguistics.** Same as Japanese, Korean, and Linguistics 330. See Linguistics 330.
- 390. Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated for a maximum of 6 hours or 2 units.
- 399. Study Abroad.** Lectures, seminars, and practical work in Chinese language, literature, and civilization and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5. 0 credit.

Japanese

- 101. Elementary Japanese, I.** An introduction to Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 102. Elementary Japanese, II.** Second term of spoken Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Japanese. Prerequisite: Japanese 101. 5 hours.
- 150. Introduction to Japanese Culture.** Same as Asian Studies 150. A topical introduction to Japanese cultural and aesthetic life with attention to cultural and aesthetic patterns as they are reflected in literature, language, and the arts. 3 hours.
- 175. Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175 and Comparative Literature 175. See Asian Studies 175.
- 203. Intermediate Japanese, I.** First term of second year of the Japanese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Japanese 102 or 301, or equivalent. 5 hours.
- 204. Intermediate Japanese, II.** Concentration on ability to engage in reasonably fluent discourse in Japanese, on comprehensive views of formal grammar, and on ability to read simple ordinary written Japanese. Prerequisite: Japanese 203 or equivalent. 5 hours.
- 205. Japanese Literature in Translation, I.** Same as Asian Studies 205 and Comparative Literature 211. A survey of Japanese literature from earliest times to around 1600 A.D.; readings in prose, poetry, and drama in English translation. 3 hours.
- 206. Japanese Literature in Translation, II.** Same as Asian Studies 206 and Comparative Literature 212. A survey of Japanese literature from around 1600 A.D. to recent times; readings in prose, poetry, and drama in English translation; and lectures and papers. 3 hours.
- 218. Japanese Hero Types.** Same as Asian Studies and Comparative Literature 218. Analysis of Japanese hero and heroine archetypes in comparison with their Western counterparts: from shaman ruler, Don Juan, samurai romantics, feudal paragons, to modern superfluous hero and self-destructive hollow man; no knowledge of Japanese required. Discussion with readings and films. 3 hours.
- 219. Women in Japanese Literature.** Same as Asian Studies and Comparative Literature 219. Critical study of Japanese women's history as represented in literature, emphasizing religious-social-literary significance, male view of women, female roles, and universal experience of growing up female; no knowledge of Japanese required. Readings and discussion. 3 hours.

- 238. Hiroshima/Nagasaki and the Literature of Survival.** Same as Asian Studies and Comparative Literature 238. Examination of the ways in which the Japanese have tried to come to terms with the experience of nuclear war through a study of memoirs, novels, essays, plays, and films; draws comparison with other literature of survival like that produced after the Nazi Holocaust. Readings in English. 3 hours.
- 301. Intensive Japanese, I.** An intensive introduction to spoken and written Japanese; emphasis on basic grammatical patterns and vocabulary. Equivalent to Japanese 101 and 102; for students who have no previous Japanese and who want to learn at a rapid rate. 10 hours or 2 units.
- 302. Intensive Japanese, II.** Continuation of Japanese 301. Emphasis on conversation and reading. Equivalent to Japanese 203 and 204. Prerequisite: Japanese 102 or 301, or equivalent. 10 hours or 2 units.
- 305. Advanced Japanese, I.** Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 204 or 302; or consent of instructor. 5 hours or 1 unit.
- 306. Advanced Japanese, II.** Continuation of Japanese 305. Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 305 or equivalent. 5 hours or 1 unit.
- 309. Social Science Readings in Japanese.** Readings in Japanese social science materials, including articles from newspapers, periodicals, and learned journals. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit. May be repeated for a maximum of 9 hours or 3 units.
- 310. Modern Japanese Literature.** Reading and analysis of selected Japanese texts, primarily fiction. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit.
- 315. Modern Japanese Fiction in Translation.** Same as Asian Studies and Comparative Literature 315. Critical study of selected 20th century writers with an emphasis on cultural background, world view, human relationships, esthetic theories, Japanese and Western traditions, and universal literary issues. Requires no knowledge of Japanese; readings and films. Prerequisite: Junior standing or consent of instructor. 3 hours, or 1 or 1 unit.
- 325. Modern Japanese Drama.** Same as Asian Studies 325 and Theatre 320. Examination of the Japanese Modern Theatre movement from 1887 to the present through representative plays and relevant documents. Readings in English; no knowledge of Japanese required. Prerequisite: Two semesters of literature or theatre at the 200 level or above, or consent of instructor. 3 hours or 1 unit.
- 330. Introduction to Far Eastern Linguistics.** Same as Chinese, Korean, and Linguistics 330. See Linguistics 330.
- 390. Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated for a maximum of 6 hours or 2 units.
- 399. Study Abroad.** Lectures, seminars, and practical work in the Japanese language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.50-0 to 16 hours, or 0 units.

Korean

- 101. Elementary Korean, I.** An introduction to Korean, including conversation with a native Korean-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 102. Elementary Korean, II.** Second term of spoken Korean, including conversation with a native Korean-speaking tutor under the direction of linguist-instructor, studies formal grammar based on conversational materials, and includes some work on written Korean. Prerequisite: Korean 101. 5 hours.

- 135. Korean Personalities.** Same as Asian Studies 135. Surveys Korean culture as exemplified by celebrated legendary, fictional, and historical personalities: founding heroes, virtuous generals, fighting monks, fanatics, martyrs and rebellious rulers, queens, concubines and courtesans, poets, kings, and mad princes; illustrates recurring themes and patterns in Korean culture. No knowledge of Korean required. 3 hours.
- 203. Intermediate Korean, I.** First term of second year of the Korean language, including drill for advanced conversational fluency; introduces a variety of styles and levels of discourse and usage; and increases study of the written language and formal grammar. Prerequisite: Korean 102 or 301. 5 hours.
- 204. Intermediate Korean, II.** Second term of second year of the Korean language including drill for more advanced conversational fluency; more variety of styles and levels of discourse and usage; more formal grammar and an introduction of basic Chinese characters. Prerequisite: Korean 203. 5 hours.
- 301. Intensive Korean, I.** Intensive introduction to spoken and written Korean; emphasizes the introduction of basic vocabulary and grammar. Equivalent to Korean 101 and 102; for students who have not previously studied Korean and want to learn at a rapid rate. 10 hours or 2 units. Credit may not be received for both Korean 301 and either Korean 101 or 102.
- 302. Intensive Korean, II.** Continuation of Korean 301; continuing practice of conversation and reading; and introduction to Korean texts written in mixed script. Equivalent to Korean 203 and 204. Prerequisite: Korean 301 or 102. 10 hours or 2 units. Credit may not be received for both Korean 302 and either Korean 203 or 204.
- 305. Advanced Korean, I.** Concentrates on the ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on the ability to read ordinary texts in Korean, including some Chinese characters. Prerequisite: Korean 204 or 302. 3 hours or $\frac{3}{4}$ unit.
- 306. Advanced Korean, II.** Continuation of Korean 305; emphasizes rapid reading, fluent conversation, learned vocabulary and idiom acquisition, and reading of newspapers. Prerequisite: Korean 305. 3 hours or $\frac{3}{4}$ unit.
- 309. Social Science Readings in Korean.** Reading and analysis of selected Korean texts in the social sciences, emphasizing specialized terminology and prose style. Prerequisite: Korean 306 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 330. Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Linguistics 330. See Linguistics 330.
- 399. Study Abroad.** Lectures, seminars, and practical work in Korean language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5; Korean 102 or equivalent, or consent of the Asian Studies advisor. 0 to 16 hours, or 0 units. May be repeated to a maximum of 32 hours per academic year.

ASTRONOMY

Head of Department: Professor R. Allen

Department Office: 349 Astronomy Building, 1011 W. Springfield, Urbana

- 100. Perspectives in Astronomy.** A one-semester introduction to astronomy. The nature of science; sun, planets, and moons; origin of the solar system; nature and evolution of stars; exploding stars; stellar remnants, including dwarfs, neutron stars, and black holes; molecules in space; galaxies and quasars; past and future of the universe; and life in the universe. Lectures and observation. 3 hours. Credit is not given to students with credit in Astronomy 101, 102, or 300; not open to students with credit in Physics 102, 107, or equivalent.

- 101. Descriptive Astronomy.** The first semester of a two-semester introduction to astronomy. Introductory survey of the universe; structure and motions of the earth and moon; planetary motions; physical nature of the planets; comets and meteors; and origin and evolution of the solar system. Lectures, discussion, and observation. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300; not open to students who have credit in Physics 102, 107, or equivalent.
- 102. Descriptive Astronomy.** The stars: distances, motions, and dimensions; atoms and radiation; structure, origin, and evolution of stars; structure of the Milky Way; and galaxies and the structure of the universe. Lectures, discussion, and observation. Prerequisite: Astronomy 101. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300.
- 110. Black Holes.** Studies evolution of our understanding of the force of gravity from Aristotle to Einstein; the nature of gravity as curved space; properties of black holes and gravitational waves; stellar evolution and the formation of black holes; models of black holes as energy sources for active galactic nuclei and quasars; black holes and cosmology. Non-mathematical treatment. Prerequisite: Astronomy 100 or 102. 3 hours.
- 111. Life in the Universe.** Reviews the nature and evolution of the physical Universe emphasizing the constraints thus imposed on possible abodes of life; the nature, origin, and evolution of life on Earth and implication for the possibility of extraterrestrial life; the search for life on other planets of the solar system; and the possibility of life and search for life beyond the solar system. Prerequisite: Astronomy 100 or 102. 3 hours.
- 112. Origin and Evolution of the Universe.** Non-mathematical treatment of cosmology; observational clues to the early history of the Universe; the age of the Universe; models of the origin of the Universe; the primeval fireball; origin and evolution of galaxies, stars, and planets; and the future of the Universe. Prerequisite: Astronomy 100 or 102. 3 hours.
- 113. The Sky.** Examines the visual aspects and phenomena of the sky; astronomical lore and history. Prerequisite: Astronomy 100 or 102. 3 hours.
- 140. Astronomy and Civilization.** Examines the importance of astronomy in early western cultures; studies the impact of developing astronomical and physical discoveries and theories on western civilization, as well as the reverse impact of society on astronomy and physics. 3 hours.
- 141. The Physical Universe.** Study of the various forms of universal energy, using some of the subject matter of cosmology and modern physics; emphasis on such items as man's ability to measure very far distances and to interpret the evidence for the origin of the solar system and of the universe. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. General Astronomy.** A survey of astronomy for students having some background in physics. The approach is primarily descriptive, but mathematical techniques are used where needed. The chief topics are orbits and gravitation; the bodies of the solar system; the nature and evolution of the stars; galaxies; and the structure of the universe. Prerequisite: Physics 102, 107, or equivalent. 3 hours. Credit is not given to students who have credit in Astronomy 101, 102, or 300.
- 290. Individual Study.** Individual study at an advanced undergraduate level. Prerequisite: Consent of adviser and of staff member who supervises the work. 2 to 4 hours.
- 300. Astronomy for Teachers.** A general course in astronomy designed for teachers which includes classical astronomy, modern developments, and aspects of the space program; discussion of available curriculum materials for elementary and secondary teaching and some practice given in telescopic observation. 4 hours or 1 unit. Credit is not given to students with credit in Astronomy 100, 102, or 210, or to astronomy majors. Graduate credit is given only to students in elementary and secondary teacher training programs.
- 304. Astrophysics, I.** Introduction to astrophysical problems, with emphasis on underlying physical principles; includes the nature of stars, equations of state, stellar energy generation, stellar structure and evolution, astrophysical neutrinos, binary stars, white dwarfs, neutron stars and pulsars, and novae and supernovae. Prerequisite: Physics 108. 3 hours or 1 unit.

- 305. Astrophysics, II.** Introduction to astrophysical problems; includes fundamentals of solar system astrophysics, elements of physical cosmology, and such additional topics as galactic nuclei, quasars, cosmic ray nuclei, the interstellar medium, and cosmic electrodynamics. Prerequisite: Astronomy 304. 3 hours or 1 unit.
- 314. Observational Astronomy.** Introduction to astronomical equipment; optical photography, photometry, and spectroscopy; radio astronomy; astronomical coordinate systems and transformations; determination of latitude, longitude, and time; and introduction to error theory and data analysis. Practical experience with the 12-inch refractor. Lectures and laboratory. Prerequisite: Astronomy 102 or 210; Mathematics 240, 241, or 245. 4 hours or 1 unit.
- 315. Observational Techniques.** Methods of observation and reduction in optical and radio wavelength regions, photographic and photoelectric photometry, spectrophotometry, optical and radio line profiles; radial velocity determinations; stellar diameters from lunar occultations; and pulsar timing. Lectures and laboratory. Prerequisite: Astronomy 314 or graduate standing. 4 hours or 1 unit.
- 321. Galactic Astronomy.** Galactic structure: the observational data; stars in the solar neighborhood; the solar motion; stellar statistics and distribution; stellar populations; interstellar matter and spiral structure; and the whole galaxy. Prerequisite: Astronomy 102 or 210; Astronomy 305 or consent of instructor. 3 hours or 1 unit.
- 322. Extragalactic Astronomy.** Galactic dynamics. Galaxies; distances; structural features; groups and clusters; radio galaxies and quasars; and spatial distribution and motions. Prerequisite: Astronomy 321. 3 hours or 1 unit.
- 333. Solar System Astrophysics.** Planetary orbits and perturbations; physical perturbations; physical parameters of the planets; planetary interiors, atmospheres, magnetospheres, and surface layers; the satellites; asteroids and comets; meteors, meteorites, and tekites; interplanetary grains and gas; and problems of origin and evolution. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 396. Seminar in Astronomy.** Lectures on topics of current interest in astronomy and astrophysics; for advanced undergraduates and graduates. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Stellar Atmospheres.** Physical characteristics of stellar atmospheres as derived from spectroscopic observations; radiation transfer; theory and observations of the continuous spectrum; limb darkening; formation of absorption lines; line profiles; curves of growth; relative chemical abundances; and emission features. Prerequisite: Consent of instructor. Desirable background includes some familiarity with atomic physics, advanced calculus, and general astronomy. 1 unit.
- 402. Theoretical Astrophysics.** Same as Physics 402. See Physics 402.
- 404. Stellar Structure and Evolution.** Same as Physics 404. Relationship between observable features of stars and the physical processes that occur in their interiors; topics include matter and radiation in stars (equations of state, modes of energy flow, nuclear energy production, and element synthesis); structure of stars during all phases prior to the supernova or planetary nebula stage; stellar pulsations with reference to Cepheids and RR Lyrae variables; and properties of white dwarfs, neutron stars, and contact binaries. Prerequisite: Physics 361 and 382, Physics 402, or consent of instructor. 1 unit.
- 405. Diffuse Matter Astrophysics.** Same as Physics 405. Interstellar gas: balance of microscopic processes, large scale structure, interaction with stars, dynamics, heating, ionization, and cooling; continuous and discrete radiation processes, excitation mechanisms, propagation of radiation, molecule formation, dust grains, star formation, magnetic fields, and cosmic rays. Prerequisite: Consent of instructor. 1 unit.
- 406. High Energy Astrophysics.** Same as Physics 406. Survey of nuclear processes in astrophysical environments; topics include nuclear energy generation, thermonuclear reactions, weak interactions and neutrino astrophysics, nucleosynthesis, superheavy nuclei, cosmochronology, and mechanisms of nova and supernova explosions. Prerequisite: Physics 402 or consent of instructor. 1 unit.
- 424. General Relativity and Cosmology.** Same as Mathematics 460 and Physics 424. See Physics 424.

- 490. Individual Study.** Individual study or nonthesis research. Prerequisite: Consent of adviser and of staff member who supervises the work. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 4 units.
- 496. Seminar in Special Topics.** Prerequisite: Consent of instructor. 0 to 4 units.
- 499. Thesis Research.** 0 to 4 units.

ATMOSPHERIC SCIENCES

Head of Department: Professor Y. Ogura

Department Office: 6-109 Coordinated Science Laboratory, 1101 West Springfield, Urbana

- 100. Introduction to Meteorology and Weather Forecasting.** Introduces the student to the basic concepts and principles of atmospheric sciences; also introduces modern tools and scientific techniques used by meteorologists to analyze and forecast the weather. Supplements classroom lectures with map exercises and preparation of real-time weather forecasts. 3 hours.
- 199. Undergraduate Open Seminar.** Special topics each semester. 1 to 5 hours. May be repeated.
- 222. Weather Processes.** Introduction to the mean state of the atmosphere, the fundamental physics of weather processes, and the mechanisms producing daily weather changes, both qualitative and quantitative in nature. Prerequisite: Mathematics 242. 3 hours.
- 301. Principles of Atmospheric Physics.** Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere, and the formation of clouds and precipitation. Prerequisite: Mathematics 242 or 245; consent of instructor. 4 hours or 1 unit.
- 302. Principles of Atmospheric Dynamics.** Same as Physics 302. An introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of the neutral atmosphere. Prerequisite: Mathematics 343; consent of instructor. 4 hours or 1 unit.
- 310. Satellite Meteorology.** Reviews the theory and practice of observing the atmosphere using satellite-borne instrumentation; applications include weather analysis and forecasting using visible and infrared images, and the measurement of basic atmospheric variables such as temperature, moisture, wind, and precipitation. Prerequisite: Atmospheric Sciences 222 or 301; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 397. Topics in Atmospheric Sciences.** Special topics in atmospheric sciences at an advanced undergraduate level. Prerequisite: Advanced undergraduate standing and consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Synoptic Meteorology.** Examines the observed behavior of the atmosphere through the application of physical and hydrodynamical principles to analyses of real meteorological data; develops concepts for studying atmospheric circulations, particularly extratropical cyclones and anticyclones. Laboratory work includes the development of diagnostic techniques suitable for a better understanding of the current weather. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
- 405. Numerical Methods in Fluid Dynamics.** Same as Computer Science 405. Intended to give the student practical numerical techniques for solving those linear and nonlinear differential equations which appear frequently as initial and boundary value problems in hydrodynamics and dynamic meteorology. Prerequisite: Mathematics 343 or consent of instructor. 1 unit.
- 406. Dynamical Weather Prediction.** Describes the principles and methods of simulating and predicting large-scale atmospheric motions on the basis of hydrodynamics and thermodynamics. Prerequisite: Atmospheric Sciences 302. 1 unit.
- 408. Atmospheric General Circulation.** Reviews the observed general circulation of the earth's atmosphere; discusses the balance requirements of mass, momentum, and energy

- conservation; illustrates, by means of different mathematical modelings and laboratory physical modeling, the important processes which determine the earth's and other planets' general circulation; and considers theories of climatic changes. Prerequisite: Atmospheric Sciences 301 or equivalent, and Atmospheric Sciences 302. 1 unit.
- 411. Atmospheric Convection.** Atmospheric convection processes from the classical Benard-Rayleigh theory of convection to the structure and dynamics of isolated clouds, organized cloud systems, and ensembles of cumulus clouds; interactions of cumulus clouds with their environment. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
- 421. Precipitation Physics.** Develops an understanding of precipitation processes through cloud observations, microphysics, dynamics, and comprehensive theoretical models; includes growth by condensation, coalescence, and riming; and studies ice crystals, hail, and weather modification. Prerequisite: Atmospheric Sciences 301. 1 unit.
- 431. Boundary Layer Meteorology.** Comprehensive review of processes in the lowest layer of the atmosphere based on the statistical mechanics of turbulent motions; emphasizes the effects of earth's rotation, mean wind shear, stratification, thermal stability, interaction with the free atmosphere, and surface roughness; and includes applications for the numerical prediction of diurnal changes of the boundary layer structure, transports of momentum, heat, and moisture and pollution dispersion. Prerequisite: Atmospheric Sciences 302, Theoretical and Applied Mechanics 335, or equivalent. 1 unit.
- 441. Dynamics of Climate and Climate Change.** Global aspects of climate and climate change; empirical studies of the observed climate system; the heat budget, general circulation of the atmosphere, role of oceans and cryosphere, interannual variability, and causes of climate change; climate modeling; and long range forecasting and possible future trends. Prerequisite: Atmospheric Sciences 301 and 302, or consent of instructor. 1 unit.
- 451. Atmospheric Radiation.** Physical concepts and various methods of analysis of radiation scattering by atmospheric molecules, particulates, and clouds; infrared radiative transfer in a stratified inhomogeneous atmosphere; radiation and ozone photochemistry in the stratosphere; and remote temperature and composition sensing techniques using satellite radiation data. Prerequisite: Atmospheric Sciences 301 or Astronomy 380. 1 unit.
- 490. Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
- 491. Seminar in Atmospheric Sciences.** Seminar on topics of current interest; see Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 497. Special Topics in Atmospheric Sciences.** Lecture course in topics of current interest; subjects such as tropical meteorology, aerosol physics and geophysical fluid dynamics will be covered in semester offerings on a regular basis. Prerequisite: Consent of instructor. 0 to 1 unit.
- 499. Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units.

AVIATION

Director of Institute: H. L. Taylor

Institute Office: Terminal Building, University of Illinois- Willard Airport, Savoy 61874

- 101. Private Pilot, I.** An introductory course in partial preparation for FAA Private Pilot certification; includes instruction in aerodynamics, airplane systems, airport and airplane operations, federal regulations, and airplane safety; and includes 27 hours of inflight training (21 hours dual, 5 hours solo, 1 hour flight exam) and 6 hours in a flight simulator. Private Pilot certification requires completion of Aviation 120. 3 hours.
- 102. Orientation Refresher.** An intermediate course to provide additional aeronautical proficiency in the primary trainer and serve as an introduction to other types of aircraft; emphasis on airplane utility and safety; eighteen hours of flight, four hours of flight

simulator training, and five hours of flight discussion directed to airplane operation. Prerequisite: Credit or concurrent registration in Aviation 101, or consent of director. 0 credit.

120. **Private Pilot, II.** Second course in preparation for FAA Private Pilot certification; includes instruction in airplane operation, navigation, night flying, and meteorology; and includes 36 hours of inflight training (19 hours dual, 15 hours solo, 2 hours flight exams), and 6 hours in a flight simulator. Students successfully completing final examinations will be issued a Private Pilot Certificate. Prerequisite: Credit or concurrent registration in Aviation 101. 3 hours.
121. **Private Pilot, IIA.** A special course for the student who is entering the University Pilot Training Program with a Private Pilot Certificate and who desires to continue in the commercial-instrument sequence (Aviation 130, 140, etc.); includes instruction in airplane operations, navigation, and meteorology; and includes 17 hours of inflight instruction (minimum of 12 hours dual, maximum of 4 hours solo, and a 1 hour flight exam), and 3 hours in a flight simulator. Prerequisite: Private Pilot Certificate (minimum of 60 hours of flight). 2 hours.
130. **Commercial-Instrument, I.** The first of a series of advanced flight courses in preparation for an FAA Commercial Pilot Certificate; reviews cross-country flight with emphasis on local instrument flying procedures; and includes 40 ½ hours of lecture discussion on instrument flying, navigation, advanced maneuvers, and flight physiology, and 32 hours of flight (12 ½ dual, 16 solo, and 3 ½ pilot-in-command to include 1 flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 120, consent of director. 3 hours.
140. **Commercial-Instrument, II.** The second in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; IFR/VFR local and cross country. Includes 40 ½ hours of lecture discussion on advanced maneuvers, aerodynamics, and navigation and 28 hours of flight (5 ½ dual, 12 solo, and 10 ½ pilot in command to include one flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 130. 3 hours.
142. **Powerplant Theory.** Operating principals of a broad range of turbine and reciprocating aircraft powerplants; includes power development and engine efficiency calculations, design and manufacturing techniques, and select engine systems. 4 hours.
143. **Materials and Processes, I.** A study of materials and processes used in the maintenance of aircraft; includes theory and practice in precision measurement, identification and use of hardware, safetying techniques, identification of materials used in aircraft plumbing systems, and nondestructive inspection methods. 3 hours.
144. **Powerplant Theory Laboratory.** An application of the principles of construction, theory of operation, and airworthiness criteria as introduced in Aviation 142; includes procedures and engine operation for both piston and turbine powerplants. Prerequisite: Credit or concurrent registration in Aviation 142. 2 hours.
145. **Aircraft Electrical Systems.** A study of the physical principles that apply to present-day aerospace vehicles; includes AC and DC electrical theory, power sources, transmission, measurement, solid state devices, integrated circuits, and problems in aircraft electrical circuits. 3 hours.
147. **Introduction to Federal Aviation Regulations.** A study of regulations, directives, and specifications governing the manufacture, operation, and maintenance of aircraft, and the control of air traffic as well as the qualifications and certification of personnel and equipment engaged in aircraft operation and maintenance. 3 hours.
152. **Powerplant Systems, I.** Theory and operating principles of the ignition, starting, and electrical power generating components and systems used with aircraft turbine and reciprocating powerplants. Prerequisite: Aviation 142 and 145. 4 hours.
158. **Aircraft Materials and Processes, II.** A survey of materials used in the manufacture of structural components of aerospace vehicles; emphasis on the sources, manufacturing processes, physical properties, and working characteristics of various ferrous and nonferrous metals. 2 hours.

154. **Powerplant Systems, II.** Theory of operation, design, and maintenance procedures for fixed pitch and controllable propellers, includes a study of propeller governing and control systems for reciprocating and turboprop engines. Prerequisite: Aviation 145. 3 hours.
155. **Aerodynamics and Load Planning.** Calculating wing rib layout, load factors, load planning, weight and balance, powerplant performance, and an introduction to high speed aerodynamics. 3 hours.
156. **Powerplant Systems, III.** An introduction to fuels and fuel systems as related to aircraft turbine and reciprocating powerplants, study of fuel system functions including carburetion, fuel injection, fuel management, and supercharging. Prerequisite: Aviation 142 and 145. 3 hours.
157. **Powerplant Conditioning and Testing.** A study of powerplant malfunction, diagnosis and maintenance procedures, materials, and equipment; includes condition monitoring techniques and some of the economic aspects of powerplant maintenance. Prerequisite: Aviation 143, 144, 152, 153, 154, and 156; concurrent registration in Aviation 159 or consent of instructor. 7 hours.
159. **Aircraft Nondestructive Inspection.** A study of specialized inspection techniques, equipment, and procedures used in aircraft maintenance; includes federal aviation regulations, advisory circulars, airworthiness directives, and manufacturers' publications as they apply to powerplants and airframes. Prerequisite: Aviation 143, 144, 152, 153, 154, and 156; concurrent registration in Aviation 157 or consent of instructor. 3 hours.
163. **Aircraft Materials and Processes, III.** A survey of nonstructural materials used in the construction of aircraft components; the sources, manufacturing processes, physical properties, and working characteristics of synthetics, fabrics, composites, woods, and their associated surface treatments studied in detail. Prerequisite: Credit or concurrent registration in Aviation 143. 3 hours.
164. **Aircraft Systems: Survey of Rotary Wing Technology.** Includes airfoil and drive system inspection, powerplant operation, fire detection, extinguishing systems, hydraulics, pneumatics, flight control, and electrical systems. Prerequisite: Consent of instructor. 3 hours.
165. **Aircraft Fabricating Processes, I.** Procedures and techniques of mechanical, nonfusion attachment, sheet metal forming, and use of adhesives, bonded materials, and plastics in aircraft component fabrication. Laboratory experiences include the use of mechanical fasteners, similar and dissimilar metal assembly, and plastic and bonded structure fabrication. Prerequisite: Aviation 143, 153, and 155. 4 hours.
167. **Aircraft Fabricating Processes, II.** Fusion and adhesion procedures and techniques including gas, AC and DC arc, and inert gas processes. Laboratory experiences include fusion and adhesion processes with representative metals used in the aircraft industry. Prerequisite: Aviation 143 and 153; General Engineering 105. 3 hours.
169. **Aircraft Systems, I.** A study of basic principles and design concepts of the environmental and life support systems used in modern aircraft; study of representative systems for pressurization, oxygen, heating, cooling, and ice and fire protection with detailed emphasis on individual components and their relationship to the complete system. Prerequisite: Aviation 145. 4 hours.
170. **Aircraft Systems, II.** Electrical distribution circuits and associated lighting, power, communication, navigation, and instrumentation systems common to modern aircraft; emphasis on circuit analysis and performance testing. Prerequisite: Aviation 145, 152, and 155. 5 hours.
172. **Aircraft Systems, III.** Includes hydraulic and pneumatic power systems as utilized in modern aircraft; emphasis on theory of operation, design concepts, component relationships, and malfunction diagnosis. Prerequisite: Aviation 145. 3 hours.
174. **Aircraft Assembly and Inspection.** Aircraft assembly, configuration, and alignment consistent with associated aerodynamics; includes structure and systems inspection, and FAA regulations. Prerequisite: Aviation 163, 165, 167, 169, 170, and 172; or concurrent registration in Aviation 169, 170, or 172, and consent of instructor. 5 hours.

181. **Aircraft Communication Systems.** Comprehensive study of the characteristics and operating principles of modern very high frequency (VHF) and ultra-high frequency (UHF) airborne communications equipment. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 182 and 183. 5 hours.
182. **Aircraft Navigation Systems.** Study of the characteristics and operating principles of airborne navigation equipment; includes VHF omnidirectional range (VOR), instrument landing system (ILS), automatic direction finding (ADF), and area navigation (RNAV). Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 183. 5 hours.
183. **Aircraft Pulse Systems.** Operating principles, applications, diagnosis, and maintenance of airborne pulse equipment, including distance measuring equipment (DME), transponders, and radar. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 182. 5 hours.
185. **Aircraft Flight Control Systems.** Operating principles, diagnosis, and maintenance of flight directors, autopilots, and area navigation (RNAV) airborne computers (analog and digital). Prerequisite: Aviation 181, 182, and 183. 5 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Commercial-Instrument, III.** The third in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; reviews cross-country flight, emphasizing instrument flying procedures. Includes 40 $\frac{1}{3}$ hours of lecture/discussion on cross-country procedures, aircraft powerplants and systems, and aircraft maintenance inspections as well as 28 $\frac{2}{3}$ hours of flight: 7 dual, 11 $\frac{1}{2}$ solo, and 10 pilot in command to include one flight exam for qualified individuals, plus 8 hours in a flight simulator. Prerequisite: Aviation 140; consent of director. 5 hours.
210. **Commercial-Instrument, IV.** The fourth and final in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate with an instrument rating. IFR, VFR cross-country, and VFR commercial maneuvers, includes 40 $\frac{1}{3}$ hours of lecture/discussion on applied meteorology, aircraft operation, and federal aviation regulations and 31 $\frac{2}{3}$ hours of flight: 13 $\frac{1}{2}$ dual, 10 solo, and 8 pilot in command to include 2 flight exams for qualified individuals, plus 4 hours in a flight simulator. Prerequisite: Aviation 200; consent of director. 5 hours.
220. **Flight Instructor.** Prepares the commercial pilot for an FAA Flight Instructor certificate. Forty-eight classroom hours of ground school instruction on techniques of flight instruction and theory of flight, and a minimum of twenty-three hours of flight training in four-place aircraft, two hours in a flight simulator, three hours practice teaching in a flight simulator, and one hour flight check. Prerequisite: Commercial pilot certificate; instrument rating; junior standing; consent of director. 5 hours.
222. **Instrument Flight Instructor.** Leads to an instrument instructor's rating on the student's flight instructor certificate; five hours of simulator, ten hours of flight and one hour of flight check time. Includes refresher on chart symbol interpretation, federal aviation regulations, communications, instrument construction and operation, and electronic aids to navigation, designed to include obtaining a flight instructor instrument rating. Prerequisite: Commercial pilot certificate; instrument rating; flight instructor certificate; airplane rating; consent of director. 1 hour.
224. **All Attitude Orientation.** Safe handling of an aircraft in all attitudes through various aerobatic maneuvers which include loops, snap rolls, slow rolls, Immelmann, Culpin S's, and similar type maneuvers, thorough check of takeoff and landing procedures. Prerequisite: Aviation 101 and 120 or the private pilot certificate; consent of director. 1 hour.
250. **Practice Teaching, Airplane.** Practice teaching using classroom, audiovisual material, simulator, and airplane; prepares the certified flight instructor to teach in all modes of aviation education. A minimum of 2 hours of classroom lecture, 3 hours of simulator instruction, and 19 hours of airplane instruction is given by the student; an additional 10 hours of classroom lecture clarifies and explains the proper method of successful instruction. Prerequisite: Aviation 220 or flight instructor certificate; junior standing; consent of director. 8 hours.

- 280. Special Rating (Multiengine Land).** Prepares the commercial pilot for an FAA multiengine land airplane rating; 16 hours of discussion and 9 hours of flight (7 $\frac{1}{2}$ dual, $\frac{1}{2}$ solo, and 1 flight exam for qualified individuals in a multiengine land airplane). Prerequisite: Commercial Pilot Certificate; consent of director. 1 hour.
- 284. Jet Aircraft Systems and Operations, I.** An operator oriented study of modern jet systems and procedures, including related federal aviation regulations, aerodynamics, weight, and balance; preparation for the airline flight engineer. Prerequisite: Commercial Pilot Certificate with Instrument Rating; or Private Pilot Certificate and credit or concurrent registration in Aviation 169, 170, and 172; or consent of instructor. 3 hours.
- 290. Advanced Topics in Avionics.** Independent study of advanced topics in the applications of aviation electronics. Prerequisite: Second year standing in aviation or consent of instructor. 1 to 4 hours.
- 291. Special Ratings and/or Specialized Flight.** Prepares the commercial pilot for special FAA pilot certificates and/or ratings such as seaplane, airline transport pilot, and helicopter, and specialized flight such as advanced multiengine operation; sixteen hours of preflight ground school instruction and variable flight instruction as selected by the student. Options are advanced multiengine, helicopter, and airline transport pilot. Registration is limited to professional students with approval of director through head of pilot training. Prerequisite: Commercial pilot certificate; consent of director. 1 hour.
- 294. Airport Management.** Management problems in planning, design, operation, maintenance, and administration of airports; legislation and federal regulations affecting air commerce and airports; and current problems in certification, security, safety, land acquisition, zoning, and state and federal participation in airport development. Prerequisite: Aviation 101 and Business Administration 210 or 247, or consent of instructor. 3 hours.
- 355. Aviation Accident Investigation and Analysis.** Fundamental concepts of aviation safety augmentation with emphasis on accident prevention through accident investigation, casualty reduction through crashworthy design, and safety enhancement resulting from litigation; accident investigation techniques and crash survival design factors. Prerequisite: Aviation 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

BANDS

(See Music 280-290)

BIOCHEMISTRY

Head of Department: Professor L. P. Hager

Department Office: 415 Roger Adams Laboratory, 1209 West California, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 292. Senior Thesis.** Limited in general to seniors in biochemistry and chemistry. Each student who desires to do thesis research must receive written permission from a member of the biochemistry faculty. Accordingly, prospective students are encouraged to contact the biochemistry staff in the semester prior to registration in this course. Students must present a thesis to receive credit in this course. Registration of 10 hours over two semesters is expected. Prerequisite: Biochemistry 350 and 355. 4 to 6 hours. (Counts for advanced hours in LAS.)
- 320. Molecular Biophysics.** Same as Biophysics 320. See Biophysics 320.
- 338. Plant Molecular Biology.** Same as Plant Biology 338. See Plant Biology 338.
- 350. Introductory Biochemistry.** The chemistry and metabolism of carbohydrates, lipids, proteins, nucleic acids, vitamins, and coenzymes and their relation to the regulation and processes of organisms, cells, and subcellular components. Not intended for students in

- biochemistry curriculum. Prerequisite: Chemistry 131 or 136, or equivalent, 8 hours or $\frac{1}{2}$ unit. Students may not receive credit for both Biochemistry 350 and the Biochemistry 352-353 sequence.
- 352. General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Students should not enroll in Biochemistry 352 without intent to take Biochemistry 353. Prerequisite: Chemistry 110 or 123, and Chemistry 336, or consent of instructor, 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
- 353. General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Prerequisite: Biochemistry 352 or consent of instructor, 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
- 355. Biochemistry Laboratory.** Introduction to experimentation with biochemical systems, processes, and compounds, identification and quantitative measurement of constituents and transformations in biological systems. Prerequisite: Chemistry 131 or 136, or equivalent; credit or concurrent registration in Biochemistry 350, 352, or 353, or equivalent. Quantitative analytical chemistry and credit or concurrent registration in a course that includes nucleic acid biochemistry (i.e., Biochemistry 350 or 353 are recommended), 4 hours or 1 unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biophysics and Chemistry 440. See Chemistry 440.
- 452. Experimental Techniques in Biochemistry.** Experiments concerning the detection, isolation, and characterization of macromolecules, including enzymes, antibodies, and nucleic acids; methods of studying the size, shape, and hydrodynamic properties of macromolecules and other compounds. Prerequisite: Biochemistry 352, 353, or 355, or equivalent, 4 to 1 unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units credit.
- 455. Biochemistry Seminar.** Discussions of current research and literature. Required of all graduate students whose major is biochemistry. Prerequisite: Biochemistry 352, 353, and 355; or equivalent, $\frac{1}{2}$ unit. May be repeated once.
- 490. Special Topics in Biochemistry.** Designed for students majoring or minoring in biochemistry who wish to undertake individual studies of a non-Ph.D. thesis nature under the direction of a faculty member of the department. Prerequisite: Consent of head of department, $\frac{1}{2}$ to 4 units (summer session), $\frac{1}{2}$ to 2 units.
- 494. Chemical Basis of Biological Specificity.** Same as Chemistry 494. Biological formation and interaction of large molecules; analysis of the structural features concerned with functional specificity in heteropolymers, viruses, and subcellular particles; nucleic acids and their role as genetic molecules; proteins in their role as genetic products with highly specific functions; and metabolic interrelations of these molecules. Prerequisite: Chemistry 344 and 346, Biochemistry 352 and 353, or consent of instructor, $\frac{1}{2}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 2 units credit.
- 499. Thesis Research.** 0 to 4 units.

BIOENGINEERING

Chairperson, Executive Committee: C. Cam

Program Office: 164 Mechanical Engineering Building, 1206 West Green, Upland

- 120. Introduction to Bioengineering.** Readings and discussions on historical developments, recent trends, and specific topics such as radiation, modeling, instrumentation, biomaterials, biomechanics, heat and mass transfer, ergonomics, and operations research. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 270. Individual Study.** Individual projects. Prerequisite: Consent of instructor, 0 to 4 hours.

- 308. Implant Materials for Medical Applications.** Review of the biological and engineering aspects of implant materials; characterization of major classes of promising implant materials; and problems of tissue-implant interaction and surgical problems involved in implant work. Laboratories and independent projects illustrate the use of implant materials. Prerequisite: Chemistry 102; Physics 102 or 108, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 314. Biomedical Instrumentation.** Same as Electrical Engineering 314. See Electrical Engineering 314.
- 315. Biomedical Instrumentation Laboratory.** Same as Electrical Engineering 315. See Electrical Engineering 315.
- 370. Special Topics in Bioengineering.** Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 375. Modeling of Bio-Systems.** Same as Electrical Engineering 375. See Electrical Engineering 375.
- 424. Ultrasonic Biophysics.** Same as Biophysics 424. See Biophysics 424.
- 498. Individual Study.** Individual projects. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.

BIOLOGY

Director of School of Life Sciences: Professor Samuel Kaplan

School Office: 393 Morrill Hall, 505 S. Goodwin, Urbana

- 100. Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. Low credit option; no laboratory. 3 hours. Credit is not given for both Biology 100 and 101.
- 101. Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. High credit option; weekly laboratory. 4 hours. Credit is not given for both Biology 100 and 101.
- 102. Biological Sciences.** Continuation of Biology 100 or 101. Low credit option; lecture and discussion, no laboratory. Prerequisite: Credit in one first-level course in biology. 3 hours.
- 103. Biological Sciences.** Continuation of Biology 100 or 101. High credit option; lecture, discussion and laboratory. Prerequisite: Credit in one first-level course in biology. 4 hours.
- 104. Animal Biology.** Classical zoological concepts with emphasis on the diversity and comparative anatomy of animals and the fundamentals of physiology, genetics, evolution, and behavior. Enrollment priority is given to students in curricula which require this course. 4 hours.
- 110. Principles of Biology, I.** Heredity, evolution, diversity, reproduction, development, structure and function of cells, organisms, and populations. Prerequisite: One year of college chemistry, or concurrent registration in Chemistry 102 with laboratory. 5 hours.
- 111. Principles of Biology, II.** Continuation of Biology 110. Prerequisite: Biology 110. 5 hours.
- 123. Adventures in Life Sciences.** General introduction to the School of Life Sciences emphasizing selected areas of research in SOLS and career opportunities in life sciences. 1 hour.
- 144. Introduction to the Biological Literature.** Using professional literature as examples of introductory-level biological concepts, class discussions analyze biological research papers as they appear in a weekly scientific journal. Prerequisite: Concurrent registration in Biology 111 or consent of instructor. 1 hour.
- 151. The Cell.** Study of the biology of cells from the molecular to the microscopic level of organization. Prerequisite: Credit or concurrent registration in organic chemistry; consent of honors biology committee. 5 hours. Students may not receive credit for both Biology 151 and Genetics and Development 213.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 251. The Organism.** Study of the way different classes of organisms respond to challenges of

their environment; emphasis on the general features of organismic behavior. Prerequisite: Biology 151; good standing in the honors biology program; and consent of the honors biology committee. 5 hours.

285. **Scientific Writing for Biologists.** Practice in writing about biological subject matter and experience with the retrieval and processing of information in the biological sciences. Prerequisite: Junior or senior standing in a curriculum related to biological sciences. 3 hours. (Counts for advanced hours in LAS.)
303. **Introduction to Neurobiology.** An introduction to the physiology of nerve cells, mechanisms of neural integration, and the organization of sensory and motor systems; also introduces neurochemistry, neuroendocrinology, neural development, neural plasticity, and the physiological basis of behavior. Prerequisite: Biology 111 or 251, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
305. **Fundamentals of Microscopy.** Lectures on applications of transmission and scanning electron microscopy; review of light microscopy, phase contrast, interference, and Nomarski optics. Prerequisite: Physics 102 or equivalent. 3 hours or $\frac{1}{2}$ unit.
324. **Chemical Ecology.** The chemical bases of ecological interactions among organisms; topics include the chemical structures and functions of messenger compounds important in inter- and intraspecific interactions among plants, insects, higher animals, fungi, microbes, and their environments. Offered in alternate years. Prerequisite: Courses in organic chemistry and ecology, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
338. **History of Biology.** Same as History 338. See History 338.
339. **Tropical Ecology.** Interactions of climate, soils, plants, and animals including humans in the tropics; examines principles of ecology as they relate to diversity of tropical habitats and to problems of agricultural and technological development in the tropics. Prerequisite: Ecology, Ethology, and Evolution 212 or Plant Biology 381, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
351. **Population Biology.** Study of problems associated with behavior of plant and animal populations based on genetic, evolutionary, and ecological principles. Prerequisite: Biology 251, statistics, good standing in the honors biology program, consent of Honors Biology Committee. 4 hours or 1 unit.
371. **Quantitative Biology, I.** Theory and practical application in biology of probability and statistics, lectures and assigned problems. Prerequisite: College algebra, consent of instructor. 4 hours or 1 unit.
372. **Quantitative Biology, II.** Additional topics in biostatistics, emphasizing nonparametric, comparative, correlational, and sequential analyses; multi-dimensional contingency analyses, circular statistics, binomial sequential sampling. Lecture, field trips, and discussion. Prerequisite: Biology 371 or consent of instructor. 4 hours or 1 unit.
373. **Advanced Biometry.** Bivariate and multivariate statistical treatment of biological experiments and surveys; emphasizes analysis of large, unbalanced data matrices, and follows the general linear model approach. Techniques appropriate to electronic digital computation are considered in detail. Prerequisite: A course in calculus, a course in statistics, and a course or experience in electronic digital computation, or consent of instructor. 5 hours or 1 unit.
380. **Social Issues in Biology.** Ethical and sociopolitical implications of the biological sciences; an issue-oriented lecture-discussion format centering on problems such as bioethics, genetics and development, health care and allocation of scarce resources, death and dying, behavior manipulation, biological experimentation, population control, and environmental ethics. Prerequisite: Upper division standing and 6 hours of life science. 3 hours or $\frac{1}{2}$ unit.
390. **Special Courses.** Experimental and temporary courses. Prerequisite: Consent of instructor. 1 to 5 hours or $\frac{1}{2}$ to 1 unit. May be repeated as topic varies.
430. **Biological Ultrastructure.** Lectures and reports on the fine structure of plant and animal cells and cell products, discussions of possible relationships of ultrastructure to function and of diverse interpretations of chemical-physical information as ultrastructure. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.

- 431. Plant Cell Metabolism.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 431. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the biochemistry of mature seeds and metabolic processes occurring during seed germination and heterotrophic growth. Meets during the first half of the fall semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. ½ unit.
- 432. Plant Cell Energetics.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 432. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the energy coupling processes in plant cells (respiration, photosynthesis, photorespiration); and discusses current literature relating to mechanisms of electron transport, phosphorylation, and carbon fixation. Meets during the second half of the fall semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. ½ unit.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 433. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns mechanisms of plant response to the environment, including ion uptake and transport, water relationships, gas exchange, and photosynthesis of whole plants. Meets during the first half of the spring semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. ½ unit.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 434. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the hormonal regulation of growth, development, and reproduction and the metabolism of seed and fruit formation. Meets during the second half of the spring semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. ½ unit.
- 444. Morphometry.** Examines the theoretical basis and practical applications of stereological principles to sectioned materials useful for both light and electron microscopic studies; compares manual and computer assisted data collection and analysis; three dimensional reconstructions from serial sections. Prerequisite: Statistics 100 or equivalent; consent of instructor. ½ or ¾ unit.
- 450. Scanning Electron Microscopy.** Introduction to theoretical aspects of the scanning electron microscope structure and function, beam specimen interactions, image characteristics, and qualitative energy-dispersive x-ray microanalysis. Prerequisite: Concurrent registration in Biology 451; a course in modern physics or physical chemistry giving an introduction to wave mechanics; consent of instructor. ½ unit.
- 451. Scanning Electron Microscopy Laboratory.** Operation of the scanning electron microscope and ancillary equipment; studies of specimen preparation technique development and x-ray microanalysis. Prerequisite: Concurrent registration in Biology 450; consent of instructor. ½ unit.
- 452. Transmission Electron Microscopy.** Fundamental principles of transmission electron microscopy; topics include instrumentation, electron optics, image formation and interpretation, photographic techniques, and routine specimen preparation. Prerequisite: Concurrent registration in Biology 453 or equivalent; consent of instructor. ¾ unit.
- 453. Transmission Electron Microscopy Laboratory.** Examines alignment, operation and performance evaluation of transmission electron microscopes; electron micrography of a variety of biological specimens including electron diffraction, photographic darkroom techniques, ultramicrotomy, perfection of routine and specialized biological specimen preparation. Prerequisite: Concurrent registration in Biology 452; consent of instructor. 1 unit.
- 454. Advanced Methods in Electron Microscopy.** Same as Ceramic Engineering 454. Supplementary training in advanced techniques such as electron microprobe analysis, freeze-etch freeze-fracture techniques, quantitative energy dispersive x-ray analysis, or instruction on specific microscopes. Prerequisite: Biology 450-451 and 452-453; consent of instructor. ¼ unit. May be repeated.
- 457. Ultrastructural Pathology.** Same as Veterinary Pathobiology 457. See Veterinary Pathobiology 457.

- 490. Special Topics in Biology.** Individual topics in research and/or reading conducted under the supervision of faculty members in the School of Life Sciences. Designed for students enrolled in the biology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their doctorate degree. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

BIOPHYSICS

(See Physiology and Biophysics)

BUSINESS

Acting Dean of College: Dean John F. Due

College Office: 260 Commerce Building (West), 1206 South Sixth, Champaign

- 299. International Business Study in Absentia.** Upon prior written approval of the adviser, the major department, and the College of Commerce and Business Administration office, a student may earn up to 18 credit hours per semester undertaking a study and/or research project in international business away from the Urbana-Champaign campus. The student's major department verifies the satisfactory progress of the work by means of interim and final written reports, written or oral examinations, or other means established by the department. While absent from the Urbana-Champaign campus, the student must continue to pay all fees required by the University of Illinois to retain continuity of enrollment and to allow the time spent away from this campus to count toward residency. Prerequisite: The student must be a commerce-major in good standing who has completed at least 45 semester hours toward a bachelor's degree with at least one semester in residence at the University of Illinois. 0 to 18 hours. This course may be repeated for a maximum of 36 credit hours, all of which must be earned within twelve consecutive months.

BUSINESS ADMINISTRATION

Head of Department: Professor Louis R. Pondy

Department Office: 350 Commerce Building (West), 1206 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. The Legal Environment of Business.** Examination of the nature of law and the formation and application of legal principles; the role of law in society; the legal environment in which business operates, particularly government taxation; the regulation of commerce, competition, and labor-management relations; and the concept of property, its creation, transfer, and importance to our business society. Prerequisite: Junior standing. 3 hours.
- 202. Principles of Marketing.** Emphasizes the concepts of planning, organization, control, and decision making as they are applied in the management of the marketing function. Prerequisite: Economics 173 or equivalent. 3 hours.
- 203. Principles of Business Law.** Contracts, the uniform commercial code, creditors' rights, agency and employment, business organizations, and property. Prerequisite: Business Administration 200. 4 hours. Credit is not given for both Business Administration 203 and 261.

- 205. Business Location Decision-Making: Theory and Practice.** Same as Geography 205. See Geography 205.
- 210. Management and Organizational Behavior.** A general analysis of management and organizational behavior from a systems point of view, including classical organizational theory and management, organizational behavior, and management science; environmental forces; planning, organizing, and control processes; motivation, incentives, leadership, communication, and interpersonal relations; and discussion of production and decision-making and mathematical models. Prerequisite: Junior standing. Students are encouraged to take Business Administration 202, 210, and Finance 254 concurrently. 3 hours. Credit is not given for both Business Administration 210 and 247. 212. Principles of Retailing. Gives a general analysis of the structure of retailing emphasizing the retailing environment and operating efficiencies; includes patronage behavior, merchandise control, pricing, promotion, location, and vendor relations; and gives special attention to emerging trends in retailing. Prerequisite: Business Administration 202. 3 hours.
- 247. Introduction to Management.** Summary of management in a modern industrial enterprise; emphasis on motivation, small group behavior, and the problems of designing and operating a formal organization structure. For noncommerce students only. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Business Administration 247 and 210.
- 261. Summary of Business Law.** Basic principles of the private law of business including the law of contracts, agency, and business organizations; a brief introduction to the law of sales, commercial paper, security devices, and property. Prerequisite: Junior standing. 3 hours. Credit is not given for both Business Administration 261 and 203.
- 274. Operations Research.** Introduction to methods of operations research from an executive or managerial viewpoint, emphasizing formulation of business problems in quantitative terms; industrial applications of linear programming, dynamic programming, game theory, probability theory, queueing theory, and inventory theory. Prerequisite: Economics 173, or consent of instructor. 3 hours.
- 294. Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
- 295. Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.
- 300. Socio-Economic Management as Public Policy.** Same as Accountancy, Political Science, and Social Science 300. See Political Science 300.
- 314. Production.** Introduction to production management, consideration of major problems of the production area, and the use of quantitative methods for solving them. Prerequisite: Business Administration 274 or consent of instructor. 3 hours or ½ unit.
- 315. Management in Manufacturing.** The application of production concepts and quantitative techniques to actual industrial problems; the mathematical structure of the particular production problems; the general structure of the production system and its interaction with marketing and budgeting; and areas including inventory control, production processes, programming, production control, forecasting of production levels, simulation of the production system, and physical planning of industrial plants. Prerequisite: Business Administration 314. 3 hours or ½ unit.
- 320. Marketing Research.** Focuses on the techniques and methods of marketing research; emphasizes primarily survey research and experimental design; and offers students the opportunity to apply techniques to real world situations. Prerequisite: Business Administration 202 and Economics 172. 3 hours or ½ unit.
- 321. Individual Behavior in Organizations.** Understanding the behavior of employees in work organizations; particular attention to the motivation of individuals to join and perform in organizations and to employee satisfaction with elements of the work environ-

ment; and emphasis on various management strategies to modify employee motivation and satisfaction. Prerequisite: Business Administration 210, graduate standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 322. Group Processes in the Organization.** Analyzes several aspects of group techniques within the organization, including norm establishment, communication and comparison processes, collective bargaining, group decision making, problem solving, and coalition formation and conflict. Prerequisite: Business Administration 210 and Psychology 201. 3 hours or $\frac{3}{4}$ unit.
- 323. Organizational Design and Environment.** Understanding of complex organizations; particular attention to ways of dividing work, achieving coordination, and issues connected with change and adaptation. Prerequisite: Business Administration 210. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 337. Promotion Management.** Studies the effects of promotion upon sales and society from managerial and behavioral points of view; examines management of the advertising, sales promotion, and sales force functions within the context of an overall marketing program; includes consumer response to advertising, promotional planning and budgeting, advertising and sales research, media selection, legal environment of promotion, and sales force management and control; takes an analytical focus throughout; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 344. Buyer Behavior.** Studies the factors affecting customer behavior in household and organizational markets and their relevance for marketing management planning and analysis; provides an overview of explanations of consumption differences anchored in socioeconomic, demographic, cultural, and psychological processes; and surveys buyer decision-making processes and their implications for marketing strategy. Prerequisite: Business Administration 320. 3 hours or $\frac{1}{2}$ unit.
- 345. Small Business Consulting.** Through guided experience, students identify and offer advice to local small business firms; exposes students, serving as consultants, to the wide variety of problems facing the smaller firm as well as enables them to apply current business methods to real problems. Students work in teams. Prerequisite: Junior standing in the College of Commerce and Business Administration or admission to the Master of Business Administration program; or consent of instructor. 4 hours or 1 unit.
- 346. Entrepreneurship: Small Business Formation.** Studies entrepreneurship for those with a serious interest in owning their own business within five years of graduation; students prepare a comprehensive business plan for starting or acquiring such a business, also studies the problems of an existing small business. Prerequisite: Consent of instructor. 4 hours or 1 unit.
- 351. Personnel Administration.** Studies concepts and methods used by the staff personnel unit in building and maintaining an effective work force in an industrial organization, development of ability to design the personnel subsystem within the firm and to deal effectively with problems encountered in such areas as recruitment, selection, training, and wage and salary administration; and considerable emphasis on case analysis, role playing, and research. Prerequisite: Business Administration 323, Economics 173 and 240. 3 hours, or $\frac{3}{4}$ to 1 unit. Credit is not given for Business Administration 351 and Psychology 245.
- 352. Pricing Policies.** The role of pricing in contemporary marketing and major pricing decisions facing the firm; theoretical, economic, and practical methods and models for setting prices, pricing new products, initiating price changes, and responding to competitive pricing; the relationship of pricing objectives and strategies to the goals of the firm, and sealed bidding for contracts. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 360. Marketing to Business and Government.** Introduces the general area of industrial marketing, examines the nature of industrial markets especially as they compare to consumer markets and emphasizes such factors as the demand for industrial goods, marketing intelligence systems for industrial firms, marketing strategy in industrial markets, and analyses and control of industrial marketing programs; integrates important

concepts from sales management and business logistics throughout the course; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.

- 370. International Marketing.** Examines social, political, cultural, and economic environmental differences among countries in terms of their impact on the strategy of extension versus adjustment of marketing practice by multinational corporations; examines each marketing function in detail with respect to the specific areas the international marketer must examine. A special section concentrates on international market research. Prerequisite: Business Administration 344 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 373. Business Information Systems.** Fundamentals of business data processing; consideration of the use of modern electronic computers in the areas of accountancy, economics, management, marketing, and general business. The facilities of the Digital Computer Laboratory are utilized. Prerequisite: Accountancy 221. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 380. Advanced Marketing Management.** An integrative study of methods and models for marketing decision-making; emphasizes the application of analytical tools and behavioral and quantitative models to marketing decision-making. Uses lectures, case studies and simulation exercises. Prerequisite: Business Administration 274 and 344. 3 hours or $\frac{1}{2}$ unit.
- 382. Introduction to International Business.** Analyzes the major business management functions of international business operations of multinational firms; topics include international business environment, organizational policies and strategies of multinational companies, industrial relations and control policies. Prerequisite: Business Administration 202 or 210, or equivalent; Economics 101 or 102. 3 hours or $\frac{1}{2}$ unit.
- 384. International Management.** Analyzes the impact of socio-cultural variables on organization structure processes, decision-making, leadership role, employee motivation and productivity in the international business area. Prerequisite: Business Administration 202 or 210, or equivalent; senior standing. 3 hours or 1 unit.
- 389. Business Policy.** Analysis of policy formulation and implementation from a company-wide standpoint; emphasis on integration of knowledge and approaches across functional areas; both endogeneous and exogeneous factors which affect company policies; and the role of the firm in society. Prerequisite: Business Administration 321 or 344; Business Administration 374; senior standing. 3 hours or $\frac{1}{2}$ unit.
- 391. Introduction to Management Information Systems.** Same as Accountancy 332. See Accountancy 332.
- 392. Information Organization for Management Information Systems.** Same as Accountancy 333. Data collection, classification, verification, and transmission; file organization, including sequential and random processing techniques, record locating, overflow procedures, and file security; analysis of alternative methods of data organization; commercial file management systems; design of data processing systems; and instruction in COBOL and use of case studies. Prerequisite: Accountancy 332 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 393. Management Information System Development.** Same as Accountancy 334. Essential steps in developing a management information system, including preliminary planning, design, feasibility analysis, implementation schedule, and postimplementation review of the system; includes a semester-long project which familiarizes students with methodology and techniques. Prerequisite: Accountancy 332 or Business Administration 392, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 394. Management Information and Control Systems.** Same as Accountancy 335. See Accountancy 335.
- 400. Managerial Economics.** Introduction to decision making for the private or public enterprise; principles of economic maximization under uncertainty; and marketing, financial, and production strategies in a dynamic multiperiod context. 1 unit. Graduate credit is not given for both Business Administration 400 and either Economics 300 or 400.
- 401. The Economic Environment.** Analysis of the functioning of the economy from an aggregative point of view; role of government policy in affecting the economic environment. 1 unit. Graduate credit is not given for Business Administration 401 and either Economics 301 or 401.

- 408. Foundations of Behavioral Science for Administration.** Develops and integrates fundamental behavioral concepts and theory having administrative applications; initially focuses on the individual decision maker and ultimately includes interpersonal, organizational, and social structures and influences; and develops strategies and methods of research on behavioral applications in business. 1 unit.
- 409. Organizational Behavior.** Same as Labor and Industrial Relations 409. Examines and analyzes the organization as a social system and the impact of its various components on work attitudes and behavior; topics include the development of organizational structures, organizational effectiveness, decision making and policy formulation, leadership, and change. Prerequisite: Business Administration 408. 1 unit.
- 410. Organizational Sciences, I.** Same as Political Science 460, Psychology 453, and Sociology 456. Introduction to the principal theories and important empirical research in various disciplines that study organizations; in addition to examination of the subject matter content of various disciplines, students critically examine the capacities and limitations of the various fields to make contributions to the study of organizations. Prerequisite: Enrollment as a major in organizational sciences in a cooperating program or consent of instructor. 1 unit.
- 411. Problems of Personnel Management.** Same as Labor and Industrial Relations 445. Examines the organization and administration of the personnel function in management; the relations of personnel administration to operating departments and the scope of business and industrial personnel services; analytical appraisal of policies and practices in selected areas of personnel administration, such as selection and training, carried out through case studies and direct industrial contracts; and specific consideration given to problems up to and including placing the person on a job. Prerequisite: Consent of instructor. 1 unit.
- 412. Organization and Its Environment.** Analysis of business organizations adapting to shifts in internal and external elements; major emphasis on (1) the business firm as a part of a complex socioeconomic system; (2) the effects of government, labor unions, and political, religious, and business organizations on the executive's decision problems; (3) environmental factors conducive to organizational change; and (4) organizational growth. Prerequisite: Business Administration 409. 1 unit.
- 413. Behavioral and Organizational Decision Making.** Examines the major types of organization theory; use of organization theory to guide research and to make business decisions; and examination of major research methods used to study business organizations. Prerequisite: Business Administration 412. 1 unit.
- 415. Foundations of Buyer Behavior.** Studies alternative models of buyer behavior; focuses attention on psychological, sociological, and economic factors including motivation, learning, attitudes, personality, reference groups, social stratification, demographics, life styles, and cross-cultural differences and their impact on purchasing, consumption, and choice decisions. Prerequisite: Business Administration 420. 1 unit.
- 416. Metatheory in Consumer Behavior.** An advanced doctoral level seminar which critically examines the relevance of behavioral and social constructs for generating consumer behavior theories with the use of philosophy of science and metatheory criteria, specifically discusses the need for, and procedures with which to modify behavioral-social constructs and processes such as motivation, concept formation, information processing, choice axioms, attitude consistency, and group norms. Prerequisite: Business Administration 415. 1 unit.
- 417. Marketing in Public Service Organizations.** Introductory analysis of the marketing problems of public service organizations, including those in the arts, health care, politics, social welfare, and public services, similarities with and differences from marketing in the business sector; problems of goal setting, strategic planning, and coordination for public service marketing programs, techniques for research and evaluation, and projects in program design, pricing, and promotion in public service markets. Prerequisite: Graduate standing and Business Administration 420, or consent of instructor. 1 unit.
- 420. Marketing Management.** Introduces concepts useful in understanding marketing sys

tems and buyer behavior in addition to developing skills in making marketing decisions; the orientation is primarily managerial and uses examples from both business and non-business contexts. 1 unit.

421. **Marketing Strategy: Theoretical Foundations.** A formal analysis of strategy drawing on concepts from the theory of games, decision theory, value theory, and information theory; topics cover elements of game models, classes of decision problems, games against nature, modern utility theory, information theory, group decision making, statistical decision theory, and linear and nonlinear optimization. 1 unit.
422. **Marketing Strategy: Decision Models.** The role of models in the design, implementation, and adjustment of seller strategy; application of simulation, programming, and other methods to the specification and solution of product, price, promotion, and other marketing problems; and topics including the nature of models and model building, forecasting models, optimization models, and other decision models. Prerequisite: Business Administration 421. 1 unit.
424. **Market Segmentation.** Deals with unique subsets of potential customers in the market who differ with regard to applications of the marketing tactic to be employed; applies cost benefit criteria to possible aggregations of these subsets. Discusses the topic from a historical perspective, a research perspective, and finally a strategic perspective; involves actual segmentation research by students. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
425. **Product Management.** The decisions on the firm's total market offer, including such topics as use of market analysis in making decisions on assortment, product development, pricing, packaging, branding, and sales forecasting; coordination of these decisions and actions with market communications, physical movement, production, finance, and the overall goals and policies of the firm; and emphasizes the use of analytic and research methods in making assortment and product decisions. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
426. **Marketing Theory and Systems.** A detailed study of macro- and micro-marketing systems and the various approaches to marketing theory; attention given to general systems theory, the nature of marketing systems, system adaptation to the environment, concepts of theory, and major approaches to macro- and micro-theory in marketing. 1 unit.
427. **Sales Force Management.** Examines primary elements and problems in the area of sales force management; studies such topics as the dyadic interaction between the buyer and seller, the sales presentation, important salesperson characteristics, the selection, training, assignment, motivation, and compensation of salespeople, supervision and evaluation of the sales force, and coordination of the sales force with other elements in a firm's marketing program. Uses case studies. Prerequisite: Business Administration 420. 1 unit.
428. **Promotional Strategy.** Management orientation to promotional strategy for the medium and large size organization; includes analyses of the primary elements of the promotional function from both qualitative and quantitative perspectives emphasizing such factors as (1) selection among alternative promotional tools, (2) the promotional budgeting and allocation process, and (3) determination of appropriate messages and media schedules for given product/market situations. Explores widely used models in depth for strategic usefulness; emphasizes case analysis and contemporary situations. Prerequisite: Business Administration 420. 1 unit.
429. **Marketing Research.** Examines the collection and analysis of information applied to marketing decisions; stresses quantitative methods including samplings, scalings, experimental design, forecasting, and multivariate procedures through the use of class projects on actual market research problems. Prerequisite: Business Administration 472, and credit or concurrent registration in Business Administration 420. 1 unit.
430. **Research Methods in Business Administration.** Theory and practice of research methodology for the study of administrative, industrial, and consumer behavior and organizations; alternative methods of data collection and their strengths and weaknesses; observational, questionnaire, field, and laboratory experimentation and statistical analysis of pregathered time series and cross-sectional data; and examples of good and bad re-

search in business disciplines. A completed individual research project of potentially publishable nature is formally presented in class. Prerequisite: Basic inferential statistics course; credit or concurrent registration in Business Administration 408. 1 unit.

431. **Survey Methods in Marketing Research.** Same as Sociology 474. Analysis of survey methods in marketing with emphasis on sample design, data collection, and data processing; an advanced course in the methods required to design, implement, and evaluate a research project. Prerequisite: Economics 171 or equivalent. 1 unit.
432. **Applied Multivariate Analysis in Business.** An advanced doctoral level seminar on the applications of multivariate statistical techniques to marketing and business problems critically examines the relevance of optimization rules and inferential properties of various multivariate techniques including regression, AID, MANOVA, discriminant, canonical, factor, clustering and multidimensional scaling for marketing and business problems, particularly emphasizes pitfalls of data and computational problems. Prerequisite: Psychology 494. 1 unit.
433. **Experimental Design.** Training in the design, execution, and interpretation of field and laboratory experimental research; emphasis on the evaluation of alternative designs, execution of problems, and interpretation of data; and a review of illustrative research studies made, an actual study designed, and data collected and interpreted. Prerequisite: Business Administration 472 or consent of instructor. 1 unit.
435. **The Sampling of Human Populations and Social Organizations.** Same as Sociology 485 and Psychology 455. Procedures for selecting samples from and estimating population parameters for human populations and social organizations, types of sample designs treated include simple random samples, stratified, and cluster samples together with random number and systematic selection techniques, and emphasis given to the study of various kinds of advanced sample designs for both area and institutional settings together with the problems involved in the application of analytical statistics to complicated sampling procedures. Each student is required to participate in a field project which involves the actual selection of a cluster sample from the local area. Prerequisite: Sociology 487 or consent of instructor. 1 unit.
442. **Social Performance of Business and Government.** The position of the business enterprise as an institution in American society, the role of the businessman in that society. Prerequisite: Completion of the first year of the M.B.A. program or equivalent. 1 unit.
443. **Legal Aspects of Management Decisions.** The legal environment in which business decisions are made, including the legal system and the role of courts, government taxation and regulation of business, administrative law, antitrust law, labor law, and trends in the law affecting business policy. 1 unit.
444. **Policy and Planning.** Policy construction and planning of policy implementation at the executive level, case studies of company wide situations from the management point of view, and integration and application of material from previous courses. Credit is not given for both Business Administration 444 and 489. Prerequisite: Business Administration 408, 420, 451 and 467 or equivalent. 1 unit.
451. **Financial Management.** An introduction to financial decision making in the firm, development of a decision making framework for determining the most efficient allocation of resources within the firm, and emphasis placed on the analysis of capital investment projects, long term sources of funds, and short term financing problems. 1 unit.
452. **Long-Term Financial Decision Making.** Same as Finance 452. See Finance 452.
453. **Working Capital Management.** Same as Finance 458. See Finance 455.
455. **Risk Management and Control.** Same as Finance 470. See Finance 470.
456. **Investment.** Same as Finance 456. See Finance 456.
457. **Security Analysis.** Same as Finance 457. See Finance 457.
458. **Portfolio Management.** Same as Finance 458. See Finance 458.
460. **Managerial Accounting and Control.** Analysis of managerial controls, the information needed for their operation, and the manner in which accounting provides that information, emphasis on accounting as a tool of management, and problems and cases stressing the type of figure information relevant to managerial decisions and the methods of using such data. 1 unit.

- 467. Production Management.** An introductory course in decision-making problems in production; includes the theoretical foundations for production management as well as the applications of decision-making techniques to production problems in the firm; and considers production processes, plant layout, maintenance, scheduling, quality control, and production control in particular. Prerequisite: Business Administration 472 and 473. 1 unit.
- 468. Production Planning and Control.** In-depth treatment of decision-making topics in production at the factory manager level and above; topics include the development of generalized decision rules and systems analysis in production; and particular emphasis on the design of production control, quality control, and inventory control systems, and how each of these systems is integrated into the firm as a whole. Prerequisite: First year of the M.B.A. program. 1 unit.
- 469. Quantitative Techniques in Production.** An advanced course in the application of quantitative techniques to decision-making problems dealing with production in the firm; topics include structural estimation of production systems, application of operations research techniques to production problems, and computer simulation of decision systems. Prerequisite: Business Administration 468 or equivalent. 1 unit.
- 470. Mathematical Analysis for Management Decisions.** An elementary course in calculus with applications to business and economics; topics include differentiations, integration, Lagrange multipliers, multivariate functions, and matrices. 1 unit.
- 472. Modern and Classical Statistics for Management Decisions.** The application of classical and modern statistics for business decision making. The level of the course assumes some prior knowledge of basic statistics as well as facility with elementary calculus. Prerequisite: Business Administration 470. 1 unit.
- 473. The Quantitative Analysis of Decisions.** Introduction to operations research techniques; topics include the construction and solution of linear models under certainty, and the construction of probabilistic models, specifically queueing theory, Markov chains, and sequential decisions. Prerequisite: Business Administration 470. 1 unit.
- 474. Applications of Operations Research Techniques.** The application of the operations research techniques developed in Business Administration 473 to practical business problems. Most of the semester is devoted to a series of field research studies. A review of previous work in the field is made prior to the field studies, and the role of the computer in solving operations research problems and its application to the field research is also a major consideration. Prerequisite: Business Administration 473. 1 unit.
- 475. Systems Modeling and Simulation.** Same as Computer Science 445. Theory and techniques of simulation and gaming; simulation languages such as GPSS, DYNAMO, and SIMSCRIPT. Applications: investigation, control, and design of various systems (inventory, production scheduling, computer, marketing, and others). Prerequisite: Computer Science 105 or Statistics 310 or Business Administration 274, or equivalent, or consent of instructor. 1 unit.
- 476. Business Forecasting and Econometrics.** Introduction to maximum likelihood estimating techniques; topics including the use and limitations of least squares, two-stage least squares, limited information and full-information estimates; and consideration of problems with observational errors, multicollinearity, and autocorrelation in time-series and cross-section structural estimation. A major portion of the course is devoted to the application of the econometric techniques in business forecasting and analysis. Prerequisite: Business Administration 472. 1 unit.
- 477. Economics of Decision Making.** The operational analysis of the problems of individual decisions under uncertainty that arise in the practice of management. Prerequisite: Business Administration 472. 1 unit.
- 478. Stochastic Models in Management Science.** Application of Markov processes to describe, analyze, and design systems of interest in management science, including queues, inventory, production, brand loyalty, stock market, and other applications. Prerequisite: Mathematics 361 or Statistics 310, or equivalent. 1 unit.
- 479. Mathematical Programming for Management Science.** Mathematical programming

models (linear, integer, quadratic, nonlinear, dynamic, and combinatorial) used to describe, analyze, and design systems such as production, transportation, scheduling, and planning. Prerequisite: Mathematics 315 or equivalent. 1 unit.

- 482. International Business Operations, I.** An integration of economics and the functional areas of business focused on the problems of managing international business operations; studies economic, legal, financial, and administrative problems through cases and literature emphasizing financial and marketing problems. Students select one area from the following for special study and reporting: Europe, Latin America, Africa, Middle and Near East, or South Asia and Far East. Prerequisite: Completion of first year of the M.B.A. program. 1 unit.
- 483. International Business Operations, II.** Continuation of Business Administration 482. Prerequisite: Business Administration 482. 1 unit.
- 486. Japanese Business and Management Systems.** Analyzes the business and management systems of Japan and compares them with the American business and management systems; topics include quality circles and quality of work life; the human side of Japanese productivity; business government relations in Japan; organizational strategies and policies of Japanese business organizations; economic, political, legal, and ecological factors affecting Japanese management systems. Prerequisite: Graduate standing; Business Administration 409 or equivalent. 1 unit.
- 490. Seminar in Business Administration.** Special topics in the general area of business. Topics are selected by the instructor at the beginning of each semester. 0 to 1 unit.
- 491. Seminar in Special Topics.** Lectures in topics of current interest not covered by regular course offerings. Subjects are announced in the Timetable. Prerequisite: Consent of instructor or head of department. ¼ to 1 unit.
- 493. Research in Special Fields.** ¼ to 2 units.
- 494. Independent Study and Research.** Directed reading and research. ¼ or 1 unit.
- 499. Dissertation Research.** Required of all students writing doctoral dissertations in business administration; guidance in writing theses and seminar discussions of interim progress reports. 0 to 4 units.

BUSINESS AND TECHNICAL WRITING

(See English)

CERAMIC ENGINEERING

Head of Department: Professor C. G. Bergeron

Department Office: 204 Ceramics Building, 105 South Goodwin, Urbana

- 190. Topics in Ceramic Engineering.** A course for freshmen providing an opportunity to become acquainted with ceramic engineering, and to participate in an engineering course in the freshman year: discussions and demonstrations on ceramic materials, processes, and properties; ceramic articles, glasses, ceramic magnets, and coatings are made in laboratory demonstrations. Discusses environmental concerns of the ceramic industries. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
- 201. Ceramic Crystal Chemistry.** Crystal structure and crystal chemistry of ceramic materials, including the structure of silicates, geometrical crystallography and discussions of crystal character and crystal growth of ceramic materials. 3 hours.
- 202. Ceramic Materials and Processes.** Characterization of ceramic raw materials and their preparation, fabrication, and processing. Prerequisite: Sophomore standing. 3 hours.
- 205. Phase Equilibria in Ceramic Systems.** The concepts, interpretations, and utilization of

- phase equilibrium diagrams in multicomponent ceramic systems at high temperatures; methods of determining equilibrium relationships; and interpretation of binary, ternary, and quaternary systems emphasizing quantitative calculations, metastability, and the origin of microstructure. Lecture and discussion. Prerequisite: Concurrent registration in Ceramic Engineering 245 or consent of instructor. 3 hours. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
208. **Thermal Processing.** The application of the principles involved in drying and high-temperature operations utilized in processing ceramic materials. Prerequisite: Junior standing in ceramic engineering. 3 hours.
216. **Rate Processes in Ceramic Engineering.** Reaction kinetics of ceramic processes; high-temperature phase transformations; sintering and grain growth; nucleation and crystal growth from melts; and mechanisms of material transport in solid and liquid systems. Prerequisite: Ceramic Engineering 245; junior standing in ceramic engineering. 3 hours.
221. **Pyrometry.** Principles and methods used in high temperature measurement and introduction to process temperature control. Prerequisite: Junior standing in engineering or equivalent. 2 hours.
245. **Physical Chemistry for Engineers.** Same as Chemistry 245. Primarily for ceramists, metallurgists, and other engineering students; not offered to chemistry or chemical engineering majors. Provides the elements of chemical thermodynamics and chemical kinetics, and provides an introduction to the statistical concepts of entropy. Prerequisite: Chemistry 102; Physics 107 or 108; Mathematics 242 or equivalent. 3 hours.
271. **Design of High-Temperature Systems.** Design for dryers, kilns, and furnaces for ceramic facilities. Prerequisite: Ceramic Engineering 208; Theoretical and Applied Mechanics 221. 3 hours.
297. **Senior Seminar.** Lectures and discussions dealing with professional practice, job selection, employment practice, continuing education, professional growth, and economics of the ceramic industries. Prerequisite: Senior standing in ceramic engineering. 1 hour.
298. **Special Problems.** Special topics in ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. Prerequisite: Senior standing. 1 to 2 hours. May be repeated to a maximum of 2 hours.
299. **Senior Thesis.** Research in ceramics and ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. To receive credit, a thesis must be presented. Prerequisite: Senior standing; grade point average of 4.0 or better. 1 to 5 hours. May be repeated to a maximum of 5 hours. A minimum total credit of 3 hours is required.
307. **Thermal and Mechanical Properties of Ceramics.** Interprets the thermal and mechanical behavior of crystalline and amorphous ceramics in terms of atomistic concepts of materials; examines influences of microstructure, composition, temperature, pressure, time and other controllable parameters. Prerequisite: Ceramic Engineering 216 and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
309. **Ceramic Processing.** Examines principles and details of ceramic processing operations; case histories and unit operations for a wide variety of ceramic products; and interrelationships that exist between materials, composition, fabrication, properties, and characterization. Prerequisite: Junior standing in engineering or physical sciences. 3 hours or $\frac{3}{4}$ unit.
310. **Refractory Technology.** Engineering properties and thermochemistry of polycrystalline materials for use at elevated temperatures including processing of raw materials and the manufacture, heat treatment, quality control, and specification of refractory products; particular emphasis on oxides, silicates, carbides, borides, cermets, and refractory metals with a correlation of the properties of these materials to certain design criteria. Includes laboratory if taken for 1 unit of graduate credit. Prerequisite: Senior standing in engineering. 3 hours or $\frac{3}{4}$ or 1 unit.
311. **Ceramic X-Ray Analysis.** X-ray diffraction for phase identification, for the determination of crystalline lattice parameters, and for the determination of the thermal expansion of crystalline solids; analytical methods of indexing powder diffraction patterns; the determi-

nation of precise lattice parameters by means of computer programming and high temperature x-ray techniques. Prerequisite: Computer Science 101 and senior standing in engineering, chemistry, or geology, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.

- 312. Ceramic Coatings.** Examines principles and technology of a wide range of ceramic coatings; emphasizes chemistry and physics that underlie coating properties, and application processes; and studies types of coatings treated including porcelain enamels, glazes, melt sprayed coatings, vapor deposited coatings, electrolytically deposited coatings, weld rod coatings, and sputtered coatings. Prerequisite: Ceramic Engineering 245, or Metallurgical Engineering 314 and 370; or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 314. Chemistry and Technology of Glass.** Glass structure and constitution and their relationship to chemical, physical, and electrical properties; melting, forming, and annealing operations; preparation of glasses and measurement of important glass properties, lectures and laboratory. Prerequisite: Junior standing in engineering, chemistry, physics, or geology. 3 hours or $\frac{1}{2}$ unit.
- 331. Ceramic Microscopy.** Studies the optical activity in isotropic and anisotropic media with particular emphasis on the materials and products of ceramics; the application of these principles and related topics of optical microscopy to the study of the morphology, aggregation, size, and microstructure of the products of high temperature thermochemical reactions and equilibria. Includes studies in thermal microscopy if taken for 1 unit of graduate credit. Prerequisite: Ceramic Engineering 205 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 340. Electrical Ceramics.** Presents the subject of dielectric crystals and their electrical properties; discussion and correlation of ferroelectric and piezoelectric properties of several crystal classes; coverage in detail of the perovskite class of ferroelectric compounds; and discussion of spinel, garnet, and hexagonal type ferrimagnetic crystals and their properties. Prerequisite: Ceramic Engineering 309 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 346. Hybrid Circuit Fabrication Laboratory.** Same as Electrical Engineering 546. See Electrical Engineering 346.
- 347. Portland Cement Technology.** An introduction to the production, composition, and properties of portland cement, emphasizing the technology and chemistry of cement manufacture, composition and characterization of cements, quality control and specifications, and reactions of cement with water in concrete. Prerequisite: Senior standing in engineering or chemistry, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 388. Nuclear Ceramics.** Same as Nuclear Engineering 388. Studies the characterization, behavior, and utilization of ceramic materials for the radiation environment of modern nuclear reactor devices with particular emphasis on the power reactor; discussion of material functions in radiation environment, the ceramic nuclear fuel cycle, radiation damage in nonfissile ceramics, and nuclear carbon, graphite, and nonfuel ceramic isotope utilization. Prerequisite: Chemistry 245 or Physics 385, or consent of instructor. 3 hours or 1 unit.
- 398. Special Topics.** Studies advanced topics related to ceramic engineering. Prerequisite: Junior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Ceramic Chemistry.** Silica, silicates, fusions, and phase relations. Prerequisite: Courses in chemistry and physics. 1 unit.
- 405. Glass Technology.** Following a brief review of unit processes and operations in glass manufacture, the course treats selected major topics relating to the glass preparation process and the chemical, mechanical, optical, and electrical properties of glass from a dominantly theoretical and research point of view. Prerequisite: Ceramic Engineering 344 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 410. Dielectric Properties of Ceramic Materials.** Review of fundamental properties of vector fields; consideration of the reaction of insulating solids to external electric fields in terms of dielectric theory; the properties of ceramic dielectrics including treatment of ferroelectrics in terms of present theory, and correlation of the piezoelectric properties of ferroelectric crystals and ceramics with the crystal structure, microstructure and the ferroelectric properties. Prerequisite: Mathematics 345 and 348, or consent of instructor. $\frac{1}{2}$ or 1 unit.

- 412. Structural Physical Ceramics.** Structural chemistry and crystallization behavior of ceramic systems at elevated temperatures; nucleation, and crystal growth; mineral synthesis; and high temperature reaction kinetics including phase transformations and diffusion. $\frac{3}{4}$ or 1 unit.
- 414. Physical Chemistry of Clays and Soils.** Same as Soils 414 and Mining Engineering 414. See Soils 414.
- 418. Physics of Strong Solids.** Characterization and interpretation of physical properties of single phase and composite materials of high strength; covalently bonded semiconductors; transition metal carbides; borides and nitrides; graphite; glass; fibers; and precipitation-hardened metals. Prerequisite: Any one of the following: Ceramic Engineering 307 or 421, Metallurgical Engineering 384, Chemistry 342 or Physics 490, or consent of instructor. 1 unit.
- 421. Refractory Materials Engineering.** Interpretation of the behavior of materials for utilization in an environment where high-temperature structural stability and control of thermal energy transport are the prime considerations; emphasizes design and material selection criteria based on thermal energy control, mechanical stress response, and structural integrity at elevated temperature. Prerequisite: Ceramic Engineering 310 or consent of instructor. 1 unit.
- 454. Advanced Methods in Electron Microscopy.** Same as Biology 454. See Biology 454.
- 461. Mineralogy of Clays.** Same as Geology 461. See Geology 461.
- 462. Mineralogy of Clays.** Same as Geology 462. See Geology 462.
- 495. Materials and Special Problems.** Conference and laboratory. Prerequisite: Graduate standing in ceramic engineering. 0 to 2 units.
- 497. Research Seminars.** Discussion and lectures on current research topics. 0 or $\frac{1}{4}$ unit. May be repeated each semester.
- 498. Seminar in Ceramics.** Lectures on current ceramic research and development; presentations by visiting lecturers as well as graduate students and staff in the department. Registration required of all graduate students in ceramic engineering. Graduate students nearing completion of their theses are required to make a seminar presentation. Prerequisite: Graduate standing in ceramic engineering. 0 credit.
- 499. Thesis Research.** Research in any of the branches of ceramics. Prerequisite: Graduate standing in ceramic engineering; Ceramic Engineering 311. 0 to 4 units.

CHEMICAL ENGINEERING

Head of Department: Professor C. A. Eckert

Department Office: 114 Roger Adams Laboratory, 1209 West California, Urbana

- 161. The Chemical Engineering Profession.** Lectures and problems on the history and scope of chemical engineering endeavors; decisions and criteria for process development and plant design. Prerequisite: Chemistry 101 or 107. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Cooperative Education: Planning.** Same as Chemistry 201. See Chemistry 201.
- 202. Cooperative Education: Industrial Practice.** Same as Chemistry 202. See Chemistry 202.
- 261. Introduction to Chemical Engineering.** Lectures and problems on material and energy balances. Prerequisite: Chemistry 102 or 108. 3 hours.
- 292. Senior Thesis.** Limited in general to seniors in the curriculum in chemical engineering. Any others must have the consent of the head of the department. Each student taking the course must register in a minimum of 5 hours either in one semester or divided over two semesters. A maximum registration of 10 hours in two semesters is permitted. However, Chemical Engineering 390 (2 hours) may be substituted for 2 of the 5 hours required in Chemical Engineering 292. In order to receive credit, a thesis must be presented by each student registered in Chemical Engineering 292. 1 to 6 hours.

- 370. Chemical Engineering Thermodynamics.** Fundamental concepts and laws of thermodynamics with emphasis on application to chemical engineering problems; introduction to phase equilibria. Prerequisite: Chemical Engineering 261. 3 hours or 1.5 unit.
- 371. Fluid Mechanics and Heat Transfer.** Introduction to fluid statics and dynamics; dimensional analysis; design of flow systems; and introduction to heat transfer conduction, convection, and radiation. Prerequisite: Chemical Engineering 261 or consent of instructor. 4 hours or 1 unit.
- 373. Mass Transfer Operations.** Introduction to mass transfer processes and design methods for separation equipment. Prerequisite: Chemical Engineering 371 or consent of instructor. 4 hours or 1 unit.
- 374. Chemical Engineering Laboratory.** Experiments and computation in fluid mechanics, heat transfer, reaction kinetics, and separation processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381, senior standing in chemical engineering. 3 hours or 1/2 unit.
- 377. Synthesis and Design of Chemical Systems.** Techniques used in the synthesis and analysis of designs for chemical processing systems; emphasizes the strategy of process engineering, including economic analysis, process simulation, and optimization. This is a capstone course designed to bring together principles from previous courses for the design of complete processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; Mathematics 345; Computer Science 101. 3 hours or 1/2 unit.
- 380. Heat, Mass, and Momentum Transport.** A unifying treatment of physical rate processes with particular emphasis on the formulation and solution of typical boundary value problems associated with heat, mass, and momentum transport. Prerequisite: Chemical Engineering 371; Mathematics 345. 3 hours or 1/2 unit.
- 381. Chemical Rate Processes and Reactor Design.** Chemical kinetics, chemical reactor design, and the interrelationship of transport and chemical reaction in open and closed systems. Prerequisite: Credit or registration in Chemical Engineering 373. 2 hours or 1/2 unit.
- 382. The Prediction of Physical Properties.** Prediction of equilibrium and transport properties in gases, liquids, and solids. Prerequisite: One year of physical chemistry. 2 hours or 1/2 unit.
- 384. Process Design Project.** A comprehensive design project, complements material covered in Chemical Engineering 377. Prerequisite: Credit or registration in Chemical Engineering 377. 1 to 3 hours, or 1/2 to 1/2 unit.
- 387. Applied Chemical Kinetics and Catalysis.** Problems in chemical kinetics; techniques for the prediction and measurement of rates of reactions; and homogeneous and heterogeneous catalysis chain reactions. Prerequisite: Chemistry 342 or Chemical Engineering 370. 2 or 3 hours, or 1 or 1/2 unit.
- 388. Electrochemical Engineering.** Fundamentals of analysis, design, and optimization of electrochemical systems. Prerequisite: Senior standing in physical science or engineering. 2 or 3 hours, or 1 or 1/2 unit.
- 389. Chemical Process Control and Dynamics.** Techniques used in the analysis of process dynamics and in the design of process control systems; includes Laplace transforms, stability analysis, and frequency response methods. Laboratory emphasizes on-line data acquisition and control. Prerequisite: Chemical Engineering 371 and senior standing in Chemical Engineering; Mathematics 345; Computer Science 101. 2 or 3 hours, or 1 or 1/2 unit.
- 390. Individual Chemical Engineering Projects.** Laboratory; development of an individual project. Prerequisite: Senior standing in chemical engineering. 2 hours or 1/2 unit.
- 392. Polymer Science and Engineering.** Fundamentals of polymer science and engineering; polymerization mechanisms, kinetics, and processes, physical chemistry and characterization of polymers, polymer rheology, mechanical properties, and processing. Prerequisite: Chemical Engineering 370, credit or concurrent registration in Chemical Engineering 371, Chemistry 344. 3 hours or 1/2 unit. Credit is not given for both Chemical Engineering 392 and either Metallurgical Engineering 375 or Chemistry 346.

- 396. Special Topics in Chemical Engineering.** Study of topics in chemical engineering; content varies from semester to semester. Typical topics include optimization, chemical kinetics, phase equilibrium, biochemical engineering, kinetic theory, and transport properties. Prerequisite: Senior standing in chemical engineering, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{1}{2}$ unit. May be repeated.
- 465. Chemical Engineering Seminar.** Required of all graduate students whose major is chemical engineering. Prerequisite: Chemical Engineering 373. $\frac{1}{4}$ unit.
- 466. Applied Mathematics in Chemical Engineering.** The development of mathematical models and a survey of modern mathematical methods currently used in the solution of chemical engineering problems; topics include the application of vectors and matrices, partial differential equations, numerical analysis, and methods of optimization in chemical engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ or 1 unit.
- 468. Properties of Fluids.** The kinetic theory of gases and the prediction of transport coefficients; statistical mechanics applied to dense gases and liquids; and theories of solutions. Prerequisite: A background in modern physical chemistry and physics; consent of instructor. $\frac{1}{4}$ or 1 unit.
- 469. Special Topics in Chemical Engineering.** Various advanced topics; generally taken during the second year of graduate study. Typical topics include turbulence, hydrodynamic instability, process dynamics, interfacial phenomena, reactor design, properties of matter at high pressure, and phase transitions. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated.
- 487. Fluid Dynamics.** Basic concepts in fluid dynamics with special emphasis on topics of interest to chemical engineers; derivation of the Navier-Stokes equations; solutions for creeping flow, for perfect fluids, and for boundary layers; non-Newtonian fluids; and turbulence. Prerequisite: Consent of instructor. 1 unit.
- 488. Advanced Topics in Heat and Mass Transfer.** Principles of transfer operations developed in terms of physical rate processes; boundary layer heat and mass transfer, eddy diffusion, phase changes, and separation processes. Prerequisite: Consent of instructor. $\frac{1}{4}$ or 1 unit.
- 496. Individual Study.** Study under the supervision of a staff member in areas not covered in course offerings. Prerequisite: Consent of the staff member under whom the study is to be made. 0 to 1 unit.
- 497. Special Problems.** Individual work on problem-oriented projects not included in theses. This could be research, engineering design, or professional work in chemical engineering which has educational values. The work must be done under the supervision of a staff member with the approval of the department head. $\frac{1}{2}$ to 4 units.
- 498. Research Seminar.** Discussion of recent developments of importance to different areas of chemical engineering research. The course is divided into a number of sections, and subject matter differs from section to section and from time to time. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
- 499. Thesis Research.** Candidates for the master's degree who elect research are required to write a thesis. A thesis is always required for the Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in another department must receive permission from the head of the Department of Chemical Engineering to register in this course. 0 to 4 units.

CHEMICAL SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Biochemistry, Chemical Engineering, and Chemistry.)

Director of School: Professor Jiri Jonas

School Office: 106 Noyes Laboratory, 505 South Mathews, Urbana

CHEMISTRY

Head of Department: Professor L. R. Faulkner

Department Office: 106 Noyes Laboratory, 505 S. Mathews, Urbana

- 100. Introductory Chemistry.** Introduction to the basic concepts and language of chemistry: lectures, recitations, and audiotutorial laboratory. Prerequisite: Two and one-half units in high school mathematics, or credit or concurrent registration in Mathematics 111 or 112. Only students without high school chemistry or with chemistry placement scores inadequate for enrollment in Chemistry 101 receive graduation credit; students with designated borderline placement into Chemistry 101 may take Chemistry 100 but will not receive credit toward graduation. 2 hours.

NOTE: Chemistry 101 - 102 constitutes the standard college chemistry sequence. Chemistry 107, 108, 109, and 110 is the intensive, more rigorous sequence for chemistry majors and well prepared students of science. The regular and intensive sequences are not designed to be mixed. A student who registers for parts of both sequences without special permission from the director of general chemistry risks loss of credit. Chemistry 101 and 103 constitutes a terminal sequence for agriculture students which does not satisfy prerequisites for advanced chemistry courses.

- 101. General Chemistry.** Lecture and laboratory. For students who have some prior knowledge of chemistry. Principles governing atomic structure, bonding, states of matter, stoichiometry, and chemical equilibrium; descriptive chemistry of the elements and coordination compounds. Prerequisite: Credit in or exemption from Mathematics 111 or 112, one year of high school chemistry or equivalent. Placement into 101 by the Chemistry Placement Test recommended. 4 hours. Students may not receive credit for both Chemistry 101 and Chemistry 107 and 109. Three semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
- 102. General Chemistry (Biological or Physical Version).** Lectures, recitations, and laboratory. Section B (Biological Version): Chemistry of organic and biochemical systems, chemical energetics and equilibrium, chemical kinetics, and reaction mechanisms. Section P (Physical Version): Chemistry of materials, including organic and biological substances, chemical energetics and equilibrium, chemical kinetics, and solids and crystals. Prerequisite: Chemistry 101, or Chemistry 107 and 109, or advanced placement credit for one semester of college-level chemistry. 4 hours. Students may not receive credit for both Chemistry 102 and Chemistry 108 and 110. Three semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
- 103. General Chemistry: Organic Chemical Studies.** Lectures, recitations, and laboratory discussion. Descriptive facts and theory of organic chemistry and applications to living processes. For students in the College of Agriculture. A terminal course in chemistry; it does not meet the Chemistry 102 prerequisite for more advanced courses in chemistry. Prerequisite: Chemistry 101. 4 hours.
- 107. Accelerated Chemistry, I.** Lectures and recitations. The beginning chemistry course for students in the chemical sciences and others with strong high school chemistry and mathematics preparation. Chemical calculations, structure, bonding and equilibrium. Credit toward graduation is received for Chemistry 107 only if Chemistry 109 is also completed. Prerequisite: Admission by U of I placement test or consent of adviser, credit or concurrent registration in Mathematics 120 or 135, concurrent registration in Chemistry 109. 3 hours.
- 108. Accelerated Chemistry, II.** Continuation of Chemistry 107. Lectures and recitations. Emphasizes chemical thermodynamics, equilibrium, chemical kinetics, and coordination chemistry. Prerequisite: Chemistry 107 and/or 109 and concurrent registration in Chemistry 110, or consent of instructor. 3 hours. Credit toward graduation is received for Chemistry 108 only if Chemistry 110 is also completed.

- 109. Accelerated Chemistry Laboratory, I.** Laboratory and discussion. Includes quantitative analysis. Prerequisite: Concurrent registration in Chemistry 107, or receipt of credit by examination for Chemistry 107, or consent of department. 2 hours. Credit is not given for both Chemistry 109 and either 122 or 123.
- 110. Accelerated Chemistry Laboratory, II.** Laboratory and discussion. Includes experiments in qualitative analysis, inorganic synthesis, and kinetics as well as an individual project. Prerequisite: Concurrent registration in Chemistry 108 or consent of department. 2 hours.
- 122. Elementary Quantitative Analysis.** Theory and practice of equilibria pertinent to chemical analyses; practical applications of classical and instrumental methods of analysis. Intended primarily for students outside the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 122 and either 109 or 123.
- 123. Quantitative Analysis.** Theory and application of chemical equilibria and instrumentation in analysis. Intended primarily for students majoring in departments within the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 123 and either 109 or 122.
- 131. Elementary Organic Chemistry.** Basic structural and synthetic organic chemistry is presented with emphasis on applications of this material to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Chemistry 102 or 108. 3 hours. Students may not receive credit for both Chemistry 131 and Chemistry 136.
- 134. Elementary Organic Chemistry Laboratory.** Basic laboratory technique in organic chemistry is presented with emphasis on experiments of interest to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Credit or concurrent registration in Chemistry 131. 2 hours. Students may not receive credit for both Chemistry 134 and 181.
- 136. Basic Organic Chemistry.** Fundamental structural, synthetic, and mechanistic organic chemistry is presented. For students whose major is chemistry or for those registering in the curriculum in chemistry or chemical engineering. Prerequisite: Chemistry 108, 122, or 123; concurrent registration in Chemistry 181; Mathematics 132 or 135. 3 hours. Students may not receive credit for both Chemistry 136 and 131.
- 181. Structures and Synthesis.** A laboratory course emphasizing molecular structure and synthetic chemistry. Prerequisite: Chemistry 108, 122, or 123; Mathematics 132 or 135; credit or concurrent registration in Chemistry 136. 2 hours. Students may not receive credit for both Chemistry 181 and 134.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Cooperative Education: Planning.** Same as Chemical Engineering 201. On-campus planning and discussion of cooperative work-study education programs in industry and government. Each chemistry or chemical engineering student participating in the cooperative education program must register for Chemistry/Chemical Engineering 201 or 202 each term (201 if on-campus, 202 if off-campus). Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
- 202. Cooperative Education: Industrial Practice.** Same as Chemical Engineering 202. Off-campus cooperative practice of chemistry or chemical engineering in industrial or governmental facilities. Each chemistry or chemical engineering student participating in cooperative education must register for Chemistry 202 for each off-campus term. Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
- 245. Physical Chemistry for Engineers.** Same as Ceramic Engineering 245. See Ceramic Engineering 245.
- 292. Senior Thesis.** Research, with thesis, under the direction of a senior staff member in chemistry. Normally the student takes two semesters of Chemistry 292 in the senior year. Chemistry 292 is recommended for all those who plan to do research and graduate study,

and it or Biochemistry 292 is a prerequisite for graduation with distinction in chemistry. In the semester preceding their initial enrollment, those interested in taking the course should consult with their advisers and with the graduate adviser for the area of interest in which they plan to work. A maximum of 10 hours may be counted toward graduation and a thesis must be presented for credit to be received. 2 to 6 hours. (Counts for advanced hours in LAS.)

- 315. Inorganic Chemistry.** Electronic structure of atoms and molecules and their relation to the properties of the elements and compounds; types of bonding; and a survey of symmetry, group theory, ligand field theory, organo-metallic chemistry, acids and bases, nonaqueous solvents, homogeneous catalysts, and bioinorganic chemistry. Prerequisite: Credit or concurrent registration in Chemistry 342. 3 hours or $\frac{1}{4}$ unit.
- 316. Inorganic Chemistry Laboratory.** Preparation of typical inorganic compounds illustrating special and advanced techniques, including characterization by modern physical methods. Prerequisite: Chemistry 383, or credit or concurrent registration in Chemistry 315, or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 322. Separation Methods.** Examines theory, practice, and instrumentation in gas and liquid chromatography, extraction techniques, mass spectrometry as coupled to chromatography, electrophoresis, and separations based on phase equilibria. Prerequisite: Credit or concurrent registration in Chemistry 340 or 342. 4 hours or 1 unit.
- 323. Applied Electronics for Scientists.** A lecture and laboratory course designed expressly for chemists and other scientists or engineers who have little or no background in electronics, but who need a working knowledge of electronic devices, circuits, and instruments; begins with electronic principles and leads systematically into digital, analog, and servo systems used in scientific instrumentation. Prerequisite: Senior or graduate standing in any of the physical sciences or engineering, or consent of instructor. 4 hours or 1 unit.
- 328. Principles of Environmental Chemistry.** Presentation of the chemical principles underlying air and water chemistry with strong emphasis on the behavior of environmental pollutants; detailed discussion of the chemistry of production of pollutants and their effects. Prerequisite: Chemistry 340, or Chemistry 336 and Physics 102, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 329. Instrumental Methods of Analysis.** Studies instrumental methods for characterization of chemical systems: potentiometry, voltammetry, atomic spectroscopy, molecular absorption and fluorescence, mass spectrometry, activation analysis, electron and x-ray spectroscopies, gas and liquid chromatography, and current topics such as laser spectroscopy. Prerequisite: Chemistry 340; or credit or concurrent registration in Chemistry 342, or consent of instructor. 4 hours or 1 unit.
- 336. Organic Chemistry.** Second course; lectures. Prerequisite: Chemistry 181 and 184, or Chemistry 136 and 181. 3 hours or $\frac{1}{4}$ unit.
- 337. Organic Chemistry.** Laboratory experiments in organic chemistry with emphasis on synthesis. Prerequisite: Credit or concurrent registration in Chemistry 336. 3 hours or $\frac{1}{4}$ unit.
- 338. Separation, Purification, and Identification of Organic Compounds.** Separation, purification, and identification of organic compounds using modern research methods; the identification of organic compounds by the use of spectroscopic methods and chemical conversion; the separation of mixtures and the purification of the components by crystallizations, sublimation, distillation, extraction, and chromatography; and the qualitative and quantitative identification of the components of a mixture. Prerequisite: Chemistry 336 and 337. 4 hours or 1 unit.
- 339. Advanced Organic Chemistry.** Interpretation of reactivity, reaction mechanisms, and intermediates, applications in organic synthesis, photochemistry, biosynthesis of natural products, and other areas. Prerequisite: Chemistry 338. 3 hours or $\frac{1}{4}$ unit.
- 340. Principles of Physical Chemistry.** A one semester course in physical chemistry emphasizing topics most important to students in the biological and agricultural sciences. Not open to students in the specialized curricula in chemistry and chemical engineering. Laboratory experience in this area provided by Chemistry 383 to be taken preferably after

- Chemistry 340. Prerequisite: Chemistry 122 or 123 and Chemistry 131, or equivalent; Physics 102; Mathematics 242 or equivalent (calculus including partial derivatives). 4 hours or 1 unit.
- 342. Physical Chemistry, I.** Lectures and problems focusing on microscopic properties. Chemistry 342 and 344 constitute a year long study of chemical principles covering topics such as quantum chemistry, atomic and molecular structure and spectra, statistical thermodynamics, properties and thermodynamics of materials in gases, solids, and liquids, and chemical kinetics and equilibria. Prerequisite: Chemistry 108, 122, or 123; Mathematics 340 or equivalent; Physics 106, 107, and 108 or equivalent. 4 hours or 1 unit.
- 344. Physical Chemistry, II.** Continuation of Chemistry 342, focusing on bulk properties. Prerequisite: Chemistry 342. 4 hours or 1 unit.
- 346. Physical Chemistry of Macromolecules.** The physical properties of systems containing large molecules, with special emphasis on proteins, nucleic acids, and high polymers; the use of physical methods for the characterization of such substances. Prerequisite: Chemistry 340 or 344. 3 hours or $\frac{3}{4}$ unit. Credit may not be received for both Chemistry 346 and Physics 350.
- 348. Advanced Physical Chemistry.** The sequence, Chemistry 348 and 349, is designed to give seniors and graduate students a unified treatment of physical chemistry on an advanced level; topics include the electronic structure and spectra of atoms, principles of wave mechanics, experimental and theoretical aspects of the chemical bond in diatomic and polyatomic molecules, statistical thermodynamics, and chemical kinetics. Prerequisite: Chemistry 344 or equivalent. 4 hours or 1 unit.
- 349. Advanced Physical Chemistry.** Continuation of Chemistry 348. Prerequisite: Chemistry 348. 4 hours or 1 unit.
- 383. Dynamics, Structure, and Physical Methods.** Laboratory presenting the relationship of dynamics and structure with emphasis on the use of physical methods to follow the course of reactions. Prerequisite: Chemistry 181 or 134; credit or concurrent registration in Chemistry 342, or credit in Chemistry 340. 2 hours or $\frac{1}{2}$ unit.
- 385. Chemical Fundamentals.** Laboratory with experiments on the fundamental physical nature of chemical phenomena. Prerequisite: Chemistry 342 and 383; credit or concurrent registration in Chemistry 344. 4 hours or 1 unit.
- 390. History of Chemistry.** Selected topics in the intellectual and social history of chemistry from antiquity to the present, viewed within the context of broader scientific and cultural developments. Prerequisite: Technical background commensurate with that of juniors in chemistry or allied sciences; or, with consent of instructor, junior standing in history and philosophy of science or other disciplines. 2 hours or $\frac{1}{2}$ unit.
- 391. Special Topics in Chemical Science and Technology.** Open to advanced undergraduates and graduate students. Deals with subjects not ordinarily covered by regularly scheduled courses. Prerequisite: Credit or concurrent registration in any 300-level course in chemistry. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. May be repeated as topics vary.
- 392. Solid State Structural Analysis.** Lectures and laboratory on various aspects of x-ray diffraction studies of solids; topics include the properties of crystals, symmetry, diffraction techniques, data collection methods, and the determination and refinement of crystal structures. Prerequisite: Chemistry 342 or consent of instructor. 4 hours or 1 unit.
- 397. Radiochemistry.** Same as Nuclear Engineering 397. Properties of radioactive nuclei, nature of radioactivity, nuclear structure, nuclear reactions, interactions of radiations with matter, chemical aspects of radioactivity work, and applications of nucleonics to chemistry. Prerequisite: One semester of physical chemistry or one semester of atomic physics, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 404. Advanced Inorganic Chemistry Laboratory.** Specialized laboratory techniques; more difficult inorganic syntheses. Prerequisite: Credit or concurrent registration in one of the lecture courses in inorganic chemistry in the 400 series. $\frac{1}{2}$ to $\frac{3}{4}$ unit.
- 405. Inorganic Chemistry Seminar.** Required of all graduate students whose major is inorganic chemistry. $\frac{1}{4}$ unit.
- 406. Physical Inorganic Chemistry.** Includes group theory and use of physical methods to

- provide information about the geometry, electronic structures, and reactivity of inorganic compounds in solution; emphasizes NMR and ESR. Prerequisite: Chemistry 344. 1 unit.
- 407. Special Topics in Inorganic Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as organometallic chemistry, advanced ligand field theory and molecular orbital theory of inorganic compounds, kinetics and mechanisms of inorganic reactions, etc. Prerequisite: Chemistry 406 or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for credit.
- 421. Spectrochemical Methods of Analysis.** Principles and applications of spectroscopic measurements and instrumentation; atomic emission, absorption, and fluorescence; ultraviolet, visible, and infrared absorption spectroscopy; molecular fluorescence and phosphorescence; Raman spectroscopy; and other spectrometric methods. Prerequisite: General physics and chemistry equivalent to a major in physical sciences for a bachelor's degree. $\frac{1}{2}$ or 1 unit. (Lecture, $\frac{1}{2}$ unit; lecture and laboratory, 1 unit.)
- 422. Electrical Methods of Chemical Analysis.** Polarography, potentiometric, amperometric, and conductometric titrations, and other selected topics. Lectures and laboratory. Prerequisite: Chemistry 344 or equivalent. 1 unit.
- 424. Special Topics in Analytical Chemistry.** Recent advances in measurement science and the application of analytical chemistry to other sciences; designed to acquaint students with techniques and applications not covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May be repeated.
- 425. Analytical Chemistry Seminar.** Required of all graduate students whose major is analytical chemistry. $\frac{1}{2}$ unit.
- 430. Advanced Organic Chemistry: Structure and Spectroscopy.** Advanced survey of organic chemistry with emphasis on structure and spectroscopy. Prerequisite: Chemistry 336. 1 unit.
- 431. Advanced Organic Chemistry: Reaction Mechanisms.** Advanced survey of organic chemistry with emphasis on reaction mechanisms and concepts of physical organic chemistry. Prerequisite: Chemistry 336 and one year of physical chemistry. 1 unit.
- 432. Advanced Organic Chemistry: Synthesis.** Advanced survey of organic chemistry with emphasis on synthesis. Prerequisite: Chemistry 336. 1 unit.
- 433. Organic Chemistry.** Special topics in organic chemistry. An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as natural product synthesis and biosynthesis, organic photochemistry, chemistry of special families of organic compounds, etc. Prerequisite: Chemistry 431 and 432, one of which may be taken concurrently. $\frac{1}{2}$ or $\frac{3}{4}$ unit. Two lectures per week are required for $\frac{3}{4}$ unit credit. May be repeated for credit.
- 435. Organic Chemistry Seminar.** Current literature in organic chemistry. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 436. Experimental Organic Chemistry.** A lecture course on research techniques in organic chemistry. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biochemistry and Biophysics 440. Topics of importance in research in biophysical chemistry are discussed with emphasis on physical background and current applications; topics may be chosen from among the following: NMR and ESR spectra of biological macromolecules, x-ray diffraction studies of macromolecules, kinetics and statistical mechanics of helix-coil transitions, physical approaches to the refolding and assembly of multi-subunit proteins, fluorescence spectroscopic studies on macromolecules, and light scattering from macromolecules in solution. Prerequisite: Chemistry 344 or equivalent or Chemistry 346. 1 unit.
- 441. Thermodynamics and Statistical Thermodynamics.** Fundamentals of classical thermodynamics with emphasis on equilibrium and stability criteria; an introduction to equilibrium statistical mechanics with discussion of several ensembles and applications to ideal systems of interest to chemists; and introduction to nonequilibrium thermodynamics. Prerequisite: Chemistry 342 and 344, or equivalent. 1 unit.
- 442. Statistical Mechanics.** Fundamentals of equilibrium statistical mechanics with selected applications to interacting classical fluids, dense gases, solutions, liquids, plasmas, and

ionic solutions; introduction to nonequilibrium statistical mechanics and linear response theory. Prerequisite: Chemistry 348 and 441, or equivalent, or consent of instructor. 1 unit.

- 443. Quantum Dynamics.** The quantum mechanical description of time-dependent processes, including discussions of the time-dependent Schrodinger equation, approximations, interaction of matter with radiation, wave packets, elastic and inelastic scattering, and relaxation phenomena. Prerequisite: Concurrent registration in Chemistry 348 or consent of instructor. 1 unit.
- 445. Physical Chemistry Seminar.** Required of all graduate students whose major is physical chemistry. Prerequisite: Consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 446. Molecular Electronic Structure.** The theoretical basis of the electronic structure of atoms and molecules; molecular orbital concepts and self-consistent field theory; angular momentum and the full rotation group; electron correlation effects; and applications to electronic spectroscopy of organic molecules, detailed descriptions of chemical reactions, and molecular properties. Prerequisite: Chemistry 348. 1 unit.
- 448. Chemical Kinetics.** Theoretical and experimental topics in chemical kinetics and chemical dynamics; topics include relation between rates and mechanisms of chemical reactions, collision theory of reaction rates, activated complex theory, theory of unimolecular processes, classical dynamics of reactive scattering, elastic scattering, quantum theory of inelastic scattering or equivalent curve crossing processes, and experimental methods. Prerequisite: Chemistry 344. 1 unit.
- 449. Special Topics in Physical Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as molecular spectroscopy, statistical mechanics, radiation and hot-atom chemistry, molecular quantum mechanics, radio-frequency spectroscopy, advanced experimental methods, kinetics of irreversible processes and cooperative phenomena, etc. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated.
- 490. Special Topics in Chemistry.** Designed for students majoring or minoring in chemistry who wish to undertake individual studies of a non-research nature under the direction of a faculty member of the department. Prerequisite: Consent of instructor and written approval of department head. Staff for the course is the same as for Chemistry 499. $\frac{1}{4}$ to 1 unit.
- 494. Chemical Basis of Biological Specificity.** Same as Biochemistry 494. See Biochemistry 494.
- 496. Carbon and Hydrogen Tracer Methodology.** Comprehensive study of the tracer methodology concerned with the use of carbon-13, carbon-14, hydrogen-2, and hydrogen-3 in chemical research. Prerequisite: Chemistry 337 or consent of instructor. $\frac{1}{4}$ unit.
- 499. Thesis Research.** A candidate for the master's degree who elects research is required to present a thesis. A thesis is always required of students working toward the degree of Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in a department other than chemistry or chemical engineering must receive permission from the head of the Department of Chemistry to register in this course. 0 to 4 units.

CINEMATOGRAPHY

(See Art and Design)

CIVIL ENGINEERING

Head of Department: Professor W. J. Hall

Department Office: 1114 Civil Engineering Building, 208 North Romine, Urbana

195. **Introduction to Civil Engineering.** A civil engineering orientation course including historical developments, educational requirements, relation to science, professional practice, and specialties within the profession. Prerequisite: Sophomore standing in civil engineering. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Engineering Surveying.** Introduction to surveying and photogrammetry. Prerequisite: Civil Engineering 293; credit or concurrent registration in Computer Science 101. 4 hours.
205. **Route Surveying and Design.** Principles for the design and layout of routes; coverage includes horizontal and vertical alignment, route location, earthwork, computation, ground and photogrammetric survey methods, and special survey methods for highways, rail roads, pipelines, tunnels and urban construction. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours.
210. **Behavior of Materials.** Same as Theoretical and Applied Mechanics 224. See Theoretical and Applied Mechanics 224.
214. **Properties and Behavior of Concrete.** Engineering properties of plain concrete; influence of cement, aggregates, water, and admixtures on the properties of fresh and hardened concrete; microstructure of cement paste and concrete; mix design; handling of fresh concrete; and behavior under various types of loading and environments. Laboratory practice is an important part of the course. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
216. **Construction Engineering.** Introduction to the construction processes: contracting and bonding, planning and scheduling, estimating and project control, scientific productivity models, and construction econometrics. Prerequisite: Civil Engineering 292; credit or concurrent registration in Computer Science 101 and Civil Engineering 293. 3 hours.
220. **Materials for Transportation Facilities.** Materials for the construction of transportation roadways including soils, aggregates, soil aggregates, bituminous materials, asphaltic mixtures, and stabilized soils; emphasizes properties, behavior, mixture analysis, and quality control. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours.
230. **Introduction to Transportation Engineering and Planning.** Same as Urban and Regional Planning 230. Introduction to engineering and planning principles applicable to all types of transportation systems; technological characteristics of transportation modes, economic and environmental concepts applied to transportation; and design, planning, and management of transportation facilities, operations, and maintenance. Prerequisite: Civil Engineering 292, Computer Science 101, Economics 101, or equivalent. 3 hours.
241. **Air and Water Quality.** Sources and types of air and water pollution, measurement of air and water quality; effects of pollutants on the environment; transport and ultimate fate of pollutants; environmental quality standards; and methods of pollution control and abatement. Prerequisite: Chemistry 102. 3 hours.
255. **Introduction to Hydrosystems Engineering.** Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water, presents a quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: Civil Engineering 293 or a course in probability or statistics; credit or concurrent registration in Theoretical and Applied Mechanics 235 and Civil Engineering 292, or equivalent. 3 hours.
261. **Introduction to Structural Engineering.** Basic topics in the analysis, behavior and design of trusses and framed structures under static loads, analysis topics including member forces in trusses, shear and moment diagrams, deflections, simple applications of the force method and slope deflection, and an introduction to computer applications by means of a general purpose structural analysis program. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.

- 262. Analysis of Framed Structures.** Comprehensive study of the force and displacement methods of analysis of framed structures; influence functions; curves of maxima; and use of computer structural analysis programs. Prerequisite: Civil Engineering 261. 3 hours.
- 263. Behavior and Design of Metal Structures, I.** Introduction to the design of metal structures; behavior of members and their connections; and theoretical, experimental, and practical bases for proportioning members and their connections. Prerequisite: Civil Engineering 261. 3 hours.
- 264. Reinforced Concrete Design, I.** Study of the strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces; extensive discussion of the influence of the material properties on behavior. Prerequisite: Civil Engineering 261. 3 hours.
- 280. Introduction to Soil Mechanics and Foundation Engineering.** Classification of soils, compaction in the laboratory and in the field, soil exploration, boring and sampling, one-dimensional settlement analyses, strength, bearing capacity of foundations, and stability of retaining walls and slopes. Prerequisites: Theoretical and Applied Mechanics 221. 3 hours.
- 284. Geotechnical Engineering.** Applied problems in geotechnical engineering; introduction to the analysis and design of foundations, excavation walls, slopes, and underground structures in soil and rock; bearing capacity and settlement of foundations, stability of excavations and slopes, and ground movements due to construction. Prerequisite: Civil Engineering 280. 3 hours.
- 290. Legal Aspects of Engineering Contracts and Specifications.** Same as General Engineering 290. See General Engineering 290.
- 292. Planning, Design, and Management of Civil Engineering Systems.** Introduction to the formulation and solution of civil engineering problems; engineering economics, mathematical modeling, optimization, and simulation; and techniques including classical optimization, linear programming, networks, critical path method, dynamic programming, and decision theory. Prerequisite: Mathematics 242, and credit or concurrent registration in Mathematics 225 or equivalent. 3 hours.
- 293. Stochastic Concepts in Civil Engineering.** Identification and modeling of nondeterministic problems in civil engineering, and the treatment thereof relative to engineering design and decision making; development of stochastic concepts and simulation models, and their relevance to real design and decision problems in various areas of civil engineering. Prerequisite: Integral calculus. 3 hours.
- 295. Professional Practice.** A series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. Lectures are given approximately once a week. Prerequisite: Junior standing. 0 hours.
- 307. Photogrammetric Engineering.** Studies in metric photography in civil engineering practice: examination of topographic, industrial, and engineering applications of photogrammetry; analog methods, instrumentation and systems; flight planning; introduction to analytical photogrammetry. Includes laboratory exercises on stereoscopic plotters. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours or 1 unit.
- 310. Construction Materials.** An intermediate level materials course which considers the molecular structure/mechanical property relationships for construction materials (metals, ceramic materials, and polymeric materials), as well as the response of those materials to service stresses and environments. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 314. Advanced Concrete Technology.** Advanced course on the properties of plain concrete as a composite material with emphasis on the importance of the chemical and physical properties of cement paste in determining the properties of concrete; discussions on the recent advances in the science and technology related to concrete performance. Prerequisite: Civil Engineering 214. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 315. Construction Productivity.** Introduction to the application of scientific principles to the measurement and forecasting of productivity in construction engineering; conceptual and

- mathematical formulations of the labor, equipment, and material factors affecting productivity. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 316. Construction Planning and Control.** Project definition; scheduling and control models; material, labor, and equipment allocation; optimal schedules; project organization; documentation and reporting systems; and management and control. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 318. Construction Cost Analyses and Estimates.** Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups and profits; and the fundamentals of cost recording for construction cost accounts and cost controls. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 320. Pavement Analysis and Design, I.** Analysis, behavior, performance, and structural design of pavements for highways and airfields; topics include climate factors, rehabilitation, life cycle design economics, and traffic loadings. Prerequisite: Civil Engineering 220 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Bituminous Materials and Mix Design.** Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; and recycling of mixtures. Prerequisite: Civil Engineering 220 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 322. Development of Highway Facilities.** Analysis of factors in developing a highway transportation facility; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming improvements; drainage design; structural design of surface; concepts of highway management and finance; and highway maintenance planning. Prerequisite: Civil Engineering 220 or consent of instructor. 4 hours or 1 unit.
- 325. Highway Traffic Characteristics.** Vehicle operating characteristics, driver characteristics, pedestrian characteristics, and roadway characteristics; their individual and collective relationships as traffic stream characteristics to the planning, design, and operation of highway facilities. Prerequisite: Civil Engineering 230 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 330. Urban Transportation Planning.** Same as Urban Planning 330. See Urban Planning 330.
- 331. Regional Transportation Planning.** Same as Urban Planning 331. Examination of the transportation systems for regions larger than urban areas through theoretical models linking the economic and political realities of present freight and passenger services at state, interstate, and national levels; considers competition among agencies and travel modes in light of federal regulations and technological developments. Prerequisite: Civil Engineering 240 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 334. Airport Design.** Basic principles of site selection for airports and fundamental considerations of design, construction, and maintenance of airport pavements and structures. Prerequisite: Civil Engineering 220 and senior standing in civil engineering, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 339. Environmental Systems Analysis, I.** Examination of principles of environmental engineering design: applications to mathematical methods, including single and multi-objective programming, to environmental systems; economic analysis, including benefit-cost, and management strategies. Prerequisite: Civil Engineering 292, and Civil Engineering 342 or 349. 3 hours or $\frac{1}{2}$ unit.
- 340. Physical Principles of Environmental Engineering Processes.** Analysis of the physical principles which form the basis of many water and air quality control operations: sedimentation, filtration, inertial separations, flocculation, and mixing and principles of reactor design. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 341. Air Resources Management.** Same as Environmental Studies 341. Examination of the

management of the air resources for a large urban area using dynamic operational gaming simulation techniques; focus on the law, technology, administration, and politics associated with the control of air resources. Prerequisite: Senior or graduate standing, or consent of instructor and credit in an introductory course in air pollution control. 2 hours or $\frac{1}{2}$ unit.

- 342. Water Quality Control Processes.** Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{1}{2}$ unit.
- 343. Chemical Principles of Environmental Engineering Processes.** Application of principles of chemical equilibrium, surface chemistry, chemical kinetics, and photochemistry to air and water quality considerations; carbonate and phosphate systems in natural waters; dissolved gases; hardness; hydrolysis of coagulants; corrosion; chemistry of disinfectants; removal of impurities by adsorption; and reactions of various pollutants in the atmosphere. Prerequisite: Civil Engineering 342 or consent of instructor. 3 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Solid Waste Management.** Analyzes the sources, quantities, and characteristics of solid waste; effect of refuse on the environment; establishment and operation of collection and transportation systems, material recovery systems, energy recovery systems, and ultimate disposal systems. A term project is required of all graduate students. Prerequisite: Civil Engineering 241 or consent of instructor. 3 hours or 1 unit.
- 345. Atmospheric Dispersion Modeling.** Application of the fundamentals of meteorology to air pollution problems including the transport and diffusion of particulate matter, aerosols and gases; precipitation processes and rain-out; behavior of stack effluents; effects of pollutants in the atmosphere. Prerequisite: Theoretical and Applied Mechanics 235 and Mechanical Engineering 205, or equivalent, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 346. Biological Principles of Environmental Engineering Processes.** Application of principles of organic chemistry, biochemistry, and biology to air and water quality, wastes, and their engineering management; biologically mediated changes in water and in domestic and industrial wastewater; biological contaminants of air; and solid waste disposal. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 347. Aquatic Ecology.** Same as Ecology, Ethology, and Evolution 359. Integrated study of the environmental factors affecting the composition and distribution of biota in lakes, rivers, and estuaries; emphasis on the nature of the response of aquatic ecosystems to stress and practical means of aquatic resource management. Prerequisite: Civil Engineering 346 or Ecology, Ethology, and Evolution 348, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 348. Atmospheric Chemistry.** Same as Environmental Studies 348. Examination of the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; atmospheric chemistry of carbon, nitrogen, and sulfur; atmospheric aerosol and heterogeneous reactions; material transport; stratospheric ozone and its depletion; airborne radioactivity and atmospheric ion chemistry. Prerequisite: Mechanical Engineering 207, Chemistry 340, or Atmospheric Sciences 301, or equivalent; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 349. Air Resources Engineering.** Introduction to air pollution; includes the basis for air quality criteria, classification of sources, and the design of systems to control air pollution from stationary sources. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{1}{2}$ unit.
- 350. Hydrology.** An applied course on hydrology dealing with environmental water problems; discussion of principles of hydrologic systems and their components; and presentation of methods of analysis and their applications to various purposes of water resources planning and development. Prerequisite: Civil Engineering 255 or equivalent with consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 351. Hydromechanics.** Applied incompressible fluid mechanics with particular reference to topics in analysis and research in civil engineering areas; includes continuity, momentum

and energy principles, potential flow, laminar motion, turbulence and diffusion, boundary-layer theory, and unsteady flow. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $\frac{1}{2}$ unit. Additional $\frac{1}{4}$ unit of credit available to graduate students through registration in Civil Engineering 497 for special course project.

- 352. Water Resources Design.** The planning, engineering, and economics of water resources development and project implementation. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 353. Analysis and Design of Hydraulic Systems.** Methodologies for hydraulic analysis and design of engineering systems, including closed conduits and hydraulic structures. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $\frac{1}{2}$ unit. Additional $\frac{1}{4}$ unit of credit available to graduate students through registration in Civil Engineering 497 for special course project.
- 356. Hydraulics of Surface Drainage.** Application of hydraulic and hydrologic principles; elements of channel design; hydrologic determination of design flow; flow through bridge openings and other obstacles; hydraulics of drainage areas; overland flow, run-off from highways, runways, and urbanized areas; hydraulics of storm drain systems; and culvert design. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. Groundwater.** Physical properties of aquifers, modeling of groundwater flow, groundwater hydrology and interrelation with surface water, well hydraulics, pumping tests, and safe yield of aquifers. Prerequisite: Civil Engineering 255 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 358. Air Pollution and Combustion.** Same as Mechanical Engineering 338 and Aeronautical and Astronautical Engineering 335. See Aeronautical and Astronautical Engineering 335.
- 361. Matrix Analysis of Framed Structures.** A unified formulation of displacement and force methods of analysis including the topological view of the structure as an assemblage of members; matrix techniques of formulation; considerations for automatic computation, and evaluation of truss, grid, and frame models for the response of real structures. Prerequisite: Civil Engineering 262. 3 hours, or $\frac{1}{2}$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 363. Behavior and Design of Metal Structures, II.** Metal members under combined loads, connections, welded and bolted; moment resistant connections, plate girders, conventional behavior, and tension field action. Prerequisite: Civil Engineering 263. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 364. Reinforced Concrete Design, II.** Study of the strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems, emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 365. Design of Structural Systems.** The whole structural design process including definition of functional requirements, selection of structural scheme, formulation of design criteria, preliminary and computer-aided proportioning, and analysis of response, cost, and value. Prerequisite: Civil Engineering 262, and credit in either Civil Engineering 263 or 264 with concurrent registration in the other. 3 hours or 1 unit.
- 368. Prestressed Concrete.** Study of strength, behavior, and design of prestressed reinforced concrete members and structures, with primary emphasis on pretensioned, precast construction; emphasis on the necessary coordination between design and construction techniques in prestressing. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 369. Behavior and Design of Wood Structures.** Mechanical properties of wood, stress grades and working stresses, effects of strength-reducing characteristics, moisture content, and duration of loading and causes of wood deterioration; glued laminated timber and ply-wood; behavior and design of connections, beams, and beam-columns; design of buildings and bridges, other structural applications: trusses, rigid frames, arches, and pole-type buildings, and prismatic plates and hyperbolic paraboloids. Prerequisite: Civil Engineering 261 and one of Civil Engineering 262, 263, or 264. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 370. Structural Reliability and Probabilistic Bases of Design.** Modern probabilistic bases

for the design and evaluation of structures and systems, including analysis of structural safety and reliability, and development of probability based design criteria; quantitative risk evaluation, systematic assessment and analysis of uncertainties, safety and load factor determinations, and risk analysis and design for wind storms and earthquakes. Prerequisite: Civil Engineering 261 and 293, or equivalent, or graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.

- 374. Introduction to Structural Dynamics.** Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multidegree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; and introduction to systems with distributed mass and flexibility. Prerequisite: Theoretical and Applied Mechanics 212; Mathematics 345; Civil Engineering 261, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for both Civil Engineering 374 and Theoretical and Applied Mechanics 311.
- 375. Welding and Joining Processes.** Same as Metallurgical Engineering 301. See Metallurgical Engineering 301.
- 378. Introduction to the Design of Ocean Structures.** Introduction to design and construction of civil engineering structures in the ocean and to associated engineering operations; principal topics include water wave mechanics, engineering oceanography, wave and current forces, and design considerations for fixed and floating structures. Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 261; Civil Engineering 293. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 379. Applied Structural Mechanics.** Study of beams under lateral load; beams with combined lateral load and thrust; beams on elastic foundations; applications of Fourier series and virtual work principles to beam-type structures; stress and strain in three dimensions; applications to flexure of beams and plates; elements of the engineering theory of plates; and torsion of thin-walled open sections. Prerequisite: Mathematics 345 and Civil Engineering 262. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Soil Mechanics and Soil Properties.** Index properties and engineering classification; water flow and hydraulic properties; stress in soil; stress-strain properties of soils; consolidation; shear strength; properties of natural soil deposits; unsaturated soils; and experimental measurements. Prerequisite: Civil Engineering 280 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 384. Applied Soil Mechanics.** Application of soil mechanics to foundations of buildings; stability of earth slopes; earth pressures and retaining walls; braced cuts; and damage due to construction operations. Prerequisite: Civil Engineering 383 or equivalent. 4 hours or 1 unit.
- 391. Computer Methods in Civil Engineering.** Review of programming concepts; formulation and programming of numerical, data processing, and logical problems with applications from various branches of civil engineering; organization of programs and data; and development and use of problem-oriented programming languages in civil engineering. Prerequisite: Computer Science 101 or equivalent; senior or graduate standing in civil engineering; or consent of instructor. 3 hours or 1 unit.
- 393. Engineering Decision and Risk Analysis.** Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multiobjective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk based design criteria, risk benefit trade-offs, and optimal decisions. Prerequisite: Civil Engineering 293 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 397. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. Prerequisite: Senior or graduate standing. 1 to 4 hours, or 0 to 4 units.
- 398. Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering offered by the faculty to augment the formal courses available. Prerequisite: Individually identified for each offering under this course number; see Timetable. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.

- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Industrial Engineering 416. See Industrial Engineering 416.
- 417. Systems Analysis, II: Digital Simulation.** Same as Industrial Engineering 417. See Industrial Engineering 417.
- 420. Pavement Analysis and Design, II.** Development of models for and analysis of pavement systems; use of transfer functions relating pavement response to pavement performance; evaluation and application of current pavement design practices and procedures; analysis of the effects of maintenance activities on pavement performance; and economic evaluation of highway and airport pavements. Prerequisite: Civil Engineering 320. 1 unit.
- 421. Pavement Evaluation, Maintenance, and Rehabilitation.** Concepts and procedures for condition survey rating; evaluation by nondestructive testing (roughness, skid resistance, structural capacity); and destructive testing, maintenance strategies, and rehabilitation of pavement systems for highways and airfields. Prerequisite: Civil Engineering 320. 1 unit.
- 423. Highway Materials Stabilization.** Stabilization of aggregates and soils with cement, lime, bituminous materials, and other stabilizing agents, emphasis on basic stabilization reactions, properties of stabilized materials, and composition design. Prerequisite: Civil Engineering 220 or consent of instructor. 1 unit.
- 424. Transportation Soils Engineering.** Occurrence and properties of surficial soils; soil classification systems; soil variability; subgrade evaluation procedures; repeated loading behavior of soils; soil compaction and field control; soil moisture, soil temperature, and frost action; soil trafficability and subgrade stability for transportation facility engineering. Prerequisite: Civil Engineering 383 or equivalent. 1 unit.
- 430. Urban Transportation Modeling.** Urban transportation network and travel demand models; methods and data requirements for estimating model parameters; and implications for planning practice. Prerequisite: Civil Engineering 340 and Industrial Engineering 401. 1 unit.
- 439. Environmental Systems Analysis, II.** Examination of advanced topics in environmental systems analysis with emphasis on the mathematical modeling of water quality systems and multi-objective programming methods of analysis. Large-scale optimization models and inter-relationships between water quality and water quantity analyses (e.g., reservoir operation). Prerequisite: Civil Engineering 339. 1 unit.
- 440. Processes for Water Quality Control, I.** Theory and basic design of processes used in water and wastewater treatment, including adsorption, ion exchange, chemical oxidation and reduction, disinfection, sedimentation, filtration, coagulation, flocculation, and chemical precipitation. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
- 441. Modeling of Water Quality in Natural Systems.** Studies mathematical modeling of the movement and fate of pollutants and other substances in streams, lakes, and other natural water bodies; the emphasis is on the development of practical models of aquatic systems. Prerequisite: Civil Engineering 340 or 351. 1 unit.
- 442. Processes for Water Quality Control, II.** Theory and basic design of processes used in water and wastewater treatment, including gas transfer, slurry dewatering, incineration, and residue disposal, and aerobic and anaerobic biological treatment processes. Prerequisite: Civil Engineering 340 and 343, and credit or concurrent registration in Civil Engineering 346, or consent of instructor. 1 unit.
- 443. Unit Operations in Environmental Engineering.** Experimental and pilot plant studies of unit operations and unit processes in environmental engineering, emphasizing water treatment and wastewater treatment; evaluation of parameters for the design of biological waste treatment units; determination of chemical requirements for water treatment processes, and studies of anaerobic digestion. Prerequisite: Civil Engineering 440 or credit or concurrent registration in Civil Engineering 449, or consent of instructor. 1 unit.
- 448. Control of Air Pollution from Stationary Sources.** Same as Mechanical Engineering 441. Study of the basic theory of pollution control devices and their application to air pollution control problems. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.

- 449. Techniques and Instrumentation in Air Sampling.** Same as Environmental Studies 449 and Mechanical Engineering 412. Study of principles of sampling for particles and gases in the field of air pollution; examination of instrumental techniques relevant to the design of sampling systems used in process control, ambient air monitoring and laboratory experiments; methods of sample analysis and their limitations. Prerequisite: Mathematics 345 and Civil Engineering 349; or consent of instructor. 1 unit.
- 450. Hydrologic Systems.** Application of systems concepts to simulate and analyze hydrologic cycle and its components in terms of various deterministic, probabilistic, stochastic, lumped, distributed, linear, and nonlinear mathematical models for the purpose of planning and designing water resources projects. Prerequisite: Civil Engineering 350 or consent of instructor. 1 unit.
- 452. Water Resources Systems.** The analytical design of modern water resources systems; emphasizes hydrosocioeconomic systems of single- and multiple-objective single-development water resources projects; and applies basic operations research techniques to the design of such systems in conjunction with consideration of intangible system parameters and constraints. Prerequisite: Civil Engineering 352 or equivalent and a course on operations research. 1 unit.
- 455. Transport Processes in Water.** Physical processes in transport by water, with emphasis on transport of pollutants; turbulent diffusion and longitudinal dispersion in pipes, rivers, and estuaries; stream reaeration; ocean outfalls; waste heat disposal; and dispersion in groundwater. Prerequisite: Mathematics 343 and 345, and Theoretical and Applied Mechanics 235, or consent of instructor. $\frac{3}{4}$ or 1 unit.
- 458. Hydraulics of River Engineering.** Hydraulics of flow in rivers, including varied open-channel flow, unsteady flow, sediment transport, and stable-channel design. Prerequisite: Civil Engineering 351 or equivalent. 1 unit.
- 462. Design of Tall Building Structures.** Examination of the methods of analysis and design criteria for tall buildings: dead, live, wind, and earthquake loads; reinforced concrete and steel moment-resisting frames, shear walls, braced frames; plastic design of multistory steel braced frames; P-Delta effects and instability; unreinforced and reinforced masonry buildings; very tall buildings including framed tube, tube in tube, trussed tube and hat trusses. Prerequisite: Graduate standing in structural engineering with courses equivalent to Civil Engineering 363 and 466, or consent of instructor. 1 unit.
- 463. Optimization of Structures.** Structural design processes; formulation of problems in the optimization of structures; optimization of structural elements; minimum volume principles; and use of mathematical programming in optimization of structural systems. Prerequisite: Bachelor of Science degree in engineering with courses in structural analysis and design, or consent of instructor. 1 unit.
- 465. Behavior of Structural Metal Frameworks.** Theories of ultimate behavior of metal structural members with emphasis on buckling and stability of members and frames; theory of torsion applied to beam torsion, lateral torsional buckling, curved beams with emphasis on design criteria; post-buckling strength of plates and post buckling versus column behavior. Prerequisite: Civil Engineering 363. 1 unit.
- 466. Behavior of Reinforced Concrete Members.** In-depth study of the behavior of reinforced concrete members, including the relationships between behavior and building code requirements. Prerequisite: Civil Engineering 262 and 264. 1 unit.
- 467. Behavior of Reinforced Concrete Structures.** Study of the strength and behavior of assemblages of reinforced concrete members, including a study of the applicability of traditional elastic design procedures to structures which exhibit inelastic behavior under the influence of both short and long term loadings. Prerequisite: Civil Engineering 466. 1 unit.
- 469. Thin Shell Structures.** Fundamental membrane and bending theories of shells; application of theories to analysis and design of folded plates and cylindrical, rotational, and translational shells; membrane stresses and deflections; and approximate bending solutions by variational, finite difference, and finite-element methods. Prerequisite: Civil Engineering 473 or consent of instructor. 1 unit.

- 473. Theory of Plates.** Classical plate bending theory; emphasis on methods of solution including series expansions, variational procedures, and finite element techniques applicable to plate-type structures commonly encountered in practice; consideration of inplane loads, large deflections, buckling, and anisotropy. Prerequisite: Civil Engineering 262 and Mathematics 345. 1 unit.
- 474. Dynamics of Framed Structures.** Advanced treatment of the dynamics of multidegree-of-freedom framed structural systems; fundamental concepts of eigenvalue theory of real matrices and energy principles of dynamics as bases for a unified approach to dynamical problems of structural assemblages; structural idealizations, principles of dynamics, Lagrange's equations, response calculations, normal mode method and its limitations, transfer matrix approach, and computer utilization. Prerequisite: Civil Engineering 361 and 374, or equivalent. 1 unit.
- 475. Steel Structures: Fatigue and Fracture.** Examination of fatigue and fracture behavior of steel structures and connections; discussion of relevant fatigue and fracture mechanics theory and experimental data and their application to an assessment of behavior and current design specification practice. Prerequisite: Civil Engineering 353. 1 unit.
- 478. Finite Element Methods in Solid and Structural Mechanics.** Theory and application of the finite element method; stiffness matrices for triangular, quadrilateral, and isoparametric elements; two- and three-dimensional elements; algorithms necessary for the assembly and solution; direct stress and plate bending problems for static, nonlinear buckling and dynamic load conditions; displacement, hybrid, and mixed models together with their origin in variational methods. Prerequisite: Theoretical and Applied Mechanics 451, or Civil Engineering 379, or consent of instructor. 1 unit.
- 479. Earthquake Engineering.** Study of the effects of earthquakes on constructed works and of the design of structures to resist earthquake motions; earthquake ground motions and mechanisms; response of structures to earthquake motion; behavior of materials, elements, assemblages and structures subjected to earthquake motion; principles of earthquake resistant design, and special topics. Prerequisite: Civil Engineering 374. 1 unit.
- 480. Earth Pressures and Retaining Structures.** Classical and modern earth pressure theories and their experimental justification; pressures and bases for design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. Prerequisite: Credit or concurrent registration in Civil Engineering 354. 1 unit.
- 481. Earth Dams and Related Problems.** Fundamentals of problems of slope stability, seepage in composite sections and anisotropic materials, methods of stability analysis, mechanism of failure of natural and artificial slopes; compaction; and field observations. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
- 482. Advanced Analysis of Consolidation of Clays.** Elastic solutions relevant to soil mechanics; permeability; general application of Terzaghi's theory of one-dimensional consolidation; advances in consolidation theories; mechanism of volume change; delayed and secondary compressibility and creep; theory of three-dimensional consolidation and solutions; radial flow, and design of sand drains, and analysis and control of settlement. Prerequisite: Civil Engineering 353. 1 unit.
- 483. Advanced Analysis of Shear Strength of Soils.** Physicochemical properties of soils; fabric and structure of soil; mechanism of shearing resistance; residual shear strength of overconsolidated clays and clay shales; long term shear strength of overconsolidated clays; Hvorslev shear strength parameters; and undrained shear strength of clays. Prerequisite: Civil Engineering 353. 1 unit.
- 484. Foundation Engineering.** Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments, and waterfront structures. Prerequisite: Civil Engineering 384. 1 unit.
- 486. Rock Mechanics, I.** Physical properties and classification of intact rock, theories of rock failure, state of stress in the earth's crust, stresses and deformations around underground openings assuming elastic, plastic, and time-dependent behavior, effect of geologic discontinuities on rock strength, and introduction to stability analyses in rock. Prerequisite: Civil Engineering 383, Geology 450 or equivalent, Theoretical and Applied Mechanics 371 or equivalent, or consent of instructor. 1 unit.

- 487. Rock Mechanics, II.** Application of rock mechanics to engineering problems; shear strength of rock masses; dynamic and static stability of rock slopes; deformability of rock masses; design of pressure tunnel linings and dam foundations; controlled blasting and blasting vibrations; tunnel support; machine tunneling; design and construction of large underground openings; and field instrumentation. Prerequisite: Civil Engineering 486 or consent of instructor. 1 unit.
- 488. Experimental Consolidation Research Methods.** Measurement of specific gravity of soil solids, Atterberg limits, and grain size; one-dimensional consolidation testing of natural soil samples; specimen preparation and sources of sample disturbance; loading procedures; sources of testing errors; and laboratory tests, analysis of data, and preparation of report. Prerequisite: Civil Engineering 383. ½ unit.
- 495. Civil and Environmental Engineering Seminar.** Discussion of current topics in civil and environmental engineering and related fields by staff, students, and visiting lecturers. 0 to ¼ unit. May be repeated.
- 497. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the adviser and the staff member who will supervise the investigation. Prerequisite: Consent of instructor. 0 to 4 units.
- 498. Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering at an advanced graduate level. Prerequisite: Individually identified for each offering under this course number; see Timetable. ¼ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

CLASSICAL CIVILIZATION

(See Classics)

CLASSICS

(Including Classical Civilization, Coptic, Greek, and Latin)

Chairperson of Department: Professor D. F. Bright

Department Office: 4072 Foreign Languages Building, 707 South Mathews, Urbana

Classical Civilization

The following courses presuppose no knowledge of the Greek and Latin languages and are open to all students. For other courses in the area of classical civilization, see Architecture 210; History of Art 215, 216, and 323; History 181, 182, 381, 382, 383, and 384; Philosophy 203 and 310; Political Science 393; and Religious Studies 201, 202, 210, and 340.

- 100. Vocabulary Building from Greek and Latin Roots.** Vocabulary building assistance for students through an analysis of Greek and Latin roots, prefixes, and suffixes found in English. 2 hours.
- 101. PLATO Laboratory in English Vocabulary Building.** Intensive drill and practice in English words derived from key Latin and Greek roots. Prerequisite: Concurrent registration in Classical Civilization 100. 1 hour.
- 110. Introduction to Greek Culture.** Study of social and cultural life in Greece during the classical period. 2 hours. Credit is not given for both Classical Civilization 110 and 114.
- 111. Mythology of Greece and Rome.** A study of the major myths of Greece and Rome and their impact upon later art, music, and literature. 2 hours. Credit is not given for both Classical Civilization 111 and 115.

- 112. The Roman Achievement.** Introduction to Roman civilization through the study of the social and cultural life of ancient Rome. 2 hours. Credit is not given for both Classical Civilization 112 and 116.
- 114. Introduction to Greek Culture.** Studies the social and cultural life in Greece during the classical period. Shares two hours of lecture with Classical Civilization 110; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 110 and 114.
- 115. Mythology of Greece and Rome.** Studies the major myths of Greece and Rome and their impact upon later art, music, and literature. Shares two hours of lecture with Classical Civilization 111; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 111 and 115.
- 116. The Roman Achievement.** Introduces Roman civilization through the study of the social and cultural life of ancient Rome. Shares two hours of lecture with Classical Civilization 112; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 112 and 116.
- 120. Origins of Western Literature.** Same as Comparative Literature 120. The origins and development of selected major genres in Western literature, emphasizing the relationship between classical representatives and their modern successors. 3 hours.
- 131. Introduction to Classical Archaeology: Greece.** Introduction to the archaeology of ancient Greece and the Aegean world. 3 hours.
- 132. Introduction to Classical Archaeology: Rome and Italy.** Introduction to the archaeology of Italy and Rome to the fall of the Roman Empire. 3 hours.
- 140. Women in Classical Literature.** Same as Comparative Literature 140. Examines how women are portrayed in the literature of classical antiquity; analyzes women's roles in ancient society and attitudes of ancient writers toward women. 3 hours.
- 150. Sports in Greece and Rome.** Same as Physical Education 141. Athletics and sports in ancient Greece and Rome from 776 B.C. to 393 A.D. 2 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Crith Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 217. Greek Art.** Same as History of Art 215. See History of Art 215.
- 218. Roman Art.** Same as History of Art 216. See History of Art 216.
- 221. The Heroic Tradition.** Same as Comparative Literature 263. Study of ancient epics and their relation to the social consciousness of their period; introductory and background lectures; and readings in the epic tradition of antiquity and its successors. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 222. The Tragic Spirit.** Same as Comparative Literature 264. Readings in the tragic drama of Greece and Rome; a systematic study of the contents and development of this classical literary-dramatic genre. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 231. The Development of the Ancient City.** Same as History of Art 217. Monuments and archaeological remains illustrating the development of the Greek and Roman city plans. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 232. Ancient Greek Sanctuaries.** Same as History of Art 218 and Religious Studies 249. A survey of the archaeological remains of ancient Greek sanctuaries and their importance to ancient society and religion. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 237. Ancient Greek Religion.** Same as Religious Studies 247. Religious developments in Greece from the prehistoric period to late antiquity. 3 hours.
- 250. Byzantine Civilization.** Surveys Byzantine civilization, literature, and art from A.D. 330 to 1453. Prerequisite: Classical Civilization 110, 111, 119, 114, or 112, or consent of instructor. 3 hours.
- 292. Senior Thesis.** Thesis and honors, for candidates for departmental distinction in classical civilization and for other seniors. Prerequisite: Senior standing and consent of chairperson of classics honors program. 2 to 4 hours. Counts for advanced hours in LAS.

- 298. Senior Survey.** For candidates for departmental distinction in the classics field of concentration. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 315. Greek, Roman, and Medieval Rhetorical Theory.** Same as Speech Communication 315. See Speech Communication 315.
- 332. The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Comparative Literature 306. Study of the aesthetic standards and theories of the Graeco-Roman world and the ways in which these ideals are expressed in the literature, art, and architecture of antiquity. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 343. The Archaeology of Greece.** Same as History of Art 315. Monuments, material remains, and sculpture and other arts illustrating the development of Greek civilization to 323 B. C. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 344. The Archaeology of Italy.** Same as History of Art 316. Monuments, material remains, and sculpture and other arts illustrating the development of Graeco-Roman and other ancient Italian civilizations to 330 A.D. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as English as a Second Language, French, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 390. Topics in Classical Literature.** Same as Comparative Literature 307. Study of selected topics in Greek and Latin literature in translation; content is variable. Prerequisite: Classical Civilization 201 or 202, or consent of instructor. 3 hours, or $\frac{1}{4}$ or 1 unit. May be repeated.
- 391. Topics in Classical Archaeology and Civilization: Seminar and Tutorial.** Study of selected topics; variable content. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
- 435. Archaeological Field Work.** Participation in archaeological excavation; discussion of methods and procedures and practice in actual working conditions. Prerequisite: Consent of instructor. 1 unit.

Coptic

- 301. Introductory Coptic, I.** Same as Linguistics 314 and Religious Studies 301. Introduction to the principles of Coptic grammar and to the reading of biblical and gnostic texts. A knowledge of classical or koine Greek, though useful, is not required. 3 hours or $\frac{1}{4}$ unit.
- 302. Introductory Coptic, II.** Same as Linguistics 315 and Religious Studies 302. Continuation of Coptic/Religious Studies 301 and Linguistics 314; reading of gnostic and postbiblical texts. Prerequisite: Coptic 301 or Linguistics 314. 3 hours or $\frac{1}{4}$ unit.

Greek

- 101. Elementary Greek.** Introduction to the fundamentals of classical Greek, including the reading of simple prose. 4 hours.
- 102. Elementary Greek.** Continuation of Greek 101. Grammar and reading. Prerequisite: Greek 101 or equivalent. 4 hours.
- 111. Elementary Koine Greek.** Same as Religious Studies 111. Introduction to the fundamentals of Koine Greek, including reading from the New Testament. 4 hours.
- 112. Elementary Koine Greek.** Same as Religious Studies 112. Continuation of Greek 111. Grammar and reading. Prerequisite: Greek 111 or equivalent. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Intermediate Koine Greek.** Same as Religious Studies 200. Reading of narrative and epistolary New Testament Greek. Prerequisite: Greek 112 or equivalent. 4 hours.

- 201. Second-Year Greek.** Reading of Attic prose. Prerequisite: Greek 102 or equivalent. 4 hours.
- 202. Second-Year Greek.** Continuation of Greek 201. Introduction to epic Greek; reading of Homer. Prerequisite: Greek 201 or equivalent. 4 hours.
- 292. Senior Thesis.** Open to candidates for distinction in Greek. Prerequisite: Senior standing 2 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Survey.** Thesis and honors. For candidates for honors in Greek and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 301. Third-Year Greek.** Readings in Attic prose. Prerequisite: Greek 202. 3 hours or ½ unit.
- 310. Introduction to Indo-European Linguistics.** Same as Latin 310 and Linguistics 309. See Linguistics 309.
- 311. Greek Prose Composition.** Practice in the writing of Greek prose. Prerequisite: Greek 201 or equivalent. 3 hours or ½ unit.
- 371. The Gospels.** Same as Religious Studies 371. Reading and analysis of the Greek Gospels following literary critical, form-critical, and redaction-critical approaches. Prerequisite: Greek 200 or consent of instructor. 3 hours, or ¾ or 1 unit.
- 391. Readings in Greek Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Greek. Prerequisite: Greek 301 or equivalent. 3 hours, or ¾ or 1 unit. May be repeated.
- 411. Advanced Composition.** Practice in writing continuous Greek prose, with special attention to stylistic problems. Prerequisite: Greek 311 or equivalent. ¾ unit.
- 419. Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric, dramatic, or Hellenistic poetry. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
- 420. Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or Hellenistic prose. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
- 431. Special Disciplines.** Same as Latin 431. Variable content course concentrating on an area such as comparative grammar, epigraphy, metrics, palaeography, or papyrology. Prerequisite: Greek 391 and Latin 391, or equivalent. 1 unit. May be repeated as topic varies.
- 480. Greek Seminar.** Research on special problems of Greek literature; required of all majors in classical philology. Prerequisite: A Greek proseminar. 1 unit.
- 493. Independent Reading.** Prerequisite: Consent of the student's advisor and of the instructor. ¾ to 2 units. May be repeated but no more than 1 unit of credit may be applied toward the minimum requirement for the M.A. degree, and no more than 2 units of credit may be applied toward the minimum requirement for the Ph.D. degree.
- 495. Introduction to Classical Studies.** Same as Latin 495. An introductory survey for graduate students in classics, prepares students for work at the graduate level and surveys basic bibliography and methodology. Prerequisite: Graduate standing in classics. 1 unit.
- 499. Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

Latin

- 101. Elementary Latin.** Grammar and reading for students who have had no work in Latin. 4 hours.
- 102. Elementary Latin.** Grammar and reading of easy prose. Prerequisite: Latin 101 or one year of high school Latin. 4 hours.
- 103. Intermediate Latin.** Review of grammar; reading of easy narrative prose. Prerequisite: Latin 102 or two years of high school Latin. 4 hours.
- 104. Introduction to Latin Literature.** Continuation of Latin 103, with readings chiefly in Latin poetic literature. 4 hours.

- 105. Intensive Elementary Latin.** Equivalent to Latin 101 and 102. Introduction to basic grammar and syntax for students who have had no previous Latin and want to learn at a rapid rate; use of computer assisted individual mastery lessons. 8 hours.
- 106. Intensive Intermediate Latin.** Equivalent to Latin 103 and 104. Review of grammar and syntax and reading of easy prose and poetry for students who have attained 102 proficiency and wish to advance more rapidly; use of computer assisted program materials. Prerequisite: Latin 102 or 105, or a placement score showing high school achievement equivalent to Latin 102. 8 hours.
- 113. Latin Composition.** Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Credit or concurrent registration in Latin 103 or three years of high school Latin. 2 hours.
- 114. Latin Composition.** Continuation of Latin 113. Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Latin 113. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Survey of Latin Literature.** The republican period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
- 202. Survey of Latin Literature.** The imperial period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
- 270. Parateaching.** Same as French, German, Russian, and Spanish 270. See French 270.
- 279. Introduction to Foreign Language Education.** Same as French, German, Humanities, Russian, and Spanish 279. See Humanities 279.
- 280. Teachers' Course.** Introduction to the problems of the teaching of Latin and a study of textbooks. Required of teacher training majors in Latin. This course will not meet during the six-week student teaching period. Prerequisite: Latin 202; senior standing. 4 hours.
- 292. Senior Thesis.** Thesis and honors. For candidates for honors in Latin and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Survey.** Thesis and honors. For candidates for honors in Latin and for other seniors. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 310. Introduction to Indo-European Linguistics.** Same as Greek 310 and Linguistics 309. See Linguistics 309.
- 311. Intermediate Prose Composition.** Practice in the writing of Latin prose. Prerequisite: Latin 114 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 391. Readings in Latin Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Latin. Prerequisite: Three years of college Latin or equivalent; consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit.
- 400. Beginning Latin for Graduate Students.** Basic grammar, syntax, and vocabulary; reading practice. Designed for graduate students who need to use Latin in their research. 4 hours. No graduate credit.
- 401. Readings in Latin for Graduate Students.** Directed readings, largely in medieval and modern Latin. Designed for graduate students who need to use Latin in their research. Prerequisite: Latin 400 or two years of high school Latin, or equivalent. 4 hours. No graduate credit.
- 411. Advanced Composition.** Practice in writing Latin prose, with special attention to stylistic questions. Prerequisite: Latin 311 or equivalent. $\frac{1}{2}$ unit.
- 419. Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric and elegiac, dramatic, or satirical poetry. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
- 420. Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or epistolography. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.

- 431. Special Disciplines.** Same as Greek 431. See Greek 431.
- 480. Latin Seminar.** Research on special problems of Latin literature; required of all concentrators in classical philology. Prerequisite: A Latin proseminar. 4 unit.
- 493. Independent Reading.** Prerequisite: Consent of the student's adviser and of the instructor. $\frac{1}{4}$ to 2 units. May be repeated but no more than 1 unit of credit may be applied toward the minimum requirement for the M.A. degree, and no more than 2 units of credit may be applied toward the minimum requirement for the Ph.D. degree.
- 495. Introduction to Classical Studies.** Same as Greek 495. See Greek 495.
- 499. Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

COMMUNICATIONS

Chairperson of Committee on Graduate Study: Professor H. S. Maclay

Office: 222b Armory, 505 East Armory, Champaign

- 101. The Social and Cultural Foundations of the Mass Media.** Analysis of the evolution and structure of the mass media in the United States with special emphasis on the effects of the mass media on public life. Prerequisite: Freshman or Sophomore standing. 3 hours. Does not count toward major requirements in the College of Communications.
- 217. History of Communications.** Same as Journalism 217. See Journalism 217.
- 218. Communications and Public Opinion.** Same as Journalism 218. See Journalism 218.
- 220. Communications and Popular Culture.** Same as Journalism 220. Examines the critical literature on mass media entertainment, reviews significant contemporary issues and develops perspectives for understanding popular culture. Prerequisite: Registration in the College of Communications or consent of the College. 3 hours.
- 231. Mass Communications in a Democratic Society.** Same as Journalism 231. See Journalism 231.
- 241. Law and Communications.** Same as Journalism 241. See Journalism 241.
- 251. Social Aspects of Mass Communications.** Same as Journalism 251 and Sociology 251. See Journalism 251.
- 261. American Broadcasting and Telecommunications.** Examines the history and principal issues of American broadcasting and the electronic media, the context of prior forms of mass communication and ideas about purposes and terms of control, the important social, economic, political, and cultural questions bearing on AM and FM radio, commercial television, public broadcasting, cable and new forms of electronic communication, issues in programming and service content, and basic legal and regulatory matters. 3 hours.
- 264. Economic Structure of Communication.** Describes and analyzes the economic structures, policies, and current problems of fields such as telecommunications, publishing, broadcasting and cable, film, recorded music, and postal service; examines how copyrights, patents, antitrust laws, and government regulation bear on the communications industry. Prerequisite: Consent of College. 3 hours.
- 291. Special Problems.** Special projects, research, and independent reading in communications for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of the College. 1 to 3 hours.
- 307. The Art of the Screen: Narration.** Same as Speech Communication 307. See Speech Communication 307.
- 308. The Art of the Screen: Exposition and Persuasion.** Same as Speech Communication 308. See Speech Communication 308.
- 310. Media Ethics.** Surveys the major ethical problems in news, advertising, and entertainment media, includes case studies and moral reasoning on confidentiality, privacy, conflict of interests, deception, violence, and pornography. 3 hours or 1 unit.
- 319. Russian and East European Cinema.** Same as Slavic and Speech Communication 319. See Slavic 319.

- 322. Politics and the Media.** Same as Political Science 322. Examines the interaction between the media and politics in the United States and elsewhere, with special emphasis on the constitutional protection of the media, politics of media control, impact of the media on such political processes as elections and policymaking, international news agencies and communications satellites, and quest for a new international information order. Prerequisite: Political Science 150 or 6 hours of social science; or consent of instructor. 3 hours, or ½ to 1 unit.
- 323. Language Acquisition.** Same as Linguistics 323 and Psychology 323. See Psychology 323.
- 325. Introduction to Psycholinguistics.** Same as Linguistics 325. See Linguistics 325.
- 335. Interpersonal Communication Processes.** Same as Speech Communication 335. See Speech Communication 335.
- 352. Attitude Theory and Change.** Same as Psychology 352 and Sociology 352. See Psychology 352.
- 361. Telecommunications Programming.** History and interpretation of American radio and television programs: types, formats, and contents in relationship to trends in American social and cultural history, themes, and myths; and relevant aspects of telecommunications technology, economics, and cultural production. 3 hours or 1 unit.
- 362. Telecommunications Management.** Examines problems and issues in telecommunications management; the role of management in operation of broadcasting, cable, and telecommunications industries; forces shaping products and services in commercial and non-profit media, i.e., technology, markets, revenues, programming, and regulation; planning, accountability, and social responsibility. 3 hours or 1 unit.
- 366. Film as Business.** Studies the filmed entertainment industry; the economic structures and policies of the production, distribution, and exhibition sectors; the nature of ownership patterns, investment, competition, and trade practices; filmed entertainment as a commodity in an international market system. Prerequisite: Consent of college or consent of instructor. 3 hours or 1 unit.
- 368. Legal and Policy Issues in Telecommunications.** Same as Radio and Television 368. Studies the histories, assumptions, and consequences of major legislative, regulatory, and judicial decisions in American broadcasting and telecommunications; social, cultural and economic background of federal communications law and regulation; administrative agency (FCC) practice and constraints; various regulatory and policy issues including fiduciary licensing, fairness doctrine, cable, public broadcasting, telematics, deregulation, and statutory revision process. 3 hours or 1 unit.
- 370. Language, Culture, and Society.** Same as Anthropology 370 and Linguistics 370. See Anthropology 370.
- 377. International Communications.** Same as Political Science 377. See Political Science 377.
- 414. Seminar on Social Interaction.** Same as Sociology 414. See Sociology 414.
- 417. Contemporary Viewpoints in Speech Communication Theory.** Same as Speech Communication 417. See Speech Communication 417.
- 420. Seminar in Semantics.** Same as Philosophy 420. See Philosophy 420.
- 424. Developmental Psycholinguistics.** Same as Linguistics 424 and Psychology 424. See Psychology 424.
- 425. Psycholinguistics.** Same as Linguistics 425 and Psychology 425. See Psychology 425.
- 432. History of Libraries.** Same as Library and Information Science 432. See Library and Information Science 432.
- 437. The Analysis of Interpersonal Interaction.** Same as Speech Communication 437. See Speech Communication 437.
- 444. Seminar in Public Opinion.** Same as Sociology 444. See Sociology 444.
- 456. Attitude Measurement and Behavioral Prediction.** Same as Psychology 456. See Psychology 456.
- 462. Seminar in Radio and Television.** Same as Radio and Television 462. See Radio and Television 462.
- 463. World Broadcasting.** Same as Radio and Television 463. See Radio and Television 463.
- 468. The Political Economy of Communications.** Same as Journalism 468. See Journalism 468.

- 470. **Communications and Popular Culture.** Same as Journalism 470. See Journalism 470.
- 471. **Proseminar in Communications, I.** Same as Journalism 471. See Journalism 471.
- 472. **Proseminar in Communications, II.** Same as Journalism 472. See Journalism 472.
- 473. **History and Theory of Freedom of the Press.** Same as Journalism 473. See Journalism 473.
- 474. **Communications Systems.** Same as Journalism 474. See Journalism 474.
- 481. **Economic and Social Aspects of Advertising.** Same as Advertising 481. See Advertising 481.
- 482. **Research Methods in Advertising and Communications.** Same as Advertising 482. See Advertising 482.
- 485. **Advertising Planning and Decision Making.** Same as Advertising 485. See Advertising 485.
- 486. **Analytical Methods in Advertising and Communications.** Same as Advertising 486. See Advertising 486.
- 490. **Special Topics in Communications.** Prerequisite: Consent of chairperson of committee on graduate study in communications. $\frac{1}{4}$ to 2 units.
- 492. **Research Methods in Communications.** Same as Journalism 492. Introduction to the methods of empirical research in the behavioral sciences applicable to research problems in human communication, with emphasis on studies of mass communication. Lectures, readings, and laboratory practice. Prerequisite: Consent of College of Communications. 1 unit.
- 493. **Qualitative Research Methods in Communications.** Introduces qualitative concepts and strategies in the social sciences and humanities which apply to research problems in mass communications. Prerequisite: Consent of College of Communications. 1 unit.
- 499. **Thesis Research.** Prerequisite: Consent of chairperson of committee on graduate study in communications, and of thesis supervisor. 0 to 4 units. Students may reregister for a total of 8 units.

COMPARATIVE LITERATURE

Director of Program: A. Owen Aldridge

Office: 2070 Foreign Languages Building, 707 South Mathews, Urbana

- 119. **The Literature of Fantasy.** Same as English 119. See English 119.
- 120. **Origins of Western Literature.** Same as Classical Civilization 120. See Classical Civilization 120.
- 130. **Italian Medieval Literature and Civilization.** Same as Italian 130. See Italian 130.
- 140. **Women in Classical Literature.** Same as Classical Civilization 140. See Classical Civilization 140.
- 141. **World Masterpieces in Western Culture, I.** Comparative study of selected works reflecting main currents of western literature and thought, such as biblical stories, Homer, Greek drama, Vergil, medieval romance and love lyrics, Dante, Boccaccio, Chaucer, Petrarch, Rabelais, Cervantes, and Shakespeare. 3 hours.
- 142. **World Masterpieces in Western Culture, II.** Comparative study of selected works reflecting main currents of western literature and thought, such as Molière, Voltaire, Swift, Goethe, romantic lyrics, Melville, Flaubert, Dostoevsky, Ibsen, Joyce, Kafka, and Camus. 3 hours.
- 175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175. Chinese 175, and Japanese 175. See Asian Studies 175.
- 190. **Masterpieces of Non-Western Cultures.** Analyzes representative works from the Middle East and Asia, includes readings and discussions, supplemented by documentary films, portrays religious, philosophic, and literary achievements of the Islamic, Hindu, Buddhist, and Confucian traditions, emphasizes comparative perspectives both within Non-Western

tradition and in juxtaposition to Western thinking. All readings are in English; knowledge of foreign languages not required. 3 hours.

191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Comparative Literary Studies, I.** An introduction to various methods in comparative literary study, including genres, thematic, literary relations, literary movements, and interdisciplinary approaches. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
202. **Comparative Literary Studies, II.** An analysis of several important world-views in western civilization (such as classical, Romantic, modern, and so forth), studied comparatively and in relation to selected figures in western literature. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
203. **Introduction to Persian Culture and Literature, I.** Same as Persian 205. See Persian 205.
204. **Introduction to Persian Culture and Literature, II.** Same as Persian 206. See Persian 206.
205. **Modern Literary Criticism.** Same as English 277. See English 277.
206. **Greek Literature in Translation.** Same as Classical Civilization 202. See Classical Civilization 202.
207. **Latin Literature in Translation.** Same as Classical Civilization 202. See Classical Civilization 202.
210. **Introduction to Modern African Literature.** Same as African Studies 210 and English 211. See African Studies 210.
211. **Japanese Literature in Translation, I.** Same as Asian Studies and Japanese 205. See Japanese 205.
212. **Japanese Literature in Translation, II.** Same as Asian Studies and Japanese 206. See Japanese 206.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Scandinavian 215. See Scandinavian 215.
217. **Women in Russian Literature.** Same as Russian 217. See Russian 217.
218. **Japanese Hero Types.** Same as Asian Studies and Japanese 218. See Japanese 218.
219. **Women in Japanese Literature.** Same as Asian Studies and Japanese 219. See Japanese 219.
224. **German Literature in Translation.** Same as German 200. See German 200.
228. **Special Topics in German Literature.** Same as German 296. See German 296.
238. **Hiroshima/Nagasaki and the Literature of Survival.** Same as Asian Studies and Japanese 238. See Japanese 238.
244. **Spanish American Culture Through Its Literature.** Same as Spanish 250. See Spanish 250.
248. **Dostoevsky and Tolstoy.** Same as Russian 222. See Russian 222.
249. **Soviet Russian Literature.** Same as Russian 225. See Russian 225.
252. **Icelandic Sagas in Translation.** Same as Scandinavian 252. See Scandinavian 252.
253. **Medieval Literature and Culture.** Same as English 202. See English 202.
255. **Renaissance Literature and Culture.** Same as English 204. See English 204.
257. **Literature and Culture of the Enlightenment.** Same as English 206. See English 206.
259. **Nineteenth-Century Literature and Culture.** Same as English 207. See English 207.
260. **Science and Technology in Contemporary Literature.** Same as Science, Technology, and Society 260. See Science, Technology, and Society 260.
263. **The Heroic Tradition.** Same as Classical Civilization 221. See Classical Civilization 221.
264. **The Tragic Spirit.** Same as Classical Civilization 222. See Classical Civilization 222.
265. **Development of the Modern Drama.** Same as English 243. See English 243.
266. **Development of the Modern Drama.** Same as English 244. See English 244.
267. **The Short Story.** Same as English 245. See English 245.

- 268. The Short Story.** Same as English 246. See English 246.
- 269. Modern British and American Fiction in Relation to Continental Fiction.** Same as English 248. See English 248.
- 283. Jewish Sacred Literature.** Same as English and Religious Studies 283. See Religious Studies 283.
- 284. Jewish Experience in Literature.** Same as English and Religious Studies 284. See English 284.
- 288. French and Comparative Cinema, I.** Same as French 288. See French 288.
- 289. French and Comparative Cinema, II.** Same as French 289. See French 289.
- 293. Senior Thesis and Honors.** Independent research guided by tutors, leading to the writing of a comparative thesis. Intended primarily for candidates for honors in comparative literature, but open to other seniors. 3 to 6 hours. May be repeated to a maximum of 12 hours. (Counts for advanced hours in LAS.)
- 295. Special Topics: Colloquium on Interdisciplinary Subjects.** Presentation and discussion of subjects relating literature to other disciplines; topics vary. 3 hours. May be repeated to a maximum of 6 hours.
- 304. Literary Criticism from Plato to 1800.** Same as English 382. See English 382.
- 305. Literary Criticism from 1800 to the Present.** Same as English 383. See English 383.
- 306. The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Classical Civilization 332. See Classical Civilization 332.
- 307. Topics in Classical Literature.** Same as Classical Civilization 390. See Classical Civilization 390.
- 310. Modern African Fiction.** Same as African Studies and French 310 and English 370. See African Studies 310.
- 311. The Chinese Novel.** Same as Asian Studies and Chinese 311. See Chinese 311.
- 312. Modern Chinese Literature in Translation.** Same as Asian Studies and Chinese 312. See Chinese 312.
- 313. The Divine Comedy.** Same as Italian 313. See Italian 313.
- 315. Modern Japanese Fiction in Translation.** Same as Asian Studies and Japanese 315. See Japanese 315.
- 323. Modern German Poetry.** Same as German 330. See German 330.
- 326. Ibsen in Translation.** Same as Scandinavian 361. See Scandinavian 361.
- 327. Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Scandinavian 362. See Scandinavian 362.
- 334. Studies in Francophonie.** Same as French 379. See French 379.
- 335. Polish Literature in Translation, I.** Same as Polish 345. See Polish 345.
- 336. Polish Literature in Translation, II.** Same as Polish 346. See Polish 346.
- 337. Nineteenth-Century Literature in Translation.** Same as Russian 315. See Russian 315.
- 338. Twentieth-Century Literature in Translation.** Same as Russian 317. See Russian 317.
- 340. Studies in Russian Literature and Society.** Same as Russian 360. See Russian 360.
- 351. International Literary Movements.** Study of the development and imitation of literary movements and stylistic trends; emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 353. Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Italian 309. See Italian 309.
- 354. Masterpieces of Italian Renaissance Literature.** Same as Italian 333. See Italian 333.
- 357. Russian Modernism.** Same as Russian 324. See Russian 324.
- 359. The International Folk Tale.** Same as English 367. See English 367.
- 361. International Literary Genres and Forms.** Structure and development of literary genres and forms in historical perspective (for instance, drama, parody and the grotesque, poetry, fables and fabulists, and modern fiction); essential international components and significant national variations of such genres and forms. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 365. Comedy.** Same as English 365. See English 365.

- 368. Russian Drama.** Same as Russian 335. See Russian 335.
- 370. Nabokov and the Emigre Literature.** Same as Russian 370. See Russian 370.
- 371. International Literary Relations.** Study of specific relations between authors of different countries; influences of certain works, concepts, or tastes on another work, author, or country; and literary interaction between Eastern and Western cultures. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 387. Introduction to Myth and Folklore.** Same as English, German, Slavic and Speech Communication 387. See English 387.
- 391. Literature and the Other Arts.** Study of the relationship between literature and other art forms; focuses on analogies of expression in different media, on specific influences among media, and on great artists who mastered several media. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 396. Special Topics in Comparative Literature.** Selected literary topics of international significance in relation to other cultural expressions. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 401. Theory of Literature.** Methods and objectives of the discipline of comparative literature. Prerequisite: Reading knowledge of two foreign languages; consent of instructor. 1 unit.
- 404. Seminar in Renaissance and Baroque Literature.** Same as Spanish 418. See Spanish 418.
- 405. See in Stylistics.** Same as Linguistics 405. See Linguistics 405.
- 415. Dostoevsky.** Same as Russian 415. See Russian 415.
- 419. Tolstoy.** Same as Russian 419. See Russian 419.
- 420. Chekhov.** Same as Russian 420. See Russian 420.
- 425. Studies in Contemporary Critical Problems.** Same as French 425. See French 425.
- 441. Naturalism, Symbolism, and Expressionism.** Same as German 451. See German 451.
- 451. Seminar in Literary Movements and Periods.** Investigation of the development and mutation of literary movements (classicism, romanticism, symbolism, etc.) through a study of critical texts and their reception in various countries. The subject of the seminar varies each semester. 1 unit. May be repeated to a total of 3 units.
- 452. Seminar in Romantic Literature.** Same as English 433. See English 433.
- 461. Seminar in Literary Genres and Forms.** Study of a form (the lyric, the novel, the drama, etc.) to discover its essential components in all the literatures studied and the significance of national variations. 1 unit. May be repeated to a maximum of 3 units as topic varies.
- 462. Seminar in Spanish-American Novel.** Same as Spanish 436. See Spanish 436.
- 471. Seminar in Literary Relations.** Investigation of the impact of one literature upon another, or of some specific works upon others (the role of English literature in continental Europe, the influence of Russian novelists on French and German writers, etc.). The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
- 472. Studies in French and Comparative Cinema.** Same as French 452. See French 452.
- 478. Seminar in Twentieth-Century French Literature.** Same as French 478. See French 478.
- 481. Seminar in Literary Themes and Types.** Study of a theme or type (the Faust myth, the romantic hero, etc.) to discover its essential components in all the literatures studied and the significance of national variations. The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
- 482. Seminar in Modern German Literature.** Same as German 461. See German 461.
- 484. Narrative Semiotics.** Same as French 484. See French 484.
- 485. Narrative Semiotics, II.** Same as French 485. See French 485.
- 490. Seminar in Contemporary Criticism, Methods and Theory.** Same as French 490. See French 490.
- 493. Special Studies.** $\frac{3}{4}$ to 1 unit.
- 499. Thesis Research.** Intended for students engaged in writing a thesis as a partial require-

ment for the M.A. or Ph.D. degree in comparative literature. Maximum credit for master's candidates is 2 units. 0 to 4 units.

COMPUTER SCIENCE

Head of Department: Professor C. W. Gear

Department Office: 114 Digital Computer Laboratory, 1304 West Springfield, Urbana

NOTE: Credit is not allowed for more than one of Computer Science 101, 102, 103, 105, and 121. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences.

- 101. Introduction to Computers for Application to Engineering and Physical Science.** A beginning course in problem solving by digital computers which covers problem formulation, algorithm development, and coding in a high-level language; use of the computer in solving a series of problems. Prerequisite: Mathematics 120 or consent of instructor. 3 hours.
- 102. Introduction to Computers and Their Application to Architecture.** Introduction to computer programming for students of architecture; higher-level programming languages and application programs of special use in architecture. 3 hours.
- 103. Introduction to Computers and Their Application to Social and Behavioral Science.** Introduction to computer programming for students with an interest in behavioral and social science computation; instruction in programming languages with an emphasis on applications from statistical and data manipulative procedures. Prerequisite: Sophomore standing; one year of college mathematics or statistics. 3 hours.
- 105. Introduction to Computers and Their Application to Business and Commerce.** Introduction to computer fundamentals, higher language programming, and the use of the computer for the solution of business problems. 3 hours.
- 106. Introduction to Computers for the Nontechnical Major.** A concise treatment of the computer's important and still growing role in virtually every significant aspect of society, including commerce, quantitative and qualitative planning, science, the criminal justice system, education, and medicine. The student is first taught to program computers interactively using an elementary programming language. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences. 3 hours.
- 121. Introduction to Computer Science.** The first course for computer science majors and other students with a deep interest in the subject; introduces students to a high-level block-structured programming language and presents the fundamental techniques of using such a language for the solution of non-numerical problems. Students write several programs during the course. Prerequisite: Three years of high school mathematics or Mathematics 111. 4 hours. Credit is not given for both Computer Science 121 and 122.
- 122. Introduction to Computer Science.** For students with previous programming experience as an alternative to Computer Science 121, presents the fundamental techniques of using a block-structured programming language for the solution of non-numerical problems. Students write several programs. Prerequisite: Computer Science 101, 102, 103, or 105, or equivalent programming experience. 2 hours. Credit is not given for both Computer Science 121 and 122.
- 196. Honors Course in Computer Science.** This course is offered for honors credit in

conjunction with other 100-level computer science courses, in which concurrent registration is required. Enrollment is strictly limited to beginning students with superior talents in computer science. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 100-level computer science course (see Timetable); consent of instructor. 1 hour.

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 221. Machine-Level Programming.** A basic course in machine-level programming. Organization of memory, central processor, and input/output devices; instruction and data types and their representation; structure and modularity of programs and data at the machine level; and introduction to system software. Prerequisite: Computer Science 121 or other 100-level computer science course, or consent of instructor. Computer Science 122 is recommended (but not required) in conjunction with Computer Science 101, 102, 103, or 105 when they are used as a prerequisite. 3 hours.
- 225. Data Structures.** A continuation of Computer Science 121; basic data types, including bits, integers, characters, and reals; data structures, including arrays, strings, lists, stacks, queues, and trees; storage management, including allocation and pointers; and searching and sorting techniques. Prerequisite: Computer Science 121 or 122. 3 hours.
- 257. Numerical Methods.** Same as Mathematics 257. An introduction to numerical methods for students in science and engineering; topics include floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations; discusses various applications in science and engineering; includes some programming as well as the use of high quality mathematical library routines. Prerequisite: A basic computer science 100-level programming course; Mathematics 225 or 315; Mathematics 242 or equivalent. 3 hours.
- 264. Introduction to the Structure and Logic of Digital Computers.** Introduction to the internal structure of digital computers; design of gates, flipflops, registers, and memories to perform operations on numerical and other data represented in binary form; and presentation in terms of logic devices (black boxes), not electrical circuits. Prerequisite: Computer Science 121 or equivalent is required; credit or concurrent registration in Computer Science 221 is recommended. 3 hours. Students may not receive credit for both Computer Science 264 and either Electrical Engineering 290 or Computer Science 360.
- 265. Logic Design Laboratory with Integrated Circuits.** A digital design laboratory employing the department's EXCEL integrated circuit modular logic kits; emphasizes designing with logic blocks (not the design of their internal circuits), the theory of which is treated in Computer Science 264. Experiments with combinational and sequential networks and simple digital systems culminate in a term project. Prerequisite: Credit or concurrent registration in Computer Science 264 or credit in Electrical Engineering 290, or consent of instructor. 2 hours. Students may not receive credit for both Computer Science 265 and Electrical Engineering 249.
- 273. Introduction to Theory of Computation.** Introduction to the various aspects of the theory of computation, including the necessary background in graph theory, combinatorics, and probability theory; also includes algorithmic procedures, theoretical limitations of computing machines, analysis of algorithms, and correctness and efficiency of algorithms. Prerequisite: Computer Science 121 or equivalent, or consent of instructor. 3 hours.
- 281. Introduction to Computer Circuits.** Introduction to the operation and use of integrated and other circuits used in digital computers; for students with a basic knowledge of electricity and magnetism but lacking experience with electronic circuits. Prerequisite: Physics 107 or equivalent. 3 hours. Students in the Electrical or Computer Engineering curricula may not receive credit for Computer Science 281.
- 282. Digital Circuits Laboratory.** A laboratory course designed to accompany Computer Science 281. Prerequisite: Credit or concurrent registration in Computer Science 281 or equivalent. 1 hour.
- 290. Individual Study.** Prerequisite: Computer Science 121 or other Computer Science 100-level programming course, or consent of instructor. 1 to 3 hours.

- 296. Honors Course in Computer Science.** Group projects for honors work in computer science. Sections of this course are offered in conjunction with other 200-level computer science courses, in which concurrent registration is required. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 200-level computer science course (see Timetable); consent of instructor. 1 hour.
- 297. Special Topics in Computer Science.** A lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours.
- 300. Advanced Computer Programming.** Advanced features of programming languages; input/output disks and tapes; plotted output; and use of operating systems and job control languages. This course is intended primarily for students who are not majoring in computer science. Prerequisite: Computer Science 100-level programming course or Computer Science 400, or consent of instructor. 3 hours or 1 unit. Students majoring in computer science may not receive graduate credit for Computer Science 300.
- 310. Information Systems.** Systems design and analysis; includes structured programming and programming in COBOL; file organizations and processing; sorting, validating, updating, and retrieval of information; storage devices; and data base concepts. Prerequisite: Accountancy 331 or 332, or 6 hours of computer science courses; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 311. Database Systems.** Examines the logical organization of databases: the entity-relationship model; the hierarchical, network, and relational data models and their languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control, and distributed database systems. Prerequisite: Computer Science 225 or 310; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 313. Combinatorial Mathematics.** Same as Mathematics 313. See Mathematics 313.
- 315. Applications of High-Performance Computers.** Detailed study of selected current applications which pace computer development in one or more significant dimensions such as processing speed, memory size and speed, input/output capacity, or programming complexity; draws applications from those of interest in the physical, social, or biological sciences; emphasizes the interplay between solution requirements and computer capabilities. Prerequisite: One course in computer programming, such as any 100-level computer science course; and calculus and the elements of linear algebra, fulfilled by any of the sequences Mathematics 120 and 132, and Mathematics 125 or 225, or 315, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 316. Interactive Systems for Instruction.** Systems for interactive instruction; survey of computer-aided instruction; and design and implementation of interactive programs. Prerequisite: A 100-level computer science course, Computer Science 400, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 317. Computer-Assisted Instruction.** Same as Secondary Education 317. See Secondary Education 317.
- 318. Computer Graphics.** Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applications of these tools to specific problems. Prerequisite: Computer Science 221, 225, or 300, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Operating Systems Design.** Discussion of the organization and structure of operating systems for various modes of computer use from simple batch systems to time sharing/multiprocessing systems. Prerequisite: Computer Science 221 and 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Programming Language Principles.** An introduction to the structure of programming languages. Formal specification of syntax and semantics; structure of algorithms; list processing, string manipulation; data description; and simulation languages; basic data types, operations, statement types, and program structure; macro languages and their implementation; and run-time representation of programs and data. Prerequisite: Computer Science 221 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 326. Compiler Construction.** Compiler structure, lexical analysis, syntax analysis, grammars,

description of programming languages, automatically constructed recognizers, and error recovery; and semantic analysis, semantic languages, semantic processes, intermediate language, optimization techniques, and extendible compilers. Prerequisite: Computer Science 325 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 327. Software Engineering.** Follows the software life cycle from the requirement, specification, and design phases through the construction of actual software. Topics include management of programming teams, programming methodologies, debugging aids, documentation, evaluation and measurement of software, verification and testing techniques, and the problems of maintenance, modification, and portability. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Microprocessor Systems.** Study of microprocessor architectures, hardware modules, and interfaces; programming, software tools, development systems, and applications; and microprocessor system design methodology. Prerequisite: Computer Science 221; Computer Science 264 or Electrical Engineering 290. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 333. Computer System Organization.** Computer system analysis and design; organizational dependence on computations to be performed; and speed and cost of parts and overall machines. Prerequisite: Computer Science 221; and Computer Science 264, Electrical Engineering 290, or Mathematics 391; or consent of instructor. 3 hours or 1 unit.
- 335. Introduction to the VLSI System Design.** Same as Electrical Engineering 325. See Electrical Engineering 325.
- 337. Control Structure of Computers.** Asynchronous, synchronous, and microprogrammed control structures in the framework of computer architecture; interlocking of autonomous subcontrols; and case studies in typical control features: instruction look-ahead, multiprocessing interrupt, and input/output. Prerequisite: Mathematics 391 or Computer Science 221, or consent of instructor. 3 hours or 1 unit.
- 338. Communication Networks for Computers.** Same as Electrical Engineering 338. Introduction to data transmission, digital multiplexing, and data switching; characteristics of transmission media, terminals, modems, and communication processes; design of error control, line control, and information flow control procedures; study of message and packet switching networks; protocols and software in packet switching systems; and modeling techniques for networks. Prerequisite: Computer Science 264 or Electrical Engineering 290, and Mathematics 361 or Electrical Engineering 313, or equivalent. 3 hours or 1 unit.
- 339. Computer Aided Design for Digital Systems.** Same as Electrical Engineering 339. Examines fundamental concepts, techniques, and tools for the computer-aided design of digital systems; topics include hardware description languages, hardware compilers, evaluation and simulation of computer architectures, logic and circuit simulation, testing, partitioning, placement and routing algorithms and the integration of CAD tools into complete design automation systems. Prerequisite: Computer Science 264 or Electrical Engineering 290; Computer Science 221 or Electrical Engineering 291; and Computer Science 281 or Electrical Engineering 340 and 342. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Mechanized Mathematical Inference.** Introduces methods of mathematical inference which can be programmed on a computer; topics include propositional calculus decision procedures, forward and backward chaining, semantics, resolution, equational systems, specialized decision procedures, applications to program verification, abstraction, and problem representation. Prerequisite: Computer Science 273 or Mathematics 314, or equivalent, and a 100 level programming course, or consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit.
- 342. Computer Inference and Knowledge Acquisition.** Systematically describes principles and algorithms underlying development of artificial intelligence systems, with special emphasis on methods of computer inference and knowledge acquisition; topics include deductive and inductive inference systems, plausible reasoning techniques, problem solving strategies, knowledge representation schemes, machine learning, conceptual data analysis, prediction and discovery programs, automatic programming, and planning strategies. Prerequisite: Computer Science 221 and a course in formal logic, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 346. Pattern Recognition and Machine Learning.** Organized review of basic theoretical concepts and methods of machine learning and recognition; decision space and linguistic and relational representation of objects; statistical and deterministic recognition algorithms; various types of learning, including adaptive, procedural, and inductive; selected applications; and medical consulting, determination of cost-optimal classification rules, inferential information systems, and computer vision. Prerequisite: Computer Science 264, or equivalent, and Computer Science 225; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 347. Knowledge-Based Programming.** Examines use of the computer to process human-made knowledge-bases. Topics include: trade-off of search versus knowledge; complexity of finite problem domains; machine-aided acquisition of knowledge from experts; acquisition of knowledge by computer induction; validation and measurement methods, production-rule programming; and logic programming. Prerequisite: Computer Science 273, and a 100-level programming course. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 348. Introduction to Artificial Intelligence.** Same as Electrical Engineering 348. See Electrical Engineering 348.
- 355. Numerical Methods for Partial Differential Equations.** Same as Mathematics 355. An introduction to numerical techniques for initial and boundary value problems in partial differential equations; includes finite difference and finite element discretization techniques, direct and iterative solution methods for discrete problems, and programming techniques and usage of FORTRAN packages. Prerequisite: Computer Science 257, and credit in a differential equations or an advanced calculus course; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 358. Numerical Analysis: Linear Problems.** Same as Mathematics 358. Numerical methods for linear algebra and eigenvalue problems with some applications to linear boundary value problems for differential equations. Prerequisite: Computer Science 257 or consent of instructor. 3 hours or 1 unit.
- 359. Numerical Analysis: Nonlinear Problems.** Same as Mathematics 359. The development and analysis of algorithms for polynomial and spline interpolation, least squares and Chebyshev approximation; interpolatory and Gaussian quadrature; solution of systems of nonlinear equations, and the initial value problem in ordinary differential equations. Prerequisite: Computer Science 257 and Mathematics 343, or consent of instructor. 3 hours or 1 unit.
- 360. Scientific Applications of Minicomputers.** Structure and programming of a minicomputer; operation and use of minicomputer peripherals; and basic digital design techniques using commercially available integrated circuits, with emphasis on the use of minicomputers in scientific experiments. Prerequisite: Any introductory computer science course, or consent of instructor. 3 hours or 1 unit. Students in the M.S. or Ph.D. program in computer science may not receive graduate credit for Computer Science 360. Students may not receive credit for both Computer Science 360 and 264.
- 363. Integrated Circuit Logic Design.** IC fabrication techniques, survey of different IC logic families, logic design procedures for each IC logic family, design of masks, logic design of digital networks with IC packages, use of ROMs as substitutes for gates, computer-aided design, and comparison of different implementation approaches based on different IC logic families, from the viewpoints of economy, performance, and design time. Prerequisite: Computer Science 281 or equivalent and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
- 364. Introduction to Computer Arithmetic.** Review of binary number representations, logical design of adders and arithmetic units, and simple multiplication and division methods, multiplier recoding, redundant division methods, design of carry-save adders and signed-digit arithmetic units, and case studies of high-speed arithmetic units. Prerequisite: Computer Science 264 or Electrical Engineering 290. 3 hours or 1 unit.
- 373. Combinatorial Algorithms.** Same as Mathematics 373. Representation and generation of combinatorial objects, searching: exhaustive search and its approximations and fast search techniques, sorting and related problems, graph algorithms, NP-hard and NP-

- complete combinatorial problems. Prerequisite: Computer Science 273 or 225, Mathematics 319, or consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Mathematics 375. Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linear-bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems; recursive functions; and computational complexity. Prerequisite: Mathematics 319 or Computer Science 273, or consent of instructor. 3 hours or 1 unit.
- 376. Program Verification.** Examines formal methods for demonstrating correctness and other properties of programs; includes an overview of predicate calculus. Topics include: invariant assertions, Hoare axiomatics, well-founded orderings for proving termination, structural induction, computational induction, data structures, and parallel programs. Prerequisite: Computer Science 273 or Mathematics 314; Computer Science 225 or advanced programming course. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 381. Introduction to Computer Memories and I/O.** Introduction to memories, input/output devices, and optical processors; lecture and demonstration. Prerequisite: Computer Science 281, Electrical Engineering 340, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Linear Programming.** Same as Mathematics 383. See Mathematics 383.
- 384. Computer Data Acquisition Systems.** Theory, operation, and design of computer data acquisition systems; analog and digital aspects, conversions between representations, interfacing and systems considerations. Prerequisite: Computer Science 264 and 281. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 385. Digital Computer Semiconductor Device Technology.** Presents the theory, technology and fabrication of integrated circuits for computers; compares attributes of the latest technologies; and discusses important device parameters, and develops models suitable for computer use. Prerequisite: Computer Science 281 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. Students may not receive credit for this course and Electrical Engineering 340.
- 389. Advanced Computer Circuits.** Theory, operation and use of digital integrated circuit technologies that are commonly used in modern digital computers; provides an understanding of the operation of various computer technologies, design knowledge at the integrated circuit package level, and an introduction to computer circuit design aids. Prerequisite: Computer Science 264 and 281. 3 hours, or $\frac{3}{4}$ or 1 unit. Students may not receive credit for both Computer Science 389 and Electrical Engineering 380.
- 391. Switching Theory.** Same as Electrical Engineering 391 and Mathematics 391. See Mathematics 391.
- 392. Finite State Machines.** Same as Mathematics 392 and Electrical Engineering 392. See Mathematics 392.
- 397. Special Topics in Computer Science.** Lectures in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 400. Introduction to Automatic Digital Computing for Graduate Students.** Beginning course covering the programming of digital computers using procedure-oriented language. 1 hour. No graduate credit.
- 405. Numerical Methods in Fluid Dynamics.** Same as Atmospheric Science 405. See Atmospheric Science 405.
- 425. Topics in Compiler Construction.** Advanced topics in compiler construction, including incremental and interactive compiling, error correction, code optimization, models of code generators, etc. Prerequisite: Computer Science 225 and 326, or consent of instructor. 1 unit.
- 433. Theory of High-Speed Parallel Computation.** Same as Electrical Engineering 433. Theoretical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; and overall computer system ideas. Prerequisite: Computer Science 333 or equivalent. 1 unit.
- 441. Computer Systems Analysis.** Same as Electrical Engineering 441. Development of analytical models of computer systems and application of such models to performance

- evaluation; topics include scheduling policies, paging algorithms, multiprogrammed resource management, and queuing theory. Prerequisite: Mathematics 361 or 363, Electrical Engineering 313, or equivalent. 1 unit.
- 445. Systems Modeling and Simulation.** Same as Business Administration 475. See Business Administration 475.
- 456. Coding Theory.** Same as Electrical Engineering 456 and Mathematics 476. See Electrical Engineering 456.
- 457. Numerical Solution of Ordinary Differential Equations.** Same as Mathematics 457. Derivation and rigorous analysis of one-step, multistep, and extrapolation methods, variable stepsize, error estimation, stiff equations, and boundary value problems. Prerequisite: Computer Science 359 or consent of instructor. 1 unit.
- 458. Topics in Numerical Analysis.** Same as Mathematics 458. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 463. Information Theory.** Same as Electrical Engineering 463 and Mathematics 463. See Mathematics 463.
- 464. Topics in Digital Computer Arithmetic.** Topics selected from the advanced theory of digital computer arithmetic, including division methods, use of redundancy, and implications of the use of number representations, such as continued products and continued fractions. Prerequisite: Computer Science 364. 1 unit.
- 465. Topics in Automata Theory.** Same as Electrical Engineering 465 and Mathematics 465. See Mathematics 465.
- 469. Introduction to Coherent Optics and Holography.** Same as Electrical Engineering 469. See Electrical Engineering 469.
- 472. Graph Theory.** Same as Mathematics 418. See Mathematics 418.
- 473. Topics in Analysis of Algorithms.** Theoretical analysis of various algorithms; topics include sorting, searching, selection, polynomial evaluation, matrix multiplication, and multiplication of real numbers. Prerequisite: Computer Science or Mathematics 373 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 474. Topics in Graph and Geometric Algorithms.** Same as Electrical Engineering 474. See Electrical Engineering 474.
- 475. Topics in Combinatorics.** Same as Mathematics 475. Selected topics from graph theory, algebraic coding theory, enumerative analysis, combinatorial design, and discrete optimization, includes other topics of current research interest, such as Ramsey's Theorem, Sperner's Theorem, Dilworth's Theorem, and the theory of matroids. Prerequisite: Computer Science 273, Mathematics 313, or consent of instructor. 1 unit.
- 485. Topics in Computer Hardware.** Advanced features of computer hardware; topics vary, but typically are chosen from: memories, optical data processing and storage, device modeling and computer aided circuit design, and stochastic representation and processing of information. Prerequisite: Consent of instructor. 1 unit.
- 487. Theory of Approximation.** Same as Mathematics 487. See Mathematics 487.
- 490. Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. 3 to 4 units.
- 491. Seminar in Computer Science.** Seminar on topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 492. Individual Project Study.** Individual study of a computer related project required of all candidates for the Master of Computer Science degree. Prerequisite: Consent of instructor. 3 to 4 units (summer session 3 to 2 units).
- 497. Special Topics in Computer Science.** Lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 3 to 1 unit.
- 499. Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units.

Crafts

(See Art and Design)

Dairy Science

(See Animal Sciences)

DANCE

Head of Department: Professor P. K. Knowles

Department Office: 4-501 Krannert Center for the Performing Arts, 500 South Goodwin, Urbana

101. **Beginning Modern Dance.** Introduction to basic dance technique and movement improvisation; the study of motion as an art, group relationships in improvisation, and discussion of choreographic ideas. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
102. **Intermediate Modern Dance.** Intermediate dance technique and improvisation. For nondance majors. Prerequisite: Dance 101 or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
105. **Jazz.** Introduction to basic dance technique and stylistic work in the jazz idiom. For non-dance majors. 1 hour. May be repeated to a maximum of 4 hours.
107. **Ballet Fundamentals, I.** Introduction to ballet for nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
108. **Ballet Fundamentals, II.** A progressive development of the concepts and skills in Dance 107; for the nondance major. Prerequisite: Dance 107; or equivalent and consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
130. **Performance Practicum, I.** Performance laboratory involving the rehearsal and performance of student works under faculty supervision and/or works by faculty and visiting artists. Prerequisite: Consent of instructor. 1 to 3 hours (1 or 2 hours credit per dance). A maximum of 16 hours of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
131. **Production Practicum.** Practical experience in the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. 1 or 2 hours (1 hour credit per concert up to 2 hours per semester). May be repeated to a maximum of 6 hours.
150. **Orientation to Dance.** A survey of the field including dance as a theatre art, careers, dance education, production, injury prevention and nutrition; also serves to orient incoming students to the faculty, programs, and policies of the Department of Dance, and the production and performing resources in the Krannert Center for the Performing Arts. 2 hours.
160. **Modern Technique, I.** Elementary technique for majors with emphasis on a conceptual understanding of movement principles and the development of technical skill and performance sensitivity. Prerequisite: Departmental audition. 1 to 3 hours. May be repeated to a maximum of 18 hours.
162. **Improvisation, I.** Experience in selective, basic processes of movement involvement, both individual and group; special attention to organic, economical bodily use, the dynamics and quality of which are necessary to the activity being performed. 1 hour.
163. **Improvisation, II.** Continuation of Dance 162, with emphasis on expanding bodily activity into various existing or created performing environments; use of sound and music, body coverings, and properties; and special attention to relating these experiences to dance composition. Prerequisite: Dance 162 or consent of instructor. 1 hour.

- 164. Beginning Composition.** Theory and practice in principles of dance composition, emphasis on solo creative work using various approaches to composition. Prerequisite: Dance 163 or consent of instructor. 2 hours.
- 166. Ballet, I.** Elementary ballet for dance majors; emphasizes placement, refinement of adagio, pirouette, jumps, and connecting steps. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 168. Music Theory for Dancers.** An introduction to basic music theory: rhythms including experience playing existing and created percussion scores; major and minor scales, chords, intervals, phrases, cadences, and rhythmic and harmonic analysis of existing pieces; includes the study of tape recorders and related sound production techniques such as splicing, editing, dubbing, and recording. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated to a maximum of 9 hours.
- 243. Creative Dance for Children.** Introduction to theories and methods of teaching dance to children, grades 1-5; includes twenty-four hours of assistance, observation, and supervised practice teaching in class situations. Prerequisite: Dance 164 and 260, or consent of instructor. 3 hours.
- 250. Dance Forms.** Introduction to movement skills and stylistic elements of theatrical and folk forms to be chosen from tap, character, jazz, preclassical and Renaissance forms, and dances of other cultures. Prerequisite: Dance 160 or 166. 1 hour. May be repeated to a maximum of 4 hours.
- 260. Modern Technique, II.** A progressive development of the concepts in Dance 160, with emphasis on the qualitative and definitive performance of a variety of technical styles. Prerequisite: Admission by departmental placement and consent of instructor. 1 to 3 hours. May be repeated to a maximum of 15 hours.
- 264. Intermediate Composition.** Experience in choreographing a minimum of one solo and two small group works utilizing various approaches to choreographic form. Prerequisite: Dance 164 or consent of instructor. 2 hours.
- 266. Ballet, II.** Intermediate ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 166, with emphasis on technical development and extended movement combinations. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 269. Music Literature for Dancers.** Basic analysis of representative pieces from the Renaissance, baroque, classical, romantic, and modern periods, emphasizing music of the twentieth century. Students learn to recognize general stylistic characteristics of each period and to understand dance forms related to the music. Prerequisite: Dance 165, or equivalent and consent of instructor. 3 hours.
- 328. Composer-Choreographer Workshop.** Same as Music 328. For experienced composers and choreographers; explores the many relationships between musical composition and choreography. Prerequisite: For dance majors, Dance 264 or consent of instructor; for music majors, Music 106 or equivalent, other compositional experience, and consent of instructor. 2 hours or 1/2 unit.
- 330. Performance Practicum, II.** Laboratory for the rehearsal and performance of concert works by graduate choreographers, faculty, and guest artists. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/3 to 1 unit (1 or 2 hours, or 1/3 or 1/2 unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
- 331. Production Practicum.** Practical experience in all aspects of the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. Prerequisite: Dance 131 or equivalent, and consent of instructor. 1 or 2 hours, or 1/3 or 1/2 unit. 1 hour or 1/6 unit credit per concert up to 2 hours or 1/3 unit per semester. May be repeated to a maximum of 6 hours or 1 unit.
- 335. Dance Repertory Workshop.** Experience in learning, rehearsing, and performing concert dance pieces under the direction of experienced choreographers. Prerequisite: Enrollment in advanced technique course, consent of instructor. 2 or 4 hours, or 1/3 or 1 unit (2 hours or 1/3 unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.

- 340. History of Dance, I.** A survey of dance from its beginnings in primitive societies through the early nineteenth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 341. History of Dance, II.** A survey tracing the development of dance from the rise of Romanticism through the twentieth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 345. Theories and Fundamentals of Movement.** Approaches to increasing ease and efficiency of movement, including theories of Sweigard, Laban, Bartenieff, Alexander, Feldenkrais, and Rolf; emphasizes alignment, connectedness, body awareness, strength, mobility, and the study of human anatomy as applied to pedestrian and dance movement. Prerequisite: Major standing in dance, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 346. Theory and Philosophy of Dance.** Study of the relationship of aesthetic principles and dance theory to a philosophy of dance in education and of dance as a performing art. Prerequisite: Dance 341 or consent of instructor. 3 hours or 1 unit.
- 347. Labanotation, I.** Fundamentals of labanotation, including theory, reading, and writing; introduction to effort/shape analysis. Prerequisite: Dance 260 or consent of instructor. 3 hours or 1 unit.
- 348. Labanotation, II.** Intermediate level theory and vocabulary of movement notation, including reading, writing, and/or special projects. Prerequisite: Dance 347. 3 hours or $\frac{3}{4}$ or 1 unit. Graduate students enrolled for one unit credit will be expected to do additional reading and writing projects.
- 349. Movement Notation.** Same as Physical Education 365 and Psychology 312. See Psychology 312.
- 351. Independent Study and Special Topics.** Special projects in research or creative investigation taught on an individual or class basis. Prerequisite: Junior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated for a maximum of 8 hours or 2 units, which may be counted toward degree requirements.
- 360. Modern Technique, III.** A progressive development of the concepts in Dance 260, with emphasis on virtuosity and versatility. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 18 hours or 2 units.
- 363. Improvisation, III.** Advanced improvisational techniques and forms; theory and practice in advanced concepts of creative improvisational human movement as an overt public art form. Prerequisite: Dance 264 or equivalent. 1 hour or $\frac{1}{4}$ unit.
- 365. Advanced Composition.** Choreography for the experienced student; includes performance of at least one original work. Prerequisite: Dance 264 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 366. Ballet, III.** Advanced ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 266. For dancers of advanced technical level with the ability to execute the ballet vocabulary; includes fundamentals of pointe work. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 8 hours or 1 unit.
- 369. Accompaniment for Dance.** For dancers and musicians; theory and practice of musical accompaniment for dance, with emphasis on improvisational techniques. Prerequisite: For dance majors, Dance 168 or equivalent, or consent of instructor; for music majors, audition with and consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 410. Professional Seminar.** Survey of professional organizations, publications, scholarly resources, and trends, culminating in student presentation of projects examining current issues in the field. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit.
- 420. Problems in Teaching and Administration.** Recent developments in the teaching of dance, including standards for major programs, curricula planning, performance experiences, administration, evaluation, and theoretical approaches to the teaching of studio courses. Prerequisite: Dance 410. 1 unit.
- 430. Dance Touring Company.** A repertory ensemble for the performance of lecture-demonstration programs, off-campus concerts, and short-term residencies; rehearsal and performance of works by resident faculty and guest choreographers. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.

431. **Production Practicum.** Practical experience in the technical, design, and administrative aspects of production in conjunction with department concerts. Prerequisite: Graduate standing in dance. 1 unit. May be repeated to a maximum of 1 unit.
450. **Independent Research.** Independent research of a historical, contemporary, philosophical, or educational facet of dance under the guidance of a faculty advisor. Prerequisite: Dance 340, 341, 346, and 410, or equivalent and consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 1 unit.
451. **Supervised Teaching.** Practical teaching experience under the supervision of a faculty member; weekly conference devoted to evaluation and planning. Teaching areas include major and nonmajor university courses and classes for community adults and children. Prerequisite: Graduate standing in dance. 1/2 to 1 unit. May be repeated to a maximum of 2 units with consent of instructor as topics vary.
460. **Modern Technique, IV.** Modern technique for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. 3/4 to 1 unit. May be repeated to a maximum of 4 units.
465. **Choreography.** A structured creative utilization of formal choreographic elements in the creation, rehearsal, staging, and performance of original dance works. Prerequisite: Graduate standing in dance and audition. 1/2 unit.
466. **Ballet, IV.** Ballet for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. 3/4 to 1 unit. May be repeated to a maximum of 4 units.
475. **Costume Design for Dance.** Same as Theatre 475. See Theatre 475.
498. **Creative Project in Dance.** The design, implementation, and completion of a culminating creative project in choreography and/or performance. Prerequisite: Seven units of graduate work in dance, including one unit in choreography. 1 unit. May be repeated to a maximum of 2 units.

ECOLOGY, ETHOLOGY, AND EVOLUTION

Head of Department: Professor G. O. Batzli

Department Office: 515 Morrill Hall, 505 S. Goodwin, Urbana

105. **Environmental Biology.** Introduction to ecological principles in relation to understanding environmental problems; emphasizes impacts upon ecosystems by human activities such as air and water pollution, usage of pesticides and pest control measures, expansion of agriculture in tropics and arid regions, harvesting the oceans, and development of energy sources. 3 hours.
109. **Sociobiology: The Evolution of Social Behavior.** Examines the functional basis of social behavior in animals and humans; explores concepts such as altruism, kin selection and sexual behavior; discusses the "sociobiology debate"; evaluates recent applications of sociobiological concepts to human behavior. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Anthropology and Human Development and Family Ecology 143. See Anthropology 143.
199. **Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
203. **Behavior of Domestic Animals.** Same as Animal Science and Dairy Science 203. See Animal Science 203.
212. **Basic Ecology.** Lecture, discussion, laboratory, and field course dealing with the relationships between organisms and their environment; introduction to physiological bases for adaptations; population dynamics; community organization; and the structure and function of ecosystems. Prerequisite: One year of biology or concurrent registration in Biology 111. 5 hours. (Counts for advanced hours in LAS.)
282. **Comparative Vertebrate Anatomy.** Classification and comparative anatomy of vertebrates including functions and evolution of their organs and organ systems. Prerequisite: Biology 111 or equivalent. 3 hours. (Counts for advanced hours in LAS.)

- 246. Vertebrate Social Organization.** Same as Anthropology, Psychology, and Sociology 246. Introduction to the biosociology of vertebrates; emphasis on the behavioral, physiological, and population aspects of vertebrate social organizations, from fishes to primates. Prerequisite: One year of introductory biology. 3 hours. (Counts for advanced hours in LAS.)
- 290. Special Topics.** Supervised participation in research and scholarly activities in ecology, ethology, or evolution, usually as an assistant to the instructor. Prerequisite: Two years of life sciences or cognates, advanced standing, and consent of instructor. 1 to 5 hours.
- 294. Individual Topics.** Supervised independent investigation of individual topics in ecology, ethology, and evolution; requires a written report to instructor. Prerequisite: Two years of life sciences or cognates, advanced standing, and consent of instructor. 2 to 5 hours.
- 301. Introduction to Evolutionary Biology.** Same as Genetics and Development 301. See Genetics and Development 301.
- 311. Evolutionary Ecology.** Emphasizes the evolution of life-history strategies in plants and animals (reproductive rates, life cycles, sex ratios, breeding and mating systems) and the coevolution of animals and plants (pollination, dispersal, and herbivory). Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 320. Invertebrate Zoology.** Invertebrates; structure and development; application of biological principles; specific and comparative morphology of the invertebrates; and coordination of structure and function, origin, development, and life histories. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit. Offered in alternate years.
- 332. The Evolution of Adaptive Systems.** Evolutionary mechanisms underlying adaptations; the relationships among theoretical population biology, developmental biology, functional morphology, and the fossil record, with some emphasis on quantitative models. Prerequisite: Genetics and Development 210 or consent of instructor; a course in calculus recommended. 3 hours or $\frac{3}{4}$ unit.
- 335. Ornithology.** Structure, function, ecology, behavior, and evolution of the birds of the world; laboratory devoted to anatomy and identification; and field studies devoted to identification of and research on birds. Optional weekend field trip. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit. Offered in alternate years.
- 336. Mammalogy.** Classification, distribution, life history, evolution, and identification of mammals. Lecture, laboratory, and field work. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit. Offered in alternate years.
- 339. Field Vertebrate Natural History.** Laboratory and field course. An intensive study of North American vertebrates with emphasis on vertebrates of Illinois; taxonomy, life histories, habitats, and feeding habits of all the common resident species. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit.
- 340. Natural History of the Vertebrates.** Lectures on vertebrate adaptations for survival and reproduction. Prerequisite: Biology 111 or equivalent, and junior standing. 3 hours or $\frac{3}{4}$ unit.
- 342. Fish and Wildlife Ecology.** Application of ecological principles and modeling to management of fish and wildlife populations; significance of abiotic and biotic factors, including life-history parameters in population growth and management; and techniques and procedures for the development of management strategies for animal populations, emphasizing vertebrates. Prerequisite: Biology 111 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit.
- 343. Limnology.** Fresh water biology; study of the lake, pond, and river with emphasis on the physical environment as well as on the plants and animals which live in fresh water. Lectures, discussions, laboratory, and field work. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
- 344. Introduction to Primate Morphology and Behavior.** Same as Anthropology 343. See Anthropology 343.
- 345. Population and Community Ecology.** Characteristics of populations and their evolution, population dynamics and regulation, and organization and structure of communities; lecture and field research projects. Prerequisite: Ecology, Ethology, and Evolution 212 or

equivalent. A course in statistics is highly recommended. 5 hours or 1 unit. Offered in alternate years.

- 346. Animal Behavior.** Same as Animal Science and Anthropology 346. An introductory course emphasizing how patterns of behavior promote survival, change through evolution, and are modified by the environment. Prerequisite: Biology 111 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 347. Animal Behavior Laboratory.** Same as Animal Science and Anthropology 347. An introduction to observational, statistical, and experimental techniques in the field, through the completion of four projects (sequence analysis, variation in FAP's, acoustic discrimination and orientation, and biological rhythms); formal reports are written for each project. Prerequisite: Ecology, Ethology, and Evolution 346 or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
- 348. Wildlife and Land Management.** Same as Forestry 348. Introduces principles of wildlife management; applies those principles to land management problems, especially forestry, range, and agricultural land-uses as they relate to aquatic and terrestrial wildlife; and discusses techniques for evaluating and improving wildlife populations. Prerequisite: Botany 100 and Biology 104, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Credit may not be received for both Ecology, Ethology, and Evolution 342 and 348. Offered in alternate years.
- 350. Behavior-Genetic Analysis.** Same as Anthropology and Psychology 342. See Psychology 342.
- 352. Behavior Genetics Laboratory.** Same as Anthropology 337 and Psychology 347. See Psychology 347.
- 353. Hormones and Behavior.** Same as Psychology 343. Survey of the behavioral effects of hormones in vertebrates and invertebrates; emphasizes the extensive literature on hormonal effects on reproductive and social behavior. Students enrolled for graduate credit may write a term paper for an extra $\frac{1}{4}$ -unit credit. Prerequisite: Biology 111 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 354. Ethology of Mammals.** Survey of mammalian behavior from an ethological perspective; emphasizes comparative evolutionary issues including feeding, communication, reproduction, parental care, and the ontogeny of behavior. Prerequisite: Ecology, Ethology, and Evolution 212 and 346, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 359. Aquatic Ecology.** Same as Civil Engineering 347. See Civil Engineering 347.
- 382. Advances in Ethology: Behavior of Marine Animals.** A survey of behavioral adaptations and the ecological and evolutionary forces which have shaped them, as revealed by studies upon marine invertebrate and vertebrate groups. Prerequisite: Biology 111 or equivalent; consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 383. Advances in Ethology: Behavioral Ecology.** An in-depth examination of areas of current interest at the interface of behavior, ecology, and evolution; focuses on communication, foraging, and social behavior. Prerequisite: Ecology, Ethology, and Evolution 212 and 346 or, consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 407. Current Concepts in Evolution.** Examines current topics in evolutionary biology, including concepts such as modes of speciation, punctuated equilibrium vs. gradualism, neutralism, macroevolution, and molecular clocks. Prerequisite: Genetics and Development 301 or equivalent. 1 unit.
- 443. Problems in Primate Behavior and Ecology.** Same as Anthropology 443. See Anthropology 443.
- 444. Concepts in Ethology.** Discussion, review, and critical analysis of general concepts and specific problems in behavior with new topics each semester. Prerequisite: Ecology, Ethology, and Evolution 346. $\frac{1}{2}$ unit. May be repeated.
- 445. Seminar in Fish and Wildlife Ecology.** Modern ecological principles and concepts to specific problems in fisheries and wildlife. Prerequisite: Ecology, Ethology, and Evolution 342 or 345, or equivalent. $\frac{1}{2}$ unit. Offered in alternate years.
- 452. Concepts in Ecology.** Discussion, review, and critical analysis of general concepts and specific problems in ecology with new topics each semester. Prerequisite: An advanced course in ecology or consent of instructor. $\frac{1}{2}$ unit. May be repeated.

- 490. Individual Research.** Individual topics in research conducted under the supervision of faculty members in the Department of Ecology, Ethology and Evolution. Prerequisite: Consent of adviser. $\frac{1}{2}$ to 3 units.
- 491. Topics in Population Biology.** Lecture and discussion of problems in population biology, with a different topic each semester. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 4 units.

ECONOMICS

Chairperson of Department: Professor P. Uselding

Department Office: 330 Commerce Building (West), 1206 South Sixth, Champaign

- 101. Introduction to Economics.** A general survey of the operation of the economic system; emphasizes the determination of the level of national income, the pricing and allocation of products, and factors of production under existing conditions in the United States. 4 hours.
- 109. Current Economic Problems.** An economic analysis of specific economic problems dealing with poverty, economic development, international economics, and other contemporary issues. Prerequisite: Credit or concurrent registration in Economics 101. 1 hour.
- 171. Introductory Economic Statistics.** Introduces statistical methods as applied in economics and other social sciences: descriptive statistics, probability theory, and distributions; sampling methods and distributions; estimation and hypothesis testing; and simple regression. For noncommerce students only. Prerequisite: Credit or concurrent registration in Mathematics 134 or equivalent. 3 hours. Credit is not given for Economics 171 if student has credit for any of the following: Economics 172 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Health and Safety Studies 321; Forestry 321; Geography 185 or 370; Social Work 327; or Statistics 100, 210, 310, or 311.
- 172. Economic Statistics, I.** An introduction to the modern theory and methodology of statistics in the areas of economics and business; topics include descriptive statistics, probability theory, sampling theory and methodology, sampling distributions, estimation, and hypothesis testing. Prerequisite: Credit or registration in Mathematics 134 or equivalent. 3 hours. Students may not receive credit for Economics 172 if they have received credit for Economics 171 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Health and Safety Studies 321; Forestry 321; Geography 185 or 370; or Statistics 100, 210, 310, or 311.
- 173. Economic Statistics, II.** Continuation of Economics 172. Emphasizes estimation and hypothesis testing for the linear statistical model; topics include contingency tables, goodness of fit, single and multiple regression, correlation, Bayesian decision theory, time series analysis, and index numbers. Prerequisite: Economics 172; Mathematics 134 or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 214. Introduction to Public Finance.** A general survey of the economics of the public sector at the federal, state, and local levels, including government expenditures, public budgeting, cost-benefit analysis, principles of taxation, tax reform, and intergovernmental fiscal relations. Prerequisite: Economics 101 or equivalent. 3 hours.
- 228. Survey of International Economics.** Introductory survey of major topics and issues in the theory and policy of international economics: theory of international trade, tariffs and commercial policy balance of payments, and adjustment and foreign exchange rate determination. Prerequisite: Economics 101 or equivalent. 3 hours. Credit is not given for both Economics 228 and 328.
- 236. American Economic History.** Traces the course of growth and development of the

economy from the colonial period to World War I; emphasizes conceptualization of key issues of the American experience and analysis of significant episodes and turning points. Prerequisite: Economics 101 or consent of instructor. 3 hours.

237. Contemporary Western Europe. Same as History 237. See History 237.

238. European Economic History. Economic structure and development of Europe since 1000 with respect to agriculture, industry, trade, technology, finance, and government; emphasis on those forces which contribute to the economic development of Europe and on the spread of these forces throughout the world. Prerequisite: Economics 101 or consent of instructor. 3 hours.

240. Labor Problems. Survey of the problems and analysis of U.S. labor markets and unions; topics include labor force participation, occupations, hours, wage determination, development and attributes of U.S. labor unions, and overview of collective bargaining and the effects of unions, unemployment, wages and inflation, and racial and sex discrimination; and selected current policy problems. Prerequisite: Economics 101. 3 hours.

245. Women in the Labor Market. Changing role of women in the labor market and the economy; supply and demand for women in the 1970s: nature, extent, and legal remedies for sex discrimination in employment; "earnings gaps" and variable employment costs, men versus women; new role of multi-earner families; and comparative use of women as a professional resource. Prerequisite: Economics 101 or equivalent. 3 hours.

255. Comparative Economic Systems. Analyzes of the significant similarities and differences in the development, structure, and policies of capitalism, communism, and market socialism. Prerequisite: Economics 101 or equivalent. 3 hours.

273. Regression and Forecasting. Covers the methodology of multiple regression, particularly as it applies to time series data and forecasting; also examines the use of various exponential smoothing models, and autoregressive integrated moving average models in business forecasting. Prerequisite: Economics 173 or equivalent. 3 hours.

288. Government Regulation of Economic Activity. Analyzes of the economic bases, policies, and consequences of government regulation of economic activity; patterns of regulation in selected areas. Prerequisite: Economics 101. 3 hours.

294. Senior Research. A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)

295. Senior Research. A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)

299. Undergraduate Open Seminar, II. An independent study course covering topics not treated by regular course offerings. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the department. While credit toward graduation is normally granted for this course, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. Prerequisite: Junior or senior standing. Economics 101 or equivalent is recommended. 0 to 9 hours. May be repeated.

300. Intermediate Microeconomic Theory. Microeconomic analysis including value and distribution theory; analysis of the pricing of the factors of production integrated in a micro-general equilibrium context which builds towards explaining the resource allocation process. Prerequisite: Economics 101 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive graduate credit for both Economics 300 and Business Administration 400. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.

301. Intermediate Macroeconomic Theory. The modern theory of the determination of the

level and rate of growth of income, employment, output, and the price level; discusses alternate fiscal and monetary policies to facilitate full employment and economic growth. Prerequisite: Economics 101 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive credit for both Economics 301 and Business Administration 401. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.

- 303. Macroeconomic Policy.** Analyzes current macroeconomic policy issues, problems, and techniques; discusses various policy techniques including monetary, fiscal, incomes, and exchange rate policies, and their effectiveness for treating inflation, unemployment, productivity, resource and exchange rate problems. Emphasizes current issues in the U.S. but includes some discussion of other developed economies. Prerequisite: Economics 301 or equivalent. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
- 306. History of Economic Thought.** The development of economics; the examination of contributions of individual writers and schools of thought as they influenced economic thought and national policy. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 312. Economic Dynamics and Growth.** Analyzes the causes of economic instability; the requirements for economic growth in the national economy; and considers public policy relating to instability and growth. Prerequisite: Economics 101 or equivalent; Economics 301. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 313. Economics of Consumption.** Same as Family and Consumer Economics 313. See Family and Consumer Economics 313.
- 314. Public Sector Economics.** Economic analysis of government tax and expenditure policies; topics include public good and externality theory, public choice theory, income distribution, cost-benefit analysis, principles of taxation, tax incidence, economic effects and optimal structures of major taxes, and taxation in developing economies. Prerequisite: Economics 300 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 315. The Economics of Poverty and Income Maintenance.** Same as Labor and Industrial Relations 315. Analyzes the nature and causes of poverty with special emphasis on critical evaluation of programs to combat poverty in the United States. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 328. International Economics.** Introduction to the theory of international trade and finance with selected application to current problems of commercial policy, balance of payments adjustment, and the international monetary system. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Contemporary Issues in the International Economy.** Analysis in depth of selected current issues and policy problems of the international economy, including (but not restricted to) the following: new approaches to the theory of international trade, reform of the international monetary system, role of the General Agreement on Tariffs and Trade and the United Nations Conference on Trade and Development in expanding trade between developed and undeveloped economies, problems of stabilizing international commodity markets, and balance of payments problems of the United States and other selected countries. Prerequisite: Economics 328 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 341. Economics of Labor Markets.** Same as Labor and Industrial Relations 341. Studies the microeconomic determinants of labor demand and supply, economic effects of unions, and macroeconomic labor market problems. Prerequisite: Economics 101. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 343. Unions, Bargaining, and Public Policy.** Analyzes the legal background and economic issues associated with unions and collective bargaining in the United States including theory of the labor movement; process of union wage determination; analysis of strikes; background, strategies, and principal issues in collective bargaining; and problems and policies of government intervention. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Economics of Human Resources.** Same as Labor and Industrial Relations 345. Educa-

- tion and training in economic growth; labor force characteristics; occupational structure and future human resources requirements; job information networks; economics of discrimination and underutilization; national human resources policies and programs; and private industry and union human resources planning. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Economics 345 and 444.
- 346. Family Economics.** Same as Agricultural Economics 370 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
- 350. The Developing Economies.** Analyzes the economic problems associated with newly developing nations; emphasizes their economic structures, their factor scarcities, and their programs for development. Not open for graduate credit to graduate candidates in economics. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ to 1 unit. Graduate credit is not given for both Economics 350 and Economics 450 or 451.
- 351. The Development of the Japanese Economy.** Analyzes Japan's international trade, economic structure, standards of living policy-making process, and future prospect; additional attention to U.S.-Japanese economic relations and Japan's role in Asia. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 352. Economic Development in Latin America.** Same as Agricultural Economics 352. Studies economic activity and the processes of diversification and industrialization in Latin America, with comparative analysis of selected countries. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 353. Economic Development in India and Southeast Asia.** Same as Agricultural Economics 353. See Agricultural Economics 353.
- 354. Economic Development of Tropical Africa.** Same as Agricultural Economics 354. See Agricultural Economics 354.
- 356. Economics of Population and Resources.** Same as Sociology 356. Interactions of population size with output, natural and man-made resources, and environment; various policies for management of these interrelated elements; and economics of demographic change. Considers both more developed and less developed countries. Prerequisite: Junior standing or consent of instructor. Economics 101 is recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. The Soviet Economy.** Analytical survey of Soviet economic development; structure and performance of the economy; and problems of planning and control. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 358. The Economy of China.** Discusses changes in the patterns of production, exchange, and distribution in Communist China, with emphasis on their relation to social transformation; survey of Chinese economic history over the past century, dealing with the institutional background to and the structure of economic activities in China. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 359. The Israeli Economy.** Analyzes the economic structures, policies, and performance of modern Israel, emphasizing the pre-1948 Palestine economy; the development of the Histadrut, Kibbutz, and Moshav; the economic relations between Arab and Jewish populations; and the impact of post-1948 immigration on Israel's economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 360. Regional Economics.** Survey of the theory and problems of regional economic development, including regional accounts, interregional income and trade theory, principles of the location of economic activity, theories of regional growth, and public policy for development of regions. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 361. Urban Economics.** Same as Finance 367. Analyzes the urban economy. The theory of urban spatial structure; the theory of local public finance, pricing, and investment decisions in the urban public sector; and the application of cost-benefit analysis and user-charge pricing to such problems as housing, transportation, land-use controls, and pollution. Prerequisite: Economics 101 or equivalent; Economics 300 is recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 372. Econometrics.** Studies econometric models and methods used in estimation and hypoth-

esis testing in economics. Prerequisite: Mathematics 134, Economics 173, and Mathematics 225 or 315. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 374. Mathematical Economics, I.** Mathematical reformulation and interpretation of traditional economic theory. Prerequisite: Mathematics 242 or equivalent; Economics 300 and 301. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 375. Mathematical Economics, II.** Introduction to linear and nonlinear economic models; emphasizes the formulation and interpretation of modern economic theory and welfare economics. Prerequisite: Mathematics 125, 225, or 315; Mathematics 242 or equivalent; Economics 300. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 384. Economics of Transportation.** Economic aspects of the transportation industry with special emphasis on problems of regulation and public policy. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 386. Current Transportation Problems.** Analytical and critical study of selected problems of current interest in transportation. Prerequisite: Economics 384 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 388. Law and Economics.** Applications of economic theory to problems and issues in both civil and criminal law and the effect of legal rules on the allocation of resources; includes property rights, liability and negligence assignment, the use of administrative and common law to mitigate market failure, and the logic of private versus public law enforcement. Prerequisite: Economics 300 or equivalent. 3 hours or $\frac{1}{2}$ or 1 unit.
- 389. Industrial Competition and Monopoly.** The organization and tactics of market control; the development of antitrust law and policy; public policy regarding competitive practices; special policies applying to natural resource industries; and regulated monopoly and government ownership as alternatives to the antitrust approach. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 400. General Economic Theory.** Emphasizes microeconomic theory; principal topics include a review of value and distribution theory, the theory of choice by households and firms, general microeconomic theory, and theoretical developments of current interest; and attention given to empirical studies intended to affirm or disaffirm economic principles. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 400 and Business Administration 400. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 401. General Economic Theory.** Emphasis on macroeconomic theory; principal topics include a review of Keynesian macroeconomic theory, formal growth theory, and selected business cycle theory. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 401 and Business Administration 401. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 402. Microeconomic Theory, I.** Introduction to the models and methods of modern microeconomic theory, concentrating on individual and firm decision making and on industry equilibrium; brief treatment of general equilibrium theory and welfare analysis. Topics include: consumer utility and demand theory; production and cost functions; firm supply, input demand, and price behavior; competitive, monopolistic, and oligopolistic industry analysis; and distribution theory. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
- 403. Macroeconomic Theory, I.** Development of modern macroeconomic theory, including national income accounts and their relation to input-output tables; classical, Keynesian, and monetarist aggregate models; behavior hypotheses of consumption, investment, and government; properties and the role of money and interest; foreign trade and investment; price rigidity, price flexibility, and employment; wage-price interaction and inflation; and ad hoc stabilization models. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.

- 404. Microeconomic Theory, II.** General market equilibrium theory and welfare economics; discusses the problems of existence, stability, efficiency, and equity of economic equilibrium; and introduces social choice and the special problems created by public goods, externalities, and uncertainty. Prerequisite: Economics 402. 1 unit.
- 405. Macroeconomic Theory, II.** Development of modern macroeconomic theory, including disequilibrium theory, optimal short-term stabilization measures, and monetary, fiscal, incomes, and exchange rate policies; large-scale econometric models; linear and neoclassical growth models; aggregate distribution theory; money, capital movements, trade, and growth; optimal growth models; and exhaustible resources and growth. Prerequisite: Economics 403. 1 unit.
- 406. History of Economic Thought.** Analyzes economic thought from the Physiocrats to World War II; evaluation of the selected materials both as reflections of their times and as contributions to contemporary economic thought. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 407. International Macroeconomics.** Deals with the international aspects of macroeconomics. Discusses issues such as the determination of exchange rates, balance of payments, the accumulation of foreign assets; considers both deterministic and stochastic systems; particularly emphasizes modelling issues. Prerequisite: Economics 405. 1 unit.
- 408. Philosophical Problems in Economics.** Studies philosophical problems in economics, with some emphasis on the methodology and epistemology of economic theory; use of the views of leading economists to show the development of broad philosophical problems of economic theory, the relation of theory and certain of its applied areas, and the relation of economics to other selected disciplines. These problems are treated in the light of modern philosophy. Prerequisite: One unit either in economic theory or in the history of economic thought. 1 unit.
- 409. Marxian Economics.** Analyzes Marx's economic theory and predictions; concentration on a critical evaluation of Marx's economic theory, a survey of contributions to the theory since Marx, and a Marxist evaluation of the neoclassical synthesis. Prerequisite: Economics 300 and 301, or consent of instructor. 1 unit.
- 410. Advanced Topics in Economic Theory, I.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
- 411. Advanced Topics in Economic Theory, II.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
- 413. Consumption Economics.** Same as Family and Consumer Economics 413. See Family and Consumer Economics 413.
- 414. Public Goods Theory.** In-depth analysis of the theory of public goods; includes public goods and externality theory, public choice, theory of cost-benefit analysis, optimal income redistribution, and fiscal federalism. Prerequisite: Economics 300 or equivalent. 1 unit.
- 415. Economics of Taxation.** Theoretical and empirical analysis of the impact of taxation on the economic system; topics include tax equity and excess burden, incentive effects of taxation, tax incidence, structure of major types of taxes (income, consumption, and wealth), normative tax analysis, and taxation in developing economies. Prerequisite: Economics 300 or equivalent. 1 unit.
- 418. Economics of Education, Health, and Human Capital.** Same as Administration, Higher and Continuing Education 418. Basic economic analysis of human capital and the value of human time, with applications to the economics of education and health; theory and analysis of consumer investment in human and physical capital over the life cycle; the returns to education and health, and their effects on growth; the theory of nonmarket

time; public finance of education and health; and implications for the analysis of the distribution of income. Prerequisite: A course in microeconomic theory and a course in statistics, or consent of instructor. 1 unit.

- 420. Monetary Theory.** Micro- and macroeconomic theories of the supply of and demand for money; money substitutes and their significance; review of current empirical research; money in closed economy, macroeconomic, and static general equilibrium models; and analysis of inflation and unemployment. Prerequisite: Consent of instructor. 1 unit.
- 421. The Theory of Monetary Policy.** Monetarism and other current topics; stabilization policy; money in dynamic models; money in open economy macroeconomic models; and international aspects of monetary theory. Prerequisite: Consent of instructor. 1 unit.
- 428. International Trade Theory.** Development and use of the neoclassical theory of international trade for the analysis of tariffs, customs, unions, and the effects of trade on the distribution of income and welfare; analysis and use of the relations between the balance of payments and national income to study the role of income changes combined with price changes in the balance of payments adjustment process. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 429. International Trade Policy.** Concepts of balance of payments equilibrium, the foreign exchange market and the theory of capital movements; current problems and policies related to balance of payments disequilibrium, trade policy, and the functioning of the international monetary system. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 436. American Economic History.** Emphasizes, but is not limited to, the reading and criticism of current literature in American economic history; attempts to facilitate understanding of the use of economic analysis in interpreting events framed in historical context; includes British colonial policy, trade and tariffs, industrialization, technology, slavery and the southern economy, land policy, agriculture, transportation and internal improvements, capital mobilization and financial organization, and the measurement of economic growth. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 437. General Economic History.** Treatment of selected topics in the economic history of industrialized economies by applying economic theory and quantitative methods of analysis to historical problems; exploration of the implications for contemporary work in economics. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 438. Economic History of Europe.** Major lines of development since 1450; comparative study of forces and institutions inimical or favorable to growth; and selected readings on organization of economic activity, role of governments and the entrepreneur, commercial policy, monetary systems, land tenure, process of capital formation, industrialization, etc. Prerequisite: Consent of instructor. 1 unit.
- 440. Labor Economics.** Same as Labor and Industrial Relations 440. Survey of recent trends in the labor force, of real and money earnings, and of the distribution of national income used as the basis for a critical economic analysis of contemporary English and American wage theory. Prerequisite: Economics 300 and 301. 1 unit.
- 441. Labor Economics.** Same as Labor and Industrial Relations 441. Economic issues and implications involved in hours of work, employment and unemployment, and trade union institutionalism (the impact of the trade union upon the basic institution of a free enterprise economy); emphasis in all cases on the development of appropriate public policy. Prerequisite: Economics 300 and 301. 1 unit.
- 442. Collective Bargaining.** Same as Labor and Industrial Relations 442. See Labor and Industrial Relations 442.
- 443. Problems and Practices of Labor Dispute Settlement.** Same as Labor and Industrial Relations 443 and Law 361. See Labor and Industrial Relations 443.
- 447. Labor Union Organization and Administration.** Same as Labor and Industrial Relations 447. See Labor and Industrial Relations 447.
- 450. The Economics of Development and Growth.** Review and analysis of the theories and patterns of growth in developed and underdeveloped economies; consideration of the problems and methods of measuring growth; critical examination of the variables thought

to be strategic in the growth process; and exploration of the policy implications of different theories. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.

- 451. The Developing Economies.** Analyzes the newly developing economies, with emphasis on institutional factors affecting development and economic policy relating to development. Prerequisite: Economics 450. 1 unit.
- 454. Population Economics.** Analyzes the determinants and consequences of population changes, including fertility, mortality, and migration; covers both modern and historical issues, at the microeconomic level (the new household economics) as well as the macro level; and includes causal and explanatory theoretical analysis as well as applications to policy issues. Prerequisite: Economics 400 and 401, or Economics 402 and 405. 1 unit.
- 455. Comparative Economic Systems.** Comparative analysis of the structures and policies of market-directed and planned economies. Prerequisite: Economics 101 or equivalent. 1 unit.
- 457. Economic Planning in the Soviet Union and Eastern Europe.** Intensive examination of the structure and performance of the Soviet and the East European economies, emphasizing analysis of the main theoretic and operational dimensions of economic planning; evaluation of choice, design, and efficacy of central planning instruments from both theoretical and historical perspectives. Prerequisite: Economics 300 and 301, or 357, or consent of instructor. 1 unit.
- 460. Urban Economics.** Examines the microeconomic theory of urban land-use and spatial structure (static and dynamic models); analyzes externalities caused by traffic congestion; normative and positive analysis of the provision of local public goods; and public policy issues (i.e., slums and urban decline, pollution). Prerequisite: Economics 402. 1 unit.
- 461. Urban and Regional Economic Development.** Measurement and analysis of inter-regional differences in economic growth. Prerequisite: Economics 300 and 301. 1 unit.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Environmental Studies, and Forestry 463. See Agricultural Economics 463.
- 464. Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Environmental Studies 464. Examines both theory and policy applications in the environmental area; selectively reviews the literature to provide a framework for understanding the relevant economic relationships and the criteria appropriate for policy assessment; emphasizes the characteristics of major environmental problems and policy choices; and considers the valuation of environmental amenities and the conflict between environmental quality and growth. Prerequisite: Economics 300 or consent of instructor. 1 unit.
- 466. Quantitative Analysis for Economics.** Studies topics in optimization: implicit function theorem, multipliers and Kuhn-Tucker conditions; topics in matrix algebra including characteristic roots and vectors, partitioned matrices, quadratic forms, special matrices; topics on difference and differential equations common in economic theory. 4 hours or 1 unit.
- 467. Mathematical Economics, I: Statics.** Studies quantitative techniques useful in economic analysis and decision making; mathematical programming; input-output analysis; point-set theory and game theory; existence, optimality, and stability conditions for static general equilibrium; and activity analysis, including welfare economics. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 468. Mathematical Economics, II: Dynamics.** Studies quantitative techniques useful in economic analysis and decision making; single and systems of difference and differential equations; dynamic programming; Pontryagin maximum principle; interaction of multiplier and accelerator; von Neumann model; Turnpike theorem; growth models; and control systems. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 470. Economic Statistics.** Classical statistics and regression analysis; descriptive statistics, probability and point and interval estimation; decision theory; variance analysis; and linear regression and least-squares estimates. Prerequisite: A course in statistics or consent of instructor. 1 unit.

- 471. Econometric Analysis.** Part 1: the construction of econometric models; characteristics of models and choice of estimating methods; and estimates of parameters by various methods. Part 2: Bayesian statistics and decision theory. Prerequisite: Economics 470 or equivalent. 1 unit.
- 472. Applied Econometrics.** Develops a general methodological basis for searching for quantitative economic knowledge; integrates and gives operational content to the topics of economic, statistical, and econometric theory. Prerequisite: Economics 471 or 476, or equivalent. 1 unit.
- 473. Time Series Analysis in Economics.** Modern time series analysis techniques for handling economic data which arises in a happenstance fashion through time and their application to specific economic problems. Prerequisite: Economics 471 or Statistics 478, or equivalent. 1 unit.
- 476. Econometrics, I.** Estimation of parameters for single-equation models; tests of hypotheses and confidence regions for regression models; large-sample theory in single-equation models; and Bayesian statistics in regression models. Prerequisite: Mathematics 315 and Statistics 310. 1 unit.
- 477. Econometrics, II.** Considers the specification of models with systems of simultaneous equations; identification problem, distributed lag models, K-class estimators, maximum likelihood estimators, three-stage least-squares, and effects of specification errors. Prerequisite: Economics 476. 1 unit.
- 478. Bayesian Inference in Econometrics.** Examines some standard econometric problems from the Bayesian perspective and compares Bayesian and classical inference. Prerequisite: Economics 476 or equivalent. 1 unit.
- 480. Industrial Organization.** Theory of the organization of markets and firms, behavior of firms, functioning of competitive systems, and performance of markets. 1 unit.
- 481. Anti-Trust and Business Policy.** Economic analysis of public policy for market structure and conduct; topics include anti-trust and mergers, predatory pricing, advertising, and technological advance. Prerequisite: Economics 480. 1 unit.
- 482. Government Regulation of Industry.** Microeconomic and econometric analyses of market failure and government response in selected industries; topics include economic effect of regulation, bureaucratic behavior, optimal policy, and strategies for regulatory reform. Prerequisite: Economics 402; Economics 480; or consent of instructor. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. $\frac{1}{4}$ to 1 unit.
- 491. Workshop and Research Seminar.** Workshops are offered in all areas of specialization in which graduate students are writing Ph.D. dissertations. The specific format varies, but in general workshop sessions include presentations by graduate students of thesis research, by faculty members of their current research, and by occasional outside speakers. Prerequisite: Admission to the Department of Economics Ph.D. program. $\frac{1}{2}$ unit. One unit of Economics 491 is required of all students in the Ph.D. program.
- 499. Thesis Research.** Preparation of thesis required of all students writing master's or doctoral theses in economics. 0 to 4 units.

EDUCATION

Dean of College: Professor Nancy S. Cole

College Office: 110 Education Building, 1310 South Sixth, Champaign

- 100. Education Practicum.** A laboratory course involving work in school and research projects of the instructor's choosing. For those who choose this option, it is taken in conjunction with Speech Communication 111 and 112, and Educational Policy Studies 201. 4 hours.
- 101. Education Practicum.** Continuation of Education 100. Prerequisite: Education 100 or consent of instructor. 4 hours.
- 111. Introduction to Education.** Introduces American public education, especially the goals,

- organization, structure and finance of schooling, and some of the typical problems teachers face. 1 hour.
- 112. Contemporary Issues in Education.** In depth analysis of how the issues of racism, sexism, IQ, bilingual/bicultural education, and mainstreaming impact on public schooling in the United States. Prerequisite: Education 111. 1 hour.
- 113. The Nature of Teaching.** Examines the general nature of the activity called teaching and the nature of the occupation of teaching in the United States; exposes students to various views of the concept of teaching, styles of teaching, teacher characteristics, the nature of the work itself, and an overview of the teacher's "role set." Prerequisite: Education 112. 2 hours.
- 114. Field Experience in Education.** Provides students with practical field experience in education; places students considering teaching as a career in public school classrooms where they will have a limited "hand on" experience; and provides students who have decided against teaching as a career the opportunity to investigate educational issues of interest to them under the supervision of the instructor. Prerequisite: Education 113. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 350. Exceptional Students in Regular Programs.** Instruction for prospective regular classroom teachers on the psychology and identification of exceptional children, including the learning disabled; methods of instruction for the exceptional child. Prerequisite: Degree candidate in a program approved by the Council on Teacher Education. 3 hours or 1 unit.
- 400. Methods of Educational Inquiry.** Critical consideration of research concepts and methods used in alternative means of contemporary educational inquiry. 0 or 1 unit.
- 449. Independent Study.** Offers opportunity of self-directed independent study, that is, develops the individual's ability as an independent student and enables the student to pursue interdisciplinary studies for which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the associate dean for graduate programs prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL POLICY STUDIES

Chairperson of Department: Professor C. J. Karier

Department Office: 360 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Foundations of American Education.** Studies some of the problems of formulating and justifying aims and policies in American education, of designing and systematizing the curriculum, of organization and social context of the public school system, and of the teaching-learning process; examined in terms of perspectives provided by social philosophy, history, sociology, and philosophy of education. 3 hours.
- 249. Independent Study.** Designed for students who wish to do advanced readings and research in greater depth and to investigate further ideas and themes that have been explored in Educational Policy Studies 199 and 201. Prerequisite: Educational Policy Studies 201; interest as attested to by instructors; and consent of adviser and staff member who supervises the work. 2 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 299. Undergraduate Seminar in Educational Policy Studies.** An advanced undergraduate seminar that builds upon introductory work in Educational Policy Studies 201 and includes historical, philosophical, legal, and social science perspectives on education. Requests for activation of this course may come from students or faculty. Prerequisite:

Educational Policy Studies 201 or equivalent, and consent of instructor. 0 to 9 hours. May be repeated.

- 300. The History of Education.** Brief introductory survey of ancient and medieval education followed by a more extended study of educational developments since the Italian Renaissance; emphasis on the relation of educational trends to broader social, economic, political, and intellectual movements. Prerequisite: Junior standing. 3 hours or $\frac{1}{2}$ unit.
- 301. Philosophy of Education.** Philosophical examination of selected educational issues; conveys a grasp of the complexities of the issues and some philosophical methods for dealing with them. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 302. History of American Education.** The development of American education in relation to political, social, and cultural developments; attention to the influence of movements in the cultural environment upon evolving conceptions of educational theory and practice. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 303. Comparative Education.** Introduction to the cross-cultural, cross-national study of educational institutions and their relationship to society. Topics may vary. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 304. Social Foundations of Education.** Introductory survey of the interrelationship between school and society, and of the impact on public education of the major social trends and forces operating in our society. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 305. History of Educational Ideas.** Studies selected educational theorists and intellectual movements; provides familiarity with the major educational ideas of the past and historical perspectives on current issues and problems in education; and readings in such authors as Aristotle, Plato, Quintilian, St. Augustine, Loyola, Comenius, Rousseau, Pestalozzi, Froebel, Herbart, and Dewey. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 306. Aesthetics, The Arts, and Education.** Theoretical introduction to the problems involved in teaching critical appreciation of the arts; examines materials from aesthetics, art history, and criticism for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 307. Aesthetics, Mass Communications, and Education.** Theoretical introduction to the problems involved in teaching a critical understanding of mass communications; examines materials from aesthetics, communication theory, and the social sciences for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 309. The Politics of Education.** An overview of the political structure and processes through which many of the major issues in education are treated; analyzes nature of the policymaking process in education and discusses the roles of principal participants in the process of educational decision making, but focuses on fundamental recurring issues in education and the ways these issues have been resolved or not resolved by the overall system. Particular attention to the role that both the federal and state judiciary as well as legislative authority have had in shaping educational policy. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 310. Economics of Education.** An introduction to economic concepts and their application to education, including investment and consumption theories of education and the role of human capital in economic growth and development; cost-benefit analyses in education, education and the distribution of income, and manpower and educational planning. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 315. Sociology of Education.** Same as Sociology 315. Education as a social process in various cultures and historical periods, emphasizing current systems in Westernized countries. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 385. Anthropology of Education.** Same as Anthropology and Educational Psychology 385. Introduction to the contribution of anthropology to the cross-cultural study of education, including discussion of material from representative cultures ranging from primitive social groups to present-day national states; special attention to education of minority ethnic and subordinate cultures; and emphasis on both informal and formal education as cultural process in relation to culture transmission, evolution, change, and development. Prerequisite:

site: A course in anthropology or sociology, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.

- 399. Issues and Developments in Educational Policy Studies.** Seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 400. Problems of Educational Theory.** Analysis of the kinds of problems encountered in constructing an educational theory, and of relations between educational theory and other disciplines, especially philosophy and the social sciences. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 401. Modern Theories of Education.** Critical analysis of the theories of educational research and practice as found in contrasting traditions of educational thought. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 402. Educational Movements in the Twentieth Century.** Historical study of significant educational trends during the past sixty years, with special reference to their influence on American education; an analytical examination of the principal transition movements in the last decade of the nineteenth century and of efforts to solve the problems since 1900. 1 unit.
- 403. The Historical Foundations of American Educational Thought.** Studies the evolution of educational theories and philosophies since the eighteenth century; particular reference to their impact upon educational developments in the United States; a broad view of the general growth of American educational thought; and attention to selected major educational theorists, or schools of thought, exploration of their fundamental ideas, and the relation of these ideas to significant intellectual currents in American culture. Prerequisite: Consent of instructor. 1 unit.
- 404. Seminar in Educational Classics.** Reading and group discussion of a limited number of the most important writings in educational philosophy which have had a profound influence on the progress of educational thought and practice. Prerequisite: Educational Policy Studies 305 or equivalent; consent of instructor. 1 unit.
- 405. Foundations of Aesthetic Education.** Philosophical approach to the problems of teaching for appreciation in formal education; appraisal of the status of aesthetic education, its nature and function, and its relation to other types of education. Prerequisite: Educational Policy Studies 306 or equivalent. 1 unit.
- 406. Seminar in the History of Education.** Intensive group study of a small number of selected problems to assist individual students to develop an understanding of and the ability to use the techniques of historical research in furthering such study; problems studied are selected in the light of the interests and previous training of the group of students enrolled. Prerequisite: Two courses in the history of education or consent of instructor. 1 unit.
- 407. Logical Foundations of Methods.** Studies the application of principles of logic (broadly construed) to methods and curriculum at all levels. Prerequisite: A course in philosophy of education and teaching experience, or consent of instructor. 1 unit.
- 408. Epistemology in Education.** Explores knowledge and inquiry as they relate to problems of formulating educational policy, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of epistemology (for example, Philosophy 329, 330, or 371), or equivalent; consent of instructor. 1 unit.
- 409. Values and Education.** Studies the nature of value as it relates to problems of formulating and justifying educational aims and policies, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of ethics or value theory, or equivalent; consent of instructor. 1 unit.
- 410. Seminar in Theories of Educational and Social Change.** Designed to help prospective educational leaders acquire an understanding of current theories of social change as these relate to educational institutions. There is now an extensive body of knowledge on the

nature and control of social change; this needs to be made available to all prospective educational leaders in order that they may go about their duties with greater understanding and skill. Designed to aid students in bringing this knowledge to bear upon the problems of leadership in educational and social change. Prerequisite: Educational Policy Studies 304 or equivalent. 1 unit.

- 411. Philosophy of Educational Research.** Examines some crucial assumptions and concepts of contemporary research in education from the point of view both of the consumer and the practitioner of educational research. Prerequisite: A course in philosophy of education and a course in the quantitative treatment of educational data, or equivalent, or consent of instructor. 1 unit.
- 412. Seminar: Dewey's Philosophy of Education.** Critical study of John Dewey's philosophy of education involving intensive study of original works. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 413. Seminar in Educational Concepts.** Some significant concepts, such as equality, authority, freedom, neutrality, indoctrination, objectivity, and teaching, are selected and examined in depth. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit. May be repeated.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 483. Methods in Comparative Education.** Designed to develop skills and understanding for field work related to the cross-national and cross-cultural study of education. Prerequisite: Consent of instructor. 1 unit.
- 484. Education in the Industrialized Nations.** Examines the social, political, and economic functions of educational systems in industrialized countries with emphasis upon the development of educational policy; focuses on Western Europe and North America. Prerequisite: Consent of instructor. 1 unit.
- 485. Education in the Developing Countries.** Analyzes of the role and functions of education in social, political, and economic development, with particular reference to the new and the developing countries. Prerequisite: Consent of instructor. 1 unit.
- 486. Education and International Relations.** Analyzes the role of education in international relations; emphasizes the policies and programs of the former colonial powers and the contemporary major national and international donor agencies, the competition among these agencies, and the results of foreign assistance programs in the developing countries. Prerequisite: Educational Policy Studies 303 or consent of instructor. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in educational policy studies; sections offered in the following fields: (a) history of education; (b) philosophy of education; (c) comparative education; (d) social foundations of education; (e) philosophy of educational research; and (f) historical methods in education. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL PRACTICE

Offices for Student Teaching: Secondary Education, 398 Education Building; Elementary Education, 306 Education Building; Special Education, 288 Education Building; Vocational and Technical Education, 347 Education Building; Art Education, 121 Art and Design Building; Dance Education, 4-305 Krannert Center for the Performing Arts; Health and Safety Studies, 113 Huff Hall; Music Education, 3004 Music Building; Physical Education, 111 Huff Hall; Speech and Hearing Science, 901 South Sixth Street; and Foreign Language, G-70-D Foreign Language Building.

Students entering teacher education curricula with 55 or more semester hours should apply for student teaching assignments during the first semester in the curriculum. However, such students must complete at least a semester before they may be admitted to educational practice.

- 150. School and Community Experiences.** Early field experiences in teacher education, including observation and laboratory experiences in public schools: designed to provide opportunities for career exploration, professional orientation, the development of insight into the interrelationship of theory and practice, and the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. Educational Practice in the Education of Exceptional Children.** A course in practice teaching which provides teaching experience with exceptional children. Prerequisite: Senior standing; consent of department; sufficient hours of background courses; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.
- 232. Educational Practice in Elementary Education.** A course in practice teaching to meet certification requirements for teaching in the elementary school. Prerequisite: Elementary and Early Childhood Education 233, 234, or 237 as required by the student's curriculum; senior standing; 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.
- 238. Educational Practice for Special Fields in Elementary Schools.** A course in student teaching to meet requirements for certification in special fields at the elementary school level. Prerequisite: For students in the early childhood education curriculum, Elementary and Early Childhood Education 334 required; consent of instructor; 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 3 to 8 hours.
- 242. Educational Practice in Secondary Education.** A course in practice teaching to meet certification requirements for teaching in the secondary school. Prerequisite: Satisfactory progress in an approved teacher education program, including 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.

EDUCATIONAL PSYCHOLOGY

Chairperson of Department: Professor Muriel Saville Troike

Department Office: 210 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Educational Psychology.** Basic undergraduate course in psychology of education for prospective teachers; materials and principles from the various areas of psychology (mental hygiene, psychology of learning, etc.) applied to the practical problems of teaching. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 236. Child Development for Elementary Teachers.** Study of child growth and development designed particularly for those preparing to teach in the elementary school; special

emphasis on the significance of the developmental process for educational programs and procedures; and systematic experience in studying and evaluating children's behavior and in handling children. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.

- 241. Sex Role Socialization: Implications for Schooling.** Reviews research and practice related to sex role socialization in education; examines sex differences in academic achievement and motivation and the effect of differential classroom environments on males and females. 3 hours.
- 249. Independent Study.** Study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclass status; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructor; consent of adviser and staff member who supervises the work. 1 to 4 hours.
- 250. Career Development Theory and Practice.** The design and implementation of an innovative life planning process; a participatory experience that includes a survey of theories, models, and research on life planning and that encourages systematic skill identification, values clarification, and the development of job search strategies. 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 311. Psychology of Learning for Teachers.** A study of the psychology of human learning as it applies to instruction, educational issues, and educational problems. Prerequisite: Educational Psychology 211 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 312. Mental Hygiene and the School.** Examination of social and emotional adjustment; study of normal personality, integration, feelings of inferiority, adjustment mechanisms, classroom therapy, and behavior disorders in children; and introduction to methods of child study and provision for emotionally disturbed children. Prerequisite: Educational Psychology 211; practice teaching or teaching experience. 2 hours or $\frac{1}{2}$ unit.
- 313. Child Language and Education.** Provides an overview of current knowledge about children's acquisition of communicative competence together with a consideration of the educational import of this developmental process. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 314. Sociocultural Influences on Learning.** Provides a general overview of the relationship of language, culture, and society to the teaching-learning process; gives broad exposure to research and theory concerned with the effects of sociocultural factors on cognition, perception, and motivation; also considers the effect of such factors on classroom interaction. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 315. Personality and Social Development.** Same as Psychology 365. See Psychology 365.
- 316. Discipline and Classroom Management.** A general overview of theories related to analyzing student behaviors in the classroom; the incidence and etiology of conduct problems and behavior disorders in the classroom, with emphasis upon preventive strategies and guiding principles for maintaining classroom discipline. Prerequisite: Educational Psychology 211 or 236, or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 341. Applications of Sex Role Theory to Counseling.** Reviews research on sex role socialization related to career, family, and personal roles for both sexes; discusses counseling strategies aimed at freeing persons from attitudes and behaviors that limit their freedom to choose; and reviews strategies for change at policy, agency and individual levels. 4 hours or 1 unit.
- 343. Individual Intelligence Testing.** Fundamental concepts relevant to the general problem of the individual testing of learning aptitude; acquisition of psychometric competence in the use of the 1960 Binet and the Wechsler tests; and acquaintance and limited practice in the administration, scoring, and interpretation of results obtained by performance scales and other devices appropriate for use with individuals having sensory, associative, and/or motor impairments. Prerequisite: Consent of instructor and 6 hours of psychology and Special Education 324, or Educational Psychology 392 or Psychology 390. 3 hours or 1 unit.

- 359. Professional Skill Development Workshop in Educational Psychology.** Laboratory, pre-practica, or workshops designed to teach practitioner-oriented skills in specialized areas of educational psychology; requests for initiation of sections in this course may be made by students or by faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 362. Adult Learning and Development.** Same as Administration, Higher, and Continuing Education 362. See Administration, Higher, and Continuing Education 362.
- 363. Instructional Design.** Same as Administration, Higher, and Continuing Education 363. The design, systematic development, and evaluation of instructional programs, including delineation of performance outcomes, analysis of concepts, design of instructional sequences, assessment of student performance, and survey of current research. Each student develops an instructional program. Prerequisite: A foundation course in educational psychology or psychology. 4 hours or 1 unit.
- 364. Psychological and Social Distortion of Information.** Study of how information is psychologically and socially constructed and distorted; implications for consumerism, political involvement, media monitoring, problem solving, policy making, and education. Prerequisite: Psychology 100. 3 hours or 1 unit.
- 385. Anthropology of Education.** Same as Anthropology and Educational Policy Studies 385. See Educational Policy Studies 385.
- 387. Computer Use in Education.** Overview of the nature and development of automation in education; use of electronic data processing systems for administrative purposes, for instruction, and for research; discussion of problems of computer management, natural language analysis, and simulation CAI applications; and laboratory experience with on-line terminals, remote entry devices, and peripheral equipment. Prerequisite: Educational Psychology 390 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 390. Elements of Educational Statistics.** Designed for terminal value for professional training of students not intending to pursue advanced graduate work, and for introductory value for students continuing graduate study in education; descriptive statistics, introduction to correlation and regression, the normal curve, statistical inference, and the presentation and interpretation of statistical data in educational literature. Prerequisite: Junior standing. 3 hours or 1 unit.
- 391. Construction and Use of Tests in Teaching.** The relationship of classroom testing to educational objectives and the curriculum; the construction, administration, and scoring of the various types of essay and short-answer tests; and other means of measuring the attainment of objectives and marking procedures. Designed primarily for classroom teachers. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
- 392. Introduction to the Principles of Measurement.** Study of the selection, preparation, administration, and interpretation of psychological and educational tests and diagnostic devices; emphasis on theory at a beginning level, with application to hypothetical school situations as a teaching device; and consideration of the sources of standard tests, criteria for their evaluation, methods of scoring, interpretation, and general and special areas. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
- 398. Evaluation Methods.** Introduces the methodology of educational program evaluation, including the design of an evaluation, the data collection techniques, approaches to data summarization, and the reporting and utilization of evaluative information; each student designs and conducts an evaluation project. Prerequisite: Educational Psychology 390. 3 hours or 1 unit.
- 399. Issues and Developments in Educational Psychology.** Experimentation or seminar on topics not treated by regularly scheduled courses. Requests for initiation of the course may be made by students or by faculty members. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 411. Psychology of Adolescence for Teachers.** Psychological significance of adolescence, its biological and social foundations, and its implications for education. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 412. Advanced Child Development for Students of Education.** Considers the nature of the

child and the child's development during the preschool and elementary school years; emphasis on development as a process of social learning; interpretation of the scientific literature as it concerns the educative process; and discussion of methods of studying and evaluating the behavior of the child as an individual and in group situations. Prerequisite: Educational Psychology 311 and 312. 1 unit.

- 413. Social Psychology and the Problems of Education.** Consideration of the concepts and methods of social psychology as applied to the professional functions of teachers, administrators, and other persons engaged in education; opportunity to work upon field problems. Prerequisite: Educational Psychology 311, 312, and 390. 1 unit.
- 414. The Psychology of College Teaching.** Designed particularly for graduate students minoring in education or preparing for college teaching. Psychoeducational problems in undergraduate and graduate teaching; special emphasis upon individual differences, remedial procedures, principles of learning, the technology of teaching and learning, adjustment problems of college students, counseling and advisory services, test construction, and analysis and use of test results and resource materials. Prerequisite: A course in psychology; consent of instructor. 1 unit.
- 415. Psychological Theories Applied to Education.** An advanced course in human behavior; special attention given to contemporary systems of psychology and their relationship to educational practice. Prerequisite: Educational Psychology 311 and 312; Educational Psychology 411 or 412; candidacy for Ed.D. or Ph.D. in Education. 1 unit.
- 420. Professional Seminar in Counseling Psychology.** Reviews the psychologists' professional code of ethics, the history of counseling psychology as a profession, and current theoretical and applied issues within the field of counseling psychology. 0 or 1 unit.
- 422. Basic Principles of Counseling.** Study of counseling processes that are especially applicable to the problems of normal individuals; study of the theories of education and personality which underlie counseling procedures for the purpose of developing the student's ability to evaluate these procedures. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 423. The Use of Tests in Guidance.** Practice in interpreting test results in case studies; study of the implications on test choices and usage of the philosophic orientation of the counselor, the type of case, the case setting, and the case information available; and discussion of the advantages and disadvantages of particular tests for given types of cases. Prerequisite: Educational Psychology 390, 392, and 422, or equivalent. 1 unit.
- 424. Supervised Practice in Educational Psychology.** Intensive supervised experiences in applied educational psychology; use of a wide variety of diagnostic and observational techniques and treatment. Students may take more than one section. Prerequisite: Master's degree in educational psychology or equivalent; consent of instructor. 1 to 2 units.
- 425. Principles and Practices of Student Personnel Services.** For teachers, administrators, student advisers, and others who are interested in basic guidance principles and in guidance methods useful to schools and to agencies dealing with out-of-school youth and adults; consideration of the role of guidance specialists and the guidance functions of community agencies. 1 unit.
- 426. Interpersonal and Personal Problem Solving for Counselors and Educators.** Studies how to facilitate the growth of persons experiencing difficulty with developmental tasks, stressful transitions, and life crises; builds on a knowledge of the problem-solving process, life span development, and of counseling theory and practice. Prerequisite: Admission to doctoral study or consent of instructor. 1 unit.
- 427. Principles and Techniques of Group Guidance.** Study of the principles of group guidance and their application; review of the historical development of group guidance and the study of pertinent research. Discussion and role playing have an important part in the work of the course, and case materials are utilized. Prerequisite: Educational Psychology 311, 312, 422, 423, and 425; or consent of instructor. 1 unit.
- 428. Theories of Career Development and the Use of Occupational Information.** Results of recent occupational research and use of these results by teachers and counselors; attention given to research techniques suitable for use in local occupational studies. Prerequisite: Educational Psychology 425 or an introductory course in counseling. 1 unit.

- 429. Field Instruction in Educational Psychology.** Individual instruction designed to help the advanced student apply basic principles of education or psychology in institutional settings. Each student is assigned to a school, community agency, or other applied settings for a supervised field experience in some aspect of educational psychology. Prerequisite: Master's degree in educational psychology or equivalent, and consent of instructor. 1 to 4 units. May be repeated to a maximum of 4 units; no more than 2 units may be taken in any given semester.
- 440. Social Development.** Research and theory relating to the social development of children; special attention to processes of social learning, environmental influences on social behavior, and the role of education in facilitating the development of social skills; and emphasis on experimental research conducted in naturalistic settings. Prerequisite: Educational Psychology 236 or Psychology 216, or equivalent; and Educational Psychology 390, Psychology 235, or equivalent. 1 unit.
- 445. Motivation and Achievement.** Examines the social, cultural, and psychological antecedents of achievement behavior; reviews current theories of achievement motivation, research, issues, and methodologies; and emphasizes applications to such areas as education, sport, and work. Gives special attention to age-related changes in motivation and achievement patterns. Prerequisite: Educational Psychology 390 or equivalent; Psychology 373 is recommended. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student; and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairperson prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 451. Evaluation of Educational Programs.** Same as Elementary and Early Childhood Education 451. See Elementary and Early Childhood Education 451.
- 460. Field Research in Educational Settings.** Examination of the conduct of research in educational settings with a focus on researcher-practitioner research collaboration; considers social psychological and design aspects of field research. Students engage in research in cooperation with local schools. Prerequisite: Educational Psychology 390 or equivalent, and consent of instructor. 1 unit.
- 461. School-University Research Practicum.** Focuses on developing skills in field-initiated research; includes research methods, implementation and evaluation of new education programs, and school district policy and operation. Students do a project designed to meet specific school needs under the direction of practicum advisers. Prerequisite: Educational Psychology 460; and Educational Psychology 496 or Psychology 306, or equivalent; or consent of instructor. 1 unit.
- 483. Single Subject Research Design.** Same as Special Education 483. See Special Education 483.
- 485. Multivariate Correlational Techniques in Educational Research.** Same as Psychology 486. Emphasis on educational research applications of correlational techniques; special attention to issues in principles of research design underlying appropriate uses of such techniques as multiple, partial, and part (semipartial) correlation and factor analysis; and illustration of techniques by examples drawn from published studies and projects conducted on this campus. Emphasis will be placed on application and interpretation of techniques rather than on theoretical rationales. Prerequisite: Educational Psychology 496 or equivalent; consent of instructor. 1 unit.
- 487. Research on Classroom Instruction.** An advanced course that reviews research findings on efficient and effective instruction in classrooms including research instruments, research procedures, and results; implementation of these findings for inservice and preservice programs; observation in ongoing classrooms; emphasis on conducting research and synthesizing research findings. Prerequisite: Educational Psychology 390; doctoral standing. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in educational psychology;

topics relate to the areas of specialization represented by the various divisions within the department. Prerequisite: Admission for doctoral study or consent of instructor. 0 to 1 unit. May be repeated to a maximum of 2 units in any area of specialization.

- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 492. Psychology of Learning and Instruction.** Same as Psychology 492. An advanced course in the nature and conditions of long-term cognitive learning and retention in classroom and similar situations; intended for doctoral students with a special interest in research leading to the improvement of classroom teaching and learning, in psychological aspects of curriculum research, and in the cognitive aspects of military and industrial training. Prerequisite: Consent of instructor. 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Psychology 494 and Sociology 494. See Psychology 494.
- 495. Theories of Measurement.** Same as Psychology 495. Classical test theory (true score, error of measurement, reliability and validity of test scores, composite measures); proposed alternatives to the classical model (generalizability theory, matrix sampling, latent trait theory, criterion-referenced measurement). Prerequisite: Educational Psychology 496 or Psychology 307, or equivalent; Educational Psychology 392 or Psychology 390, or equivalent. 1 unit.
- 496. Statistical Methods in Education.** Introduction to inferential statistical methods in education; includes probability theory, distribution theory, interval estimation, hypothesis testing, regression and correlational analysis, and analysis of variance. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
- 497. Advanced Statistical Methods in Education.** Advanced topics in analyses of variance and covariance, and principles of experimental design; brief introduction to multivariate analysis, including rudiments of matrix algebra. Prerequisite: Educational Psychology 496, Psychology 307, or equivalent. 1 unit.
- 498. Theories of Educational Evaluation.** Study of the process of educational program evaluation, its purpose and procedures, with emphasis on settings, personnel, and performance; review of principal theories; and study of models, histories, political contexts, ethics, and epistemology of evidence as they relate to the observation, judging, and reporting of educational programs. Prerequisite: Educational Psychology 390 and 392, or consent of instructor. 1 unit.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ELECTRICAL ENGINEERING

Head of Department of Electrical and Computer Engineering: Professor T. N. Trick
Department Office: 155 Electrical Engineering Building, 1406 West Green, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Seminar.** Discussions of educational programs, career opportunities, and other topics in electrical engineering. For electrical engineering students. 0 hours.
- 220. Basic Electric Circuit Analysis.** Fundamentals of electric circuit analysis including network theorems, transient, sinusoidal steady-state, and three-phase circuits. Prerequisite: Physics 107; Mathematics 242 or 245. 3 hours. Credit is not given for both Electrical Engineering 220 and 260. Electrical Engineering students receive no credit.
- 229. Introduction to Electromagnetic Fields.** Elementary electromagnetic field theory as summarized in Maxwell's equations in integral and differential form; wave propagation;

- and energy and power in electromagnetic fields. Prerequisite: Physics 107; Mathematics 345. 3 hours.
- 244. Electrical Engineering Laboratory, I.** Introduction to electronic instruments, basic measurement techniques, and basic electronic components; preparation for experimental projects. Prerequisite: Credit or concurrent registration in Electrical Engineering 260. 2 hours.
- 245. Electrical Engineering Laboratory, II.** Laboratory projects in various areas of electrical engineering. Prerequisite: Electrical Engineering 244; credit or concurrent registration in Electrical Engineering 342 or consent of instructor. 2 hours.
- 246. Project Laboratory.** Planning, designing, executing, and evaluating various experimental projects by the student along with discussion of the actual examples of experimental design, error control, and data processing. Prerequisite: Senior standing in electrical engineering; consent of instructor. 2 to 4 hours.
- 249. Digital Systems Laboratory.** Introduction to the experimental analysis and synthesis of digital networks. Prerequisite: Electrical Engineering 244 and 290, or consent of instructor. 2 hours. Students may not receive credit for both Electrical Engineering 249 and Computer Science 265.
- 250. Laboratory Applications of Microcomputers.** Introduction to microcomputer function and use at the board level; hardware and software design for interfacing; control, data-logging, and signal-conditioning applications; and peripherals and expansion. Laboratory assignments accompany the lectures and an individual project is completed at the end of the course. Prerequisite: Electrical Engineering 290 or equivalent. 4 hours. Credit is not given for both Electrical Engineering 250 and 291.
- 251. Interactive Language Organization for Microcomputer Systems.** Examines the implementation of interactive languages on microcomputers; studies operating systems, properties of interactive languages, outer and inner interpreters, combining with machine code, and interfacing to peripheral devices; laboratory assignments on microcomputer systems. Not intended for computer science or computer engineering majors. Prerequisite: Electrical Engineering 290 or equivalent. 3 hours.
- 260. Introduction to Circuit Analysis.** Elementary signals; basic principles of network analysis; and sinusoidal steady-state analysis. Prerequisite: Physics 107 and credit or registration in Mathematics 345 and Computer Science 101 or 121. 3 hours. Credit is not given for both Electrical Engineering 260 and 220.
- 271. Electrical Engineering Special Topics.** Prerequisite: As specified by department or instructor. 0 to 4 hours.
- 272. Electrical Engineering Problems.** Prerequisite: Approved written application to department as specified by department or instructor. 0 to 4 hours.
- 288. Economic Aspects of Engineering.** Fundamental principles of engineering economy. Prerequisite: Junior standing in engineering or consent of instructor. 3 hours. Students may not receive credit for both Electrical Engineering 288 and General Engineering 288.
- 290. Introduction to Computer Engineering.** Introduction to digital logic and computer systems. Representation of information; combinational network analysis and design; sequential network analysis and design; computer organization and control; machine level programming. Prerequisite: Computer Science 101 or 121. 3 hours. Students may not receive credit for both Electrical Engineering 290 and Computer Science 264.
- 291. On-Line Computing.** On-line computer use; includes assembly language programming, I/O processes and devices, interrupts and priority, semaphores, real-time operations, multi-tasking, data acquisition, and computer-based control and communication. Prerequisite: Electrical Engineering 290, Computer Science 264, or consent of instructor. 3 hours. Credit is not given for both Electrical Engineering 291 and either Electrical Engineering 250 or Computer Science 221.
- 296. Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various

aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

299. Thesis. Preliminary reading and investigation. 0 to 3 hours.

302. Electronic Music Synthesis. Survey of methods of electronic music production; musical notation translated into engineering terms; analysis and synthesis of sound spectra; electronic circuits for synthesis of musical sounds; and digital computer sound synthesis. Prerequisite: Music 100 or equivalent, Electrical Engineering 290 and 342. 3 hours or $\frac{3}{4}$ unit.

303. Topics in Audio Engineering. Sound perception related to audio; review of wave phenomena; acoustics of rooms and auditoriums; characteristics of microphones and loudspeakers; magnetic recording; and topics of specialized interest. Prerequisite: Electrical Engineering 260 and 373, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

309. Circuit, Signal, and System Analysis. Network modeling; Laplace transform; network functions; frequency response plots; input-output stability; state space methods; Fourier series; and Fourier integral. Prerequisite: Electrical Engineering 220 or 260, or equivalent. 4 hours or 1 unit. May not be taken for credit by graduate students in electrical engineering.

310. Digital Signals and Systems. Discrete-time signals and systems; convolution sum; difference equations; Z-transform; sampling theorem and data conversion; digital filter design and implementation; discrete signal analysis and the Fast Fourier Transform; and state variable methods with application to digital control and communications. Prerequisite: Electrical Engineering 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

311. Microcomputer Laboratory. Design, construction, and use of a small general purpose computer with a micro-processor CPU; MSI and LSI circuits used extensively; control panel, peripheral controllers, control logic, central processor, and programming experiments; and open lab format. Prerequisite: Electrical Engineering 249 or Computer Science 265; Electrical Engineering 291 or Computer Science 221. Credit or concurrent registration in Electrical Engineering 312 is recommended. 3 hours or $\frac{3}{4}$ unit.

312. Computer Organization and Design. Basic computer organization, design constraints for digital circuits, arithmetic algorithms and hardware implementation, memory devices and system organization, control logic and microprogramming, and input-output devices and intrasystem communication. Prerequisite: Electrical Engineering 290 or Computer Science 264; Electrical Engineering 250 or 291, or Computer Science 221. 3 hours, or $\frac{3}{4}$ or 1 unit.

313. Probabilistic Methods of Signal and System Analysis. Introduction to probabilistic methods, analysis of random signals and noise, and applications to electrical engineering problems, including reliability of circuits and systems and effects of noise systems. Prerequisite: Electrical Engineering 309. 3 hours or $\frac{3}{4}$ unit. Electrical Engineering majors may not receive graduate credit.

314. Biomedical Instrumentation. Same as Bioengineering 314. Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical transducers for measurements of biopotentials, ions and gases in aqueous solution, force, displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; and therapeutic and prosthetic devices. Prerequisite: Electrical Engineering 260 and 244, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

315. Biomedical Instrumentation Laboratory. Same as Bioengineering 315. Laboratory to accompany Electrical Engineering/Bioengineering 314. Studies medical instrumentation and transducers for static and dynamic nonbiological inputs and measures actual biomedical signals; requires some animal experiments. Prerequisite: Credit or concurrent registration in Electrical Engineering 314. 2 hours or $\frac{1}{2}$ unit.

319. Applied Modern Algebra. Same as Mathematics 319. See Mathematics 319.

321. Introduction to Controlled Thermonuclear Fusion. Same as Nuclear Engineering 321. See Nuclear Engineering 321.

324. Analog Filter Design. Properties of passive network functions; synthesis of RC and LC passive network functions; operational amplifier; RC active circuit synthesis; sensitivity of

- networks; approximation theory; and practical filter design. Prerequisite: Electrical Engineering 309. 3 hours or $\frac{1}{4}$ unit.
- 325. Introduction to the VLSI System Design.** Same as Computer Science 335. Introduction to the design and layout of VLSI (very large scale integrated) chips for complex digital systems using integrated circuit cells as building blocks and employing hierarchical design methods; novel architectures are designed and implemented, using given technology and design rules on a mini-computer system in the lab. Prerequisite: Electrical Engineering 249 and 312 or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 330. Electromechanics.** Quasi-static electromagnetic fields; lumped-parameter electromechanics; rotating machines; dynamics of electromechanical systems; fields and moving media; and transducers and actuators. Prerequisite: Electrical Engineering 229 and 260. 3 hours or $\frac{1}{4}$ unit. May not be taken for credit by graduate students in electrical engineering.
- 331. Introduction to Electric Power Engineering.** Magnetic circuit fundamentals; single-phase and three-phase AC analysis; equivalent circuits of power system elements; methods of power system modeling and analysis. Prerequisite: Electrical Engineering 260. 3 hours or $\frac{1}{4}$ unit. May not be taken for credit by graduate students in electrical engineering.
- 332. Induction Motors and DC Machines.** The fundamentals and applications of single- and three-phase induction motors and DC machines. Prerequisite: Senior standing. 3 hours or $\frac{1}{4}$ unit.
- 333. Electric Machinery.** Theory and laboratory experimentation with three-phase power, power factor correction, single- and three-phase transformers, induction machines, DC machines, and synchronous machines; includes project work on energy control systems; digital simulation of machine dynamics. Prerequisite: Electrical Engineering 330 and 331. 4 hours or 1 unit. May not be taken for credit by graduate students in electrical engineering.
- 336. Advanced Electric Machinery.** Advanced rotating machine theory and practice, dynamic analysis of machines using reference frame transformations, tests for parameter determination, reduced order modeling of machines; mechanical subsystems including governors, prime movers, excitation systems, digital simulation of inter-connected machines. Prerequisite: Electrical Engineering 333. 3 hours or $\frac{1}{4}$ unit.
- 338. Communication Networks for Computers.** Same as Computer Science 338. See Computer Science 338.
- 339. Computer Aided Design for Digital Systems.** Same as Computer Science 339. See Computer Science 339.
- 340. Solid State Electronic Devices.** Semiconductor materials and their electronic properties and applications to electronic devices; p-n junctions, transistors, and other diode and triode devices; and low-frequency applications of diodes. Prerequisite: Physics 108; Mathematics 345. 3 hours or $\frac{1}{4}$ unit.
- 342. Electronic Circuits.** Introduces analysis and design of analog and digital integrated circuits using bipolar and MOS field effect transistors. Prerequisite: Electrical Engineering 340; credit or concurrent registration in Electrical Engineering 309. 3 hours or $\frac{1}{4}$ unit. May not be taken for graduate credit by students in Electrical Engineering.
- 344. Theory and Fabrication of Solid State Devices.** Laboratory and lecture course on the physical theory, design, and fabrication of solid state devices; includes the electronic properties of semiconductors (such as mobility, carrier concentration, lifetime, energy gap), and techniques for fabricating (oxidation, diffusion, oxide masking, alloying) p-n junction devices. Prerequisite: Electrical Engineering 340. 4 hours or 1 unit.
- 346. Hybrid Circuit Fabrication Laboratory.** Same as Ceramic Engineering 346. Laboratory course on the basics of fabricating thin- and thick-film components as used in hybrid electronic circuits; experiments covering vacuum deposition, sputtering, anodization, resist processes, screen preparation, screen printing, and firing and trimming. Lectures provide background material and cover trade-offs of the two technologies. Prerequisite: Electrical Engineering 340. 2 hours or $\frac{1}{2}$ unit.
- 347. High-Frequency Circuit Design Using Scattering Parameters.** Laboratory and lecture on the use of scattering parameters for the design of high-frequency amplifiers. Prerequisite: Electrical Engineering 353. 2 hours or $\frac{1}{2}$ unit.

- 348. Introduction to Artificial Intelligence.** Same as Computer Science 348. An introductory description of the major subjects and directions of research in artificial intelligence; topics include AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Prerequisite: Electrical Engineering 291 or Computer Science 225; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 350. Lines, Fields, and Waves.** Wave equation, free and guided wave propagation, waveguides, and radiation. Prerequisite: Electrical Engineering 229 and 260. 3 hours or $\frac{3}{4}$ unit.
- 351. Microwave Laboratory.** Laboratory analysis at UHF and microwave frequencies. Prerequisite: Electrical Engineering 350. 2 hours, or 0 to $\frac{1}{2}$ unit.
- 352. Electromagnetic Fields.** Plane waves at oblique incidence, wave polarization, anisotropic media, radiation, space communications, and waveguides. Prerequisite: Electrical Engineering 350. 3 hours or $\frac{3}{4}$ unit.
- 353. Radio Communication Circuits.** Design of a radio system for transmission of information: types of receivers, matching techniques, receiver and antenna noise, types of modulation, high-frequency circuitry, and point-to-point and satellite communications. Prerequisite: Electrical Engineering 309 and 342; credit or concurrent registration in Electrical Engineering 350. 4 hours or 1 unit.
- 354. Antennas.** Antenna parameters; polarization of electromagnetic waves; basic antenna types; antenna arrays; broadband antenna design; and antenna measurements. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 355. Optical Electronics.** Optical beams and cavities; semiclassical theory of gain; characteristics of typical lasers; and application of optical devices. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or 1 unit.
- 356. Applied Electrostatics.** Discusses commercial and industrial applications of electrostatics, emphasizing general physical laws which govern their behavior; selects examples from a variety of areas, including computer peripherals, copying equipment, electric power transmission, biomedical instrumentation, and smoke detectors. Prerequisite: Electrical Engineering 229 or equivalent, and senior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 358. Applications of Radio Wave Propagation.** Terrestrial atmosphere, radio wave propagation, and applications to radio sensing and radio communication. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 359. Analog and Pulse Communication Systems.** Introduction to amplitude, phase, frequency, and pulse code modulation systems; discusses bandwidth requirements, effects of noise and applications in commercial broadcast, and telephone and satellite communications. Prerequisite: Credit or concurrent registration in Electrical Engineering 313 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 360. Coherent Optics Laboratory.** Introduction to the properties and applications of coherent laser light; experiments in interferometry, optical processors and spatial filtering, holography, optical communications, fiber optics, and special projects. Prerequisite: Credit or concurrent registration in Electrical Engineering 309 and 350; or Physics 371; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 361. Introduction to Digital Communication Systems.** Introduction to signals and noise in digital communication systems; analysis and design of efficient digital communication receivers; and signal design for, and performance of, practical communication systems. Prerequisite: Electrical Engineering 313 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 364. Power Electronics.** Existence of switching functions and methods of control such as pulse-width, pulse modulation, and phase control; studies the various converters including DC-DC, AC-DC, AC-DC DC-AC, AC-AC, and cycloconverters; examines switching devices. Prerequisite: Electrical Engineering 309 or equivalent; credit or concurrent registration in Electrical Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 366. Introduction to Surface Acoustic Waves.** Basic ultrasonic principles; piezoelectricity; transducer equivalent circuits; and radar and communication system applications: delay lines, bandpass filters, oscillators, synthesizers, matched filters, convolvers, and Fourier

- transformers. Prerequisite: Electrical Engineering 309 and 350, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 368. Solid-State Motor Drive Systems.** General principles of solid-state motor drives using silicon-controlled rectifiers and integrated circuits; discusses drive systems and components including inverters, frequency converters, motors, generators, and control systems; and industrial applications. Prerequisite: Electrical Engineering 330 or 331. 3 hours or $\frac{3}{4}$ unit.
- 369. Semiconductor Device and Linear IC Applications Laboratory.** Laboratory study of applications of unijunction transistors, silicon-controlled rectifiers, triacs, field effect transistors, and linear integrated circuits such as differential amplifiers, operational amplifiers, and linear communications integrated circuits. One hour of lecture and a three-hour laboratory each week. Prerequisite: Electrical Engineering 342. 2 hours or $\frac{1}{2}$ unit.
- 371. Topics in Electrical Engineering.** Lectures and discussions relating to new areas of interest. Prerequisite: Specified by department or instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 373. Fundamentals of Engineering Acoustics.** Same as Theoretical and Applied Mechanics 373. Development of the basic theoretical concepts of acoustical systems; mechanical vibration, plane and spherical wave phenomena in fluid media, lumped and distributed resonant systems, and absorption phenomena and hearing. Prerequisite: Mathematics 345 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 374. Ultrasonic Techniques.** Ultrasonic wave propagation, generation, detection, and measurement in liquid and solid media, acoustic impedance concepts, ultrasonic absorption and velocity measurement techniques, piezoelectricity, and discussion of industrial, experimental, bioengineering, and medical applications. Prerequisite: Electrical Engineering 373 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 375. Modeling of Bio-Systems.** Same as Bioengineering 375. Application of linear systems theory and feedback control systems analysis to biological systems; sensory receptors, neuro-muscular system models, control of eye movement, the pupil control system, man-machine interactions, parameter identification in biological systems; and optional project laboratory. Prerequisite: General Engineering 222, Mechanical Engineering 265, or Electrical Engineering 309; or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 376. Power System Analysis.** Examines the development of power system equivalents, per phase network analysis, load flow, symmetrical components, sequence networks, fault analysis, and digital simulation. Prerequisite: Electrical Engineering 330 and 331. 3 hours or $\frac{3}{4}$ unit.
- 378. Power System Operation and Control.** Studies economic operation of power systems, system protection, power system stability, dynamics and control of power systems, high voltage DC transmission, load flow interface, digital simulation. Prerequisite: Electrical Engineering 376. 3 hours or $\frac{3}{4}$ unit.
- 379. Pulse and Digital Laboratory.** Laboratory to accompany Electrical Engineering 380. Prerequisite: Credit or concurrent registration in Electrical Engineering 380. 1 hour or $\frac{1}{4}$ unit.
- 380. Pulse and Digital Circuits.** Analysis and design of circuits in which nonlinearities of the active devices are a significant factor or in which the signals are primarily pulses; generation, transmission, and processing of such signals. Appropriate for small-scale instrumentation as well as to large systems such as computers. Prerequisite: Electrical Engineering 290 and 342; credit or concurrent registration in Electrical Engineering 379, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 382. Large Scale Integrated Circuit Design.** Bipolar and MOS field effect transistor characteristics; VLSI fabrication techniques for MOS and bipolar circuits; calculation of circuit parameters from the process parameters; and design of VLSI circuits such as logic, memories, charge-coupled devices, and A/D and D/A converters. Prerequisite: Electrical Engineering 290, 340, and 342. 3 hours or $\frac{3}{4}$ unit.
- 383. Principles and Application of Linear Integrated Circuits.** Techniques of analysis and synthesis of linear integrated circuits, concentrating on linear integrated circuit biasing

systems, building blocks, differential amplifiers, operational amplifiers, and integrated circuits used in communications; analysis of integrated circuits by hand calculations and by specialized computer analysis programs. Prerequisite: Electrical Engineering 342. 3 hours or $\frac{3}{4}$ unit.

- 386. Control Systems.** Analysis and design of control systems with emphasis on modeling, state variable representation, computer solutions, modern design principles, and laboratory techniques. Prerequisite: Electrical Engineering 309 or consent of instructor. 4 hours or 1 unit.
- 387. Introduction to Quantum Electronics for Electrical Engineers.** Introduction for the senior electrical engineering student to the application of quantum mechanical concepts to electronics problems; specifically, application of elementary quantum mechanics to the detailed study of a calculable two-state laser system; and incidental quantum ideas bearing on electronics. Prerequisite: Physics 383 or consent of instructor. 3 hours or 1 unit.
- 390. Introduction to Optimization.** Basic theory and methods for the solution of optimization problems; iterative techniques for unconstrained minimization; and introductory presentation of linear and nonlinear programming with engineering applications. Prerequisite: Computer Science 101 or Mathematics 343, or consent of instructor. 3 hours or 1 unit.
- 391. Switching Theory.** Same as Computer Science 391 and Mathematics 391. See Mathematics 391.
- 392. Finite State Machines.** Same as Computer Science 392 and Mathematics 392. See Mathematics 392.
- 397. Projects and Lectures in Quantum Electronics.** Studies processes involving quantum mechanical energy transfers in energized media leading to various laser devices and their applications. A series of lectures, supplementing the special projects, offers background information on spectroscopy, collisional energy transfer, laser pumping schemes, modulation at optical frequencies, holography, and other related topics. Prerequisite: Senior standing; consent of instructor; Electrical Engineering 387 is recommended. 3 hours or $\frac{3}{4}$ unit.
- 400. Seminar.** Required of all graduate students. 0 units.
- 412. Computer Architecture.** Advanced concepts in computer architecture; design, management, and modeling of memory hierarchies, stack-oriented processors, associative processors, pipelined computers, and multiple processor systems; and focuses on hardware alternatives in detail and their relation to system performance/cost. Prerequisite: Electrical Engineering 312 or Computer Science 333, or consent of instructor. 1 unit.
- 415. Control System Theory and Design.** Synthesis of feedback control systems to meet design specifications, including sensitivity; multivariable systems; introduction to systems with random inputs; state variable techniques; and nonlinear systems. Prerequisite: Electrical Engineering 386 or equivalent, or consent of instructor. 1 unit.
- 416. Analysis of Networks and Systems.** Dynamic equations of linear lumped networks and systems; time-domain analysis and state space methods; frequency-domain analysis and transform methods; stability criteria; and applications to various problems in electrical engineering. Prerequisite: Electrical Engineering 309. 1 unit.
- 417. Nonlinear and Adaptive Control.** Studies design of nonlinear control systems based on stability considerations; examines Lyapunov and hyperstability approaches to analysis and design of model reference adaptive systems; identifiers, observers, and controllers for unknown plants. Prerequisite: Electrical Engineering 415. 1 unit.
- 418. Electric and Magnetic Fields.** Rigorous treatment of basic laws, static fields, typical field systems, harmonic functions, conjugate functions, and conformal transformation. 1 unit.
- 420. Electromagnetic Waves and Radiating Systems.** Fundamental electromagnetic theory with applications to transmission lines, waveguides, and antennas; introduction to the solution of advanced problems in static electric and magnetic fields. Prerequisite: Electrical Engineering 352. 1 unit.
- 421. Advanced Electromagnetic Engineering.** Reciprocity and equivalence principles; formulation of scattering and diffraction problems; approximations for large and for short

wavelengths; plane, cylindrical, and spherical wave problems; variational methods; Wiener-Hopf techniques; and applications to antennas and waveguide problems. Prerequisite: Electrical Engineering 420. 1 unit.

- 422. Controlled Fusion Systems, I.** Same as Nuclear Engineering 422. See Nuclear Engineering 422.
- 423. Gaseous Electronics and Plasmas.** Basic concepts and techniques, both theoretical and experimental, which are used in the areas of gaseous electronics, gas and solid plasmas, controlled fusion, aeronomy, gas lasers, and magnetohydrodynamics. Prerequisite: Physics 383 or Electrical Engineering 352, or equivalent; or consent of instructor. 1 unit.
- 425. Nuclear-Electrical Energy Conversion.** Same as Nuclear Engineering 425. See Nuclear Engineering 425.
- 428. Analysis of Nonlinear Systems.** Same as Theoretical and Applied Mechanics 428. Treatment of singular points and stability considerations; consideration of graphical and analytical methods, including the perturbation method, variation of parameters, Galerkin's method, and the Ritz method for solving nonlinear differential equations. Prerequisite: Mathematics 341; consent of instructor. 1 unit.
- 431. Theory of Guided Waves.** Propagation in general cylindrical waveguides; eigenvalue problems, stationary principles, microwave circuit theorems, boundary value problems, and the determination of circuit parameters; and periodically loaded waveguides with anisotropic media. Prerequisite: Electrical Engineering 420. 1 unit.
- 432. Compound Semiconductors (Optical Devices).** Properties of III-V and II-VI compound semiconductors and the devices which are unique to these materials; emphasis on materials such as GaAs, Ga(AsP), GaP, CdSe, Cd(SeS), etc., and on luminescence, semiconductor lamps, and semiconductor lasers. Prerequisite: Graduate standing in electrical engineering with some background in modern physics; elementary quantum mechanics; elementary semiconductor theory or equivalent. 1 unit.
- 433. Theory of High-Speed Parallel Computation.** Same as Computer Science 433. See Computer Science 433.
- 434. Random Processes.** Basic concepts of random processes; spectral analysis; linear systems with random inputs; Markov chains and Markov processes; and applications to communications and control systems engineering. Prerequisite: Mathematics 361 or equivalent, or Electrical Engineering 361. 1 unit.
- 435. Theory of Semiconductors and Semiconductor Devices.** Same as Physics 435. Introductory quantum mechanics of semiconductors; energy bands; dynamics of Bloch electrons in static and high-frequency electric and magnetic fields; equilibrium statistics; transport theory, diffusion, drift and thermoelectric effects; and characteristics of p-n junctions, heterojunctions, and transistor devices. Prerequisite: Senior-level course in quantum mechanics or atomic physics. 1 unit.
- 437. Principles of Microwave Measurements.** Generation and detection of the laboratory signal; the generalized impedance concept; matrix representation of waveguide discontinuities; determination of equivalent network parameters; analysis of measurement techniques by signal flow graphs; and accuracy criteria. Prerequisite: Electrical Engineering 355. 1 unit.
- 439. Advanced Theory of Semiconductors and Semiconductor Devices.** Continuation of Electrical Engineering 435. Selected advanced topics of current interest in the physics of semiconductors and solid-state devices. Prerequisite: Electrical Engineering 435. 1 unit.
- 441. Computer Systems Analysis.** Same as Computer Science 441. See Computer Science 441.
- 442. Design of Fault-Tolerant Digital Systems.** Formal models and concepts in fault diagnosis, fault-tolerant systems, redundancy, and self-checking systems; case studies and state-of-the-art survey of fault-tolerant computing. Prerequisite: Electrical Engineering 312 and 391, or equivalent. 1 unit.
- 445. Advanced Physical Acoustics.** Same as Theoretical and Applied Mechanics 445. Advanced topics in acoustics including physical properties of a fluid; linear propagation phenomena; nonlinear phenomena such as radiation force, streaming, and harmonic generation; cavitation; and absorption and dispersion. Prerequisite: Electrical Engineering

373 or 420, or Theoretical and Applied Mechanics 458, or equivalent; or consent of instructor. 1 unit.

- 447. Image Processing.** Examines fundamental concepts, techniques, and directions of research in image processing; topics include two-dimensional Fourier transform and filtering, image digitization, coding, restoration, reconstruction, analysis, and recognition. Prerequisite: Electrical Engineering 310 and 313; or equivalent. 1 unit.
- 448. Computer Models of Cognitive Processes.** Formal models and concepts in vision and language; detailed analysis of computer vision, language, and learning problems; relevant psychological results and linguistic systems; and survey of the state of the art in artificial intelligence. Prerequisite: Electrical Engineering 348. 1 unit.
- 449. Computer Vision.** Examines information processing approaches to computer vision, and algorithms and architectures for artificial intelligence and robotics systems capable of vision: inference of three-dimensional properties of a scene from its images, such as distance, orientation, motion, size and shape, acquisition and representation of spatial information for navigation and manipulation in robotics. Prerequisite: Electrical Engineering 348 or Computer Science 225, or consent of instructor. 1 unit.
- 451. Digital Signal Processing.** Reviews basic concepts of digital signals and systems; examines computer-aided digital filter design, quantization effects, decimation and interpolation, fast algorithms for convolution and the DFT; and introduces adaptive signal processing. Prerequisite: Electrical Engineering 310 and 313; or equivalent. 1 unit.
- 452. Computational Techniques for Circuit Analysis and Design.** Formulation of circuit equations; sparse matrix algorithms for the solution of large systems, AC, DC, and transient analysis of electrical circuits; sensitivity analysis; decomposition methods. Prerequisite: Mathematics 315 and Electrical Engineering 309. 1 unit.
- 453. Optimum Control Systems.** Formulation of the optimization problem; controllability; observability; stability; Lyapunov's second method; application of variational calculus, maximum principle, and principle of optimality to control problems; stochastic control; and adaptive control. Prerequisite: Electrical Engineering 415. 1 unit.
- 454. Sampled-Data Control Systems.** Analysis and design of feedback control systems with digital and sampled data. Prerequisite: Electrical Engineering 415 or equivalent. 1 unit.
- 455. Control of Stochastic Systems.** Stochastic control models; development of control laws by dynamic programming; separation of estimation and control; Kalman filtering; self-tuning regulators; dual controllers; decentralized control. Prerequisite: Electrical Engineering 415 and 434. 1 unit.
- 456. Coding Theory.** Same as Computer Science 456 and Mathematics 476. General discussion on coding theory with emphasis on the algebraic theory of cyclic codes; error-control procedures and circuits; and applications to computers and data-transmission systems. Prerequisite: Mathematics 317 or equivalent, or consent of instructor. 1 unit.
- 458. Multidimensional Digital Signal Processing.** Multidimensional signals, convolution, transforms, stability, sampling, windowing; design of two-dimensional digital filters; fast algorithms for multidimensional convolution, DFT, and corner turning; sensor array processing, including tomography and synthetic aperture radar; multidimensional interpolation. Prerequisite: Electrical Engineering 451. 1 unit.
- 460. Principles of Optical Communications Systems.** Characteristics of optical communication systems; topics include optical fibers, integrated optics, transmitter and receiver optics, detection techniques, photon counting, digital and analog communication, and lidar. Prerequisite: Electrical Engineering 313 and 420, or equivalent. 1 unit.
- 461. Signal Detection and Estimation.** Introduction to detection and estimation theory, with applications to communication, control, and radar systems; decision-theory concepts and optimum-receiver principles; detection of random signals in noise, coherent and non-coherent detection; and parameter estimation, linear and nonlinear estimation, and filtering. Prerequisite: Electrical Engineering 434 or equivalent, or consent of instructor. 1 unit.
- 462. Topics in Signal Detection and Estimation.** Topics selected from the following: nonlinear filtering; robust detection, estimation, and filtering; detection and estimation of point processes; quantum detection; advanced computational methods in linear filtering; white

- noise calculus for nonlinear systems. Students must complete a project. Prerequisite: Electrical Engineering 461 or consent of instructor. 1 unit.
- 463. Information Theory.** Same as Computer Science 463 and Mathematics 463. See Mathematics 463.
- 465. Topics in Automata Theory.** Same as Computer Science 465 and Mathematics 465. See Mathematics 465.
- 467. Communication Network Analysis.** A first high-level course in performance analysis and design of multiple-user communication systems; emphasizes rigorous formulation and analytical and computational methods; includes queueing networks, decentralized minimum delay routing and dynamic network flow control. Prerequisite: Computer Science 338, and either Electrical Engineering 434 or Mathematics 366; or consent of instructor. 1 unit.
- 469. Introduction to Coherent Optics and Holography.** Same as Computer Science 469. The diffraction transformation of aperture distributions between parallel planes and the imaging and Fourier-transforming properties of lenses; the theory of coherence; the principles of optical and digital holography; and devices and systems for optical data processing. 0 or 1 unit.
- 470. Nonlinear Optics.** Light propagation in anisotropic crystals; second- and third-order nonlinear susceptibility and electro-optic effect; and discussion of the relationship of these effects along with such applications as light modulation, harmonic generation, and optical parametric amplification and oscillation. Prerequisite: Electrical Engineering 420. 1 unit.
- 472. Quantum Electronics.** Brief theoretical introduction to quantum mechanics and atomic physics, with many applications in spin resonance and modern maser theory. Prerequisite: Physics 385 recommended. 1 unit.
- 473. Power System Control.** Studies energy control center functions, state estimation and steady state security assessment techniques, economic dispatch, optimal power flow, automatic generation control, and dynamic equivalents. Prerequisite: Electrical Engineering 376 or consent of instructor. 1 unit.
- 474. Topics in Graph and Geometric Algorithms.** Same as Computer Science 474. Design and analysis of computational methods for problems in graph theory and computational geometry; graph connectivity and isomorphism, flow in networks, and matching and covering; and geometric inclusion, proximity intersection and reachability, and applications to computational statistics. Prerequisite: Computer Science 373, or Computer Science 321 and either Mathematics 319 or Mathematics 313, or equivalent; or consent of instructor. 1 unit.
- 475. Ionospheric Radio Propagation.** Propagation in a stratified medium; WKB solution; ray theory; ionospheric sounding; ionospheric transmission problems; scattering by irregularities; propagation in a random medium; cross-modulation and nonlinear effects; magneto-ionic theory; Faraday effect; whistler propagation; coupling of characteristic waves; magnetohydrodynamic waves; formation of ionospheric E-region; and formation of F-region. Prerequisite: Electrical Engineering 420 or equivalent. 1 unit.
- 476. Power System Dynamics and Stability.** Detailed modeling of the synchronous machine and its controls, such as excitation system and turbine-governor dynamics; time-scales and reduced order models; non-linear and linear multi-machine models; stability analysis using energy functions; power system stabilizers. Prerequisite: Electrical Engineering 376 or consent of instructor. Concurrent registration in Electrical Engineering 415 is recommended. 1 unit.
- 477. Advanced Antenna Theory.** Selected topics from recent engineering literature on antennas supplemented by advanced topics in electromagnetic theory needed for comprehension; current techniques for analysis of wire, slot, horn, frequency independent, quasi-optical, and array antennas. Prerequisite: Electrical Engineering 420. 1 unit.
- 478. Advanced Electromagnetic Diffraction and Radiation.** Asymptotic solutions of Maxwell's equations, geometrical optics, edge diffraction, uniform theories, creeping waves, advanced antenna theory, and topics of current interest. Prerequisite: Electrical Engineering 420 or Physics 442; Electrical Engineering 421 or 477 is recommended for supplemental background. 1 unit.

- 480. Optimization by Vector Space Methods.** Same as Mathematics 480. See Mathematics 480.
- 486. The Constitution and Behavior of the Upper Atmosphere.** Same as Physics 486. Chemical and dynamical processes in the upper atmosphere; emphasis on the processes by which emitted solar energy is transformed and the resulting behavior of the atmosphere and ionosphere. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar in Special Topics.** Lectures and discussions on current research and literature on advanced topics in electrical engineering. Prerequisite: Advanced standing; consent of instructor. 0 to ½ unit. May be repeated for credit.
- 497. Electrical Engineering Problems.** Lectures and discussions relating to new areas of interest. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated for credit.
- 498. Individual Study.** Individual projects. Prerequisite: Consent of instructor. ¼ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

ELEMENTARY AND EARLY CHILDHOOD EDUCATION

Chairperson of Department: Professor P. David Pearson

Department Office: 311 Education Building, 1310 S. Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 230. Principles, Problems, and Issues in Elementary and Early Childhood Education.** Focuses on the problems and issues facing the classroom teacher in curriculum development, planning, and evaluation; develops and applies educational principles which serve to guide the teacher in dealing with these problems and issues. Prerequisite: Elementary and Early Childhood Education 237 and concurrent registration in Educational Practice 232. 3 hours.
- 233. Classroom Programs in Childhood Education.** Organizing balanced daily programs in childhood education; planning and using materials of instruction; and evaluating pupil achievement. Prerequisite: Junior standing; Educational Psychology 236. 2 hours.
- 234. Fundamentals of Nursery-Kindergarten Education.** Assists the pre-service teacher in understanding his/her role in implementing curriculum in early childhood settings. Prerequisite: Educational Psychology 236. 3 hours.
- 237. Theory and Process in Elementary School Teaching.** Directed toward affecting prospective teacher insight with regard to classroom behavior in teaching; includes materials dealing with child learning, teaching theory, and elementary school curriculum. A six-week morning assignment to a public school classroom is part of the course structure. Prerequisite: Educational Psychology 236. 5 hours.
- 249. Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 305. Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Human Development and Family Ecology 305. See Foods and Nutrition 305.
- 321. Principles and Practices in Early Childhood Education.** Studies the principles and practices of using play as an educational tool in early childhood education; reviews historical, philosophical, and psychological foundations of nursery-kindergarten methods; assesses techniques relating play to various aspects of instruction; surveys materials and equipment; and presents methods of classroom evaluation. Prerequisite: Elementary and Early Childhood Education 234. 3 hours, or ½ or 1 unit.
- 322. Parent Involvement Techniques for Teachers.** Principles and practices in working

with parents in programs of involvement, education, and participation for elementary and early childhood teachers; includes techniques of reporting to parents, counseling with parents, guiding parent participation in schools, and developing relations with community agencies. Prerequisite: Elementary and Early Childhood Education 234 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 330. Principles and Practices in Elementary Mathematics Education.** Organization, scope, and sequence of the elementary mathematics program and the functional nature of mathematics; methods, techniques, experiences, and materials of value in teaching elementary mathematics, and the role of classroom teacher. Prerequisite: Mathematics 202 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 341. Science in the Elementary School.** The principles, place, and practice of science education in the elementary school and in the lives of children; stresses the functional nature of science and its place in the curriculum; and considers the organization of the science program, experiences and techniques of value in teaching, and the role of the classroom teacher and specialist. Opportunity for experience in field and laboratory work. Prerequisite: Elementary and Early Childhood Education 237, or equivalent; two years of college science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Teaching Social Studies in the Elementary School.** Emphasizes the role of social education in the elementary school; the formal instructional program in social studies, including the knowledge, skills, and sensitivities to be taught; the teaching strategies and materials employed; and the organization of learning experiences and the total program in addition to the educative impact of the elementary school as a social system. Prerequisite: Elementary and Early Childhood Education 237; junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 348. Speech and Language Clinical Methods in the Schools.** Same as Speech and Hearing Science 348. See Speech and Hearing Science 348.
- 359. Workshop and Laboratory in Curriculum Development.** Curriculum development projects in specialized fields of elementary and early childhood education. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units toward any one degree.
- 360. The Teaching of Language Arts in the Elementary School.** Goals, content, and teaching problems involved in the devising of programs in the area of elementary school language arts that are cumulative and sequential from kindergarten through the elementary school. Prerequisite: Elementary and Early Childhood Education 237; Educational Psychology 236. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 361. Culture in the Classroom.** Overview of the social and cultural factors which affect learning and teaching, and application of cultural information to curriculum development, classroom practices, and evaluation. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 367. Literature for Elementary School Children.** Examines literature written for children and the uses of literature in the elementary school curriculum. Prerequisite: One college course in literature. 3 hours, or $\frac{1}{2}$ or 1 unit. Students may not receive credit for both Elementary and Early Childhood Education 367 and Library and Information Science 303.
- 370. Fundamentals of Reading Techniques.** Same as Secondary Education 336. Basic principles, techniques, and materials for the developmental reading program; emphasizes on methods and materials which provide for differentiated instruction. Prerequisite: Junior standing; registration in a teacher education curriculum. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 371. Principles and Practices for Fostering Independence in Reading.** Comprehension, study, and reference skills as they pertain to reading in the content fields; appropriate for elementary and junior high school majors, K through Grade Eight. Prerequisite: Elementary and Early Childhood Education 370. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 399. Issues and Developments in Elementary and Early Childhood Education.** A seminar course on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 400. Elementary School Classroom Programs.** Explores organizational centers for determin-

ing selection and sequence of educative experiences in the elementary school classroom; emphasizes the role of the teacher in curriculum construction. 1 unit.

- 401. Fundamentals of Curriculum Development.** Explores the several theoretical bases of curriculum planning and the implications of these approaches for practice. 1 unit.
- 410. Principles of In-Service Education.** Examines theoretical constructs relating to continuing professional growth with particular emphasis on incentive structures and on the organization, delivery, and evaluation of professional development activities. Prerequisite: Elementary and Early Childhood Education 400 and 401. 1 unit.
- 411. Theory and Practice of Staff Development.** Surveys the relationship between curriculum change and staff development; gives primary attention to various forms of curricular modification and corresponding staff development requirements; in addition, compares alternative approaches to staff development in order to determine their specific applicability in instructional improvement. Prerequisite: Elementary and Early Childhood Education 410 (recommended), or 400, or 401. 1 unit.
- 420. Programs in Early Childhood Education.** Advanced course intended primarily for teachers and supervisors of younger children, ages three to eight; reviews and analyzes research findings, experimentation, and current trends in curriculum organization, procedures, and materials essential to developing classroom programs for children. 1 unit.
- 421. Curriculum Problems and Trends in Early Childhood Education.** Includes principles underlying education practices in day care centers, preschool/nursery and kindergarten settings derived from theory and research in developmental psychology, social psychology, anthropology, and other related disciplines. Prerequisite: Educational Psychology 236, Psychology 216, or Human Development and Family Ecology 203; or equivalent. 1 unit.
- 430. Trends and Issues in Elementary Mathematics Programs.** Deals with theories of learning, research studies, curriculum development projects, and other events which have influenced elementary mathematics programs; also considers problems and issues in contemporary programs. Prerequisite: Elementary and Early Childhood Education 400 or 420. 1 unit.
- 431. Development of Elementary Mathematics Programs.** Deals with procedures for developing curricula in the major content areas of elementary mathematics and alternative instructional procedures. Prerequisite: Elementary and Early Childhood Education 330 or equivalent; or consent of instructor. 1 unit.
- 440. Current Issues in Elementary Science Education.** Advanced seminar in science education for teachers, consultants, and administrators, preschool through the elementary grades; identifies major problems and issues; analyzes current trends and research; and develops a philosophical framework related to science education. Prerequisite: Elementary and Early Childhood Education 341 or equivalent, and two years of college science; or consent of instructor. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. No more than 2 units may be given toward an advanced degree except by consent of the dean of the College of Education.
- 451. Evaluation of Educational Programs.** Same as Educational Psychology 451. Origins, assumptions, applications, and development of approaches to educational program evaluation in practice over the past twenty years; unobtrusive measures and noneducation evaluation systems; and practice in collecting evaluative data. Prerequisite: Educational Psychology 390, one year of work with children or youth in an institutional setting, or consent of instructor. 1 unit.
- 452. Methods of Child Study.** Studies ways in which teachers can evaluate child behavior and development with emphasis on classroom application; instruction and practice in the use and interpretation of observations, anecdotal records, rating scales, interviews, achievement tests, intelligence tests, questionnaires, and sociometric and projective techniques. Prerequisite: Educational Psychology 312 or consent of instructor. 1 unit.

- 460. Research and Trends of the Language Arts Curriculum.** Investigates research, trends, issues, and innovative practices for teachers and educators on the teaching of the language arts in the elementary school; identifies and develops procedures for organizing and implementing new knowledge and research into the elementary school curriculum. Prerequisite: Elementary and Early Childhood Education 360 or equivalent. 1 unit.
- 461. Theory and Practice in Children's Composition.** Studies composition or writing, its beginning and progress throughout the elementary grades; gives particular attention to the relationship between creativity and imagination and the basic skills of punctuation, spelling, and other conventions of writing; and examines research studies on functions of writing, motivation, and purposes for writing during the elementary school years. Prerequisite: Elementary and Early Childhood Education 360 or equivalent. 1 unit.
- 462. Linguistics and the Elementary School Curriculum.** Analyzes linguistics for the elementary school curriculum including dialect diversities, new theories of grammar, lexicography, and variations in oral and written forms of language; gives attention to how teachers apply these principles in the construction or language arts programs. Prerequisite: Elementary and Early Childhood Education 360, or credit in a course in English grammar or linguistics. 1 unit.
- 467. Children's Literature and the Elementary School Curriculum.** Investigates trends and issues related to teaching children's literature in the elementary school; focuses attention upon the organization and planning of a balanced children's literature curriculum (fictional and informational) for grades K-8. Prerequisite: Elementary and Early Childhood Education 367 or Library and Information Science 304; and English 101, 103, 106, 115, or 116, or consent of instructor. 1 unit.
- 468. Contemporary Classics in Children's Literature.** Critically examines children's books that have received major national and international awards and prizes and the requirements for that distinction; gives particular attention to the most recent publications so honored and their implications for use in the elementary classrooms. Prerequisite: Elementary and Early Childhood Education 367 or 467, or Library and Information Science 304; and English 106 or 215, or equivalent; or consent of instructor. 1 unit.
- 470. Issues and Trends in Reading.** The timing of beginning reading, the influence of certain linguists on methodology and terminology in instructional materials, and the influence of research on methodology are dealt with in a way that provides a historical perspective for evaluating the merit of emerging issues and trends. Prerequisite: Elementary and Early Childhood Education 370. 1 unit.
- 471. Field Instruction in Reading Programs.** Directed practice in the area of reading; students are placed in an approved and supervised field position for part of the semester. 1 unit.
- 472. The Organization and Supervision of School Reading Programs.** Studies procedures for planning, improving, and evaluating reading programs on a system-wide basis. Open only to those persons who are preparing to supervise reading programs or with approval of graduate adviser. Prerequisite: Elementary and Early Childhood Education 480. 1 unit.
- 473. Reading Instruction in Nursery School Through Grade Two.** Planning and evaluating reading instruction and materials in nursery school through Grade Two. Prerequisite: Elementary and Early Childhood Education 370 or 371, or equivalent; or consent of instructor. 1 unit.
- 480. Corrective Reading Instruction in the Classroom.** Nature, causes, and diagnosis of reading difficulties; translation of diagnostic information into instructional practice. Prerequisite: Elementary and Early Childhood Education 370 or 371, or equivalent. 1 unit.
- 481. Clinical Diagnosis and Remediation in Reading.** Supervised experience in the reading center; special attention to evaluative and interpretative techniques in cases of severe reading disabilities based on the analysis of specific reading needs. Prerequisite: Elementary and Early Childhood Education 480; a course in individual mental testing. 1 unit. May be repeated to a maximum of 2 units.
- 482. Clinical Practicum in Corrective Reading.** Diagnostic procedures and individual instruction with small groups of children who have reading difficulties. Prerequisite: Elementary and Early Childhood Education 480. 1 unit.

- 490. Seminar for Advanced Students of Education.** Seminar in elementary and early childhood education. Prerequisite: Admission to doctoral. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Prerequisite: Admission to doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ENGINEERING

Program Administrator: Professor H. L. Wakeland

Program Office: 207 Engineering Hall, 1308 West Green, Urbana

- 100. Engineering Lecture.** Engineering lecture for freshmen; selected topics each week. Required of freshmen in the College of Engineering. 0 hours.
- 101. Cooperative Engineering Education Seminar.** Discussion seminar which gives an introduction to cooperative engineering education. Topics discussed include duties and responsibilities of the student; duties and responsibilities of the cooperative employer; and techniques for obtaining maximum benefits from the program. Prerequisite: Cooperative student in any engineering curriculum. 0 hours.
- 102. Cooperative Engineering Education Practice.** Off-campus practice of engineering in government or industry. Prerequisite: Cooperative student in any engineering curriculum. 0 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Engineering Lecture.** Required of off-campus transfer students in the College of Engineering. Meets for first three weeks of each semester; selected topics. 0 hours.
- 298. Executives in the Technological World.** Offers a series of seminars by executives from industrial and technical organizations; provides students an opportunity to better understand the role of the technological executive as a decision-maker in the contemporary world; and discusses current trends, practices, economic conditions, productivity, government regulation, and foreign trade from the viewpoint of a wide range of industries such as transportation, steel, energy, and electronics. Prerequisite: Junior or senior standing in engineering, or consent of instructor. 1 hour.
- 299. Engineering Study Abroad.** Provides campus credit for foreign study and/or provides a mechanism for engineering students to maintain continuous enrollment on this campus. If objective is study abroad for credit, a detailed proposal must be submitted by the student for approval by a committee of the department in which the student is studying and the college office prior to such study abroad. Final determination of credit and its application toward the student's degree is made after a review of the student's work abroad by the above committee and the college office. Prerequisite: Completion of sophomore year in engineering; approval of student's proposed study program by his department and the college office. 0 to 15 hours (summer session, 0 to 7 ½ hours).

ENGINEERING HONORS

Executive Secretary of Program: Professor R. W. Bokenkamp

Program Office: 207 Engineering Hall, 1308 W. Green, Urbana

- 196. The Engineer and Society.** Prerequisite: Freshman James Scholar. 2 hours.
- 198. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester

for freshman James Scholars to enable them to explore at their own level various aspects of technology that are of interest to them. Prerequisite: Honors student in the University. 1 to 4 hours.

- 297. College Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester in special interdisciplinary subjects of current interest for James Scholars in engineering. Prerequisite: James Scholar in engineering or consent of instructor. 1 to 4 hours.

ENGLISH

(Including Business and Technical Writing and Rhetoric and Composition)

Head of Department: Professor M. Dickie

Department Office: 208 English Building, 608 S. Wright, Urbana

Business and Technical Writing

Business and Technical Writing Office: 100 English Building

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 251. Business and Administrative Communication.** Study of communication as a tool of administration and management; practice in writing a wide variety of types and forms of communication; and inclusion of oral and visual communication with the written to provide an integrated approach. For the student whose career will be in administration and management requiring a broad range of communication skills. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 271. Sales Writing.** Same as Advertising 288. Direct mail campaigns and company magazine copy. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 272. Report Writing.** Personal direction in a report writing project which can be integrated with research in another course; study of report-writing principles and practices. Classes meet for the first month after which the student and the instructor arrange a conference schedule. Small group meetings are arranged for presentation of proposals, progress reports, and summary reports. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 290. Individual Study.** Independent research with a chosen tutor leading to the writing of a formal report or preparation of some other type of major presentation of information. Enroll in Business and Technical Writing office, 100 English Building, Urbana. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours.
- 302. Descriptive English Grammar.** Same as English 302. See English 302.
- 400. Technical and Professional Writing.** Grammar, syntax, diction, paragraph development, and logic as they relate to technical and professional exposition; practice in defining problems for scientific investigation, organizing information and outlining, preparing headings and abstracts, drafting and revising papers, and presenting information graphically and orally. Prerequisite: Graduate standing. 3 hours. No graduate credit.

English

- 101. Introduction to Poetry.** Reading and discussion of representative poems of several periods and types. 3 hours.
- 102. Introduction to the Drama.** Reading and discussion of representative plays of several periods and types. 3 hours.

- 103. Introduction to Fiction.** Reading and discussion of representative fiction of several periods and types. 3 hours.
- 104. Introduction to Film.** Understanding of narrative films through the viewing and discussion of a representative body of film classics drawn from the entire range of world cinema; emphasizes the basic elements of cinematic expression, and concerns major movements, periods, and genres. 3 hours.
- 106. Literature and Experience.** Understanding of the relationship between literature and human experience through the study of significant, recurrent themes. 3 hours. May be repeated once as topics vary.
- 107. Law in Literature.** The portrayal of law and the legal system in literature with particular emphasis on the impact of that system on society and the relationship between private morality and public law; includes guest speakers from the legal profession. 3 hours.
- 113. The Idea of Comedy.** A selective introduction to the theory and practice of comedy; examines a number of influential theories of comedy and a variety of comic forms including poetry, novels, essays, plays, and short stories. 3 hours.
- 114. The Bible as Literature.** Same as Religious Studies 101. See Religious Studies 101.
- 115. Masterpieces of English Literature.** Study of selected major writings. 3 hours.
- 116. Masterpieces of American Literature.** Study of selected major writings. 3 hours.
- 118. Introduction to Shakespeare.** Representative readings of Shakespeare's drama and poetry in the context of his age, with emphasis on major plays; selections vary from section to section. Does not fulfill Shakespeare requirement for the English concentration. 3 hours.
- 119. The Literature of Fantasy.** Same as Comparative Literature 119. Surveys masterworks in the romance tradition from Shakespeare's time to the present; as distinct from science fiction, the materials feature magic and the supernatural rather than technology; and includes stage romance, fairy tale, horror tale, and fantasy-novel. Individual works are set in their historical and literary contexts. 3 hours.
- 120. Science Fiction.** A literary and historical study of science fiction from Mary Shelley to Ursula K. LeGuin with particular emphasis on the achievement of science fiction as a literary form in the romance tradition. 3 hours.
- 180. Drama in Production.** Study, discussion, and production of a dramatic text. 3 hours. May be repeated once as topic varies.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 198. Freshman Honors Seminar.** Introduction to the study of literature, with emphasis on individual work in fundamental problems of literary analysis; works studied are usually a combination either of short poems and short stories or of novels and plays. Prerequisite: James Scholar standing or other designation as a superior student. 4 hours. May be repeated once as topics vary.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Medieval Literature and Culture.** Same as Comparative Literature 253. British and continental authors (including Chaucer) read in modern English. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 204. Renaissance Literature and Culture.** Same as Comparative Literature 255. Readings in English and continental literary masterpieces with attention to the significant cultural influences of the period. 3 hours.
- 206. Literature and Culture of the Enlightenment.** Same as Comparative Literature 257. Readings in English and continental literature of the eighteenth century, with attention to significant cultural influences. 3 hours.
- 207. Nineteenth-Century Literature and Culture.** Same as Comparative Literature 259. English and Continental literature of the nineteenth century, with attention to major intellectual and social movements. 3 hours.
- 209. English Literature from the Beginning to 1798.** Historical and critical study of selected works of English literature to 1798 in chronological sequence. 3 hours.

210. **English Literature from 1798 to Present.** Historical and critical study of selected works of English literature after 1798 in chronological sequence. 3 hours.
211. **Introduction to Modern African Literature.** Same as African Studies 210 and Comparative Literature 210. See African Studies 210.
215. **Practical Criticism.** Introduction to applied literary criticism. Prerequisite: English 101. 3 hours.
240. **The English Romantic Poets.** Blake, Wordsworth, Scott, Coleridge, Byron, Shelley, and Keats. 3 hours.
241. **The Beginnings of Modern Poetry.** American and British poets including Frost, Robinson, Sandburg, Lindsay, Hardy, Hopkins, Housman, Yeats, Lawrence, the Imagists, and the early Pound and Eliot. 3 hours.
242. **Poetry Since 1940.** 3 hours.
243. **Development of the Modern Drama.** Same as Comparative Literature 265. Ibsen to O'Neill. 3 hours.
244. **Development of the Modern Drama.** Same as Comparative Literature 266. Pirandello to the present. 3 hours.
245. **The Short Story.** Same as Comparative Literature 267. Historical and critical study of the short story (American and European) from the early nineteenth century to World War I; major emphasis on such authors as Hawthorne, James, Crane, Gogol, Chekhov, Maupassant, Flaubert, Joyce, and Mansfield. 3 hours.
246. **The Short Story.** Same as Comparative Literature 268. Historical and critical study of the short story (American and European) from World War I to the present; major emphasis on such authors as Anderson, Hemingway, Faulkner, Porter, Mann, Kafka, Maugham, Lawrence, Salinger, and Camus. 3 hours.
247. **The British Novel.** Critical study of representative British novels from different literary periods. 3 hours.
248. **Modern British and American Fiction in Relation to Continental Fiction.** Same as Comparative Literature 269. An examination of important thematic and structural relationships—influences, parallels, and variations—among selected major works of the nineteenth and twentieth centuries; readings chosen from works of Bronte, Hardy, Lawrence, Woolf, James, Faulkner, Bellow, Oates, Dostoevsky, Tolstoy, Stendhal, Flaubert, Camus, Kafka, Mann, Hesse, Moravia, and Pavese. All works read in English. 3 hours.
249. **The American Novel.** Study of major and representative novels from the beginnings to the present. 3 hours.
250. **American Drama.** Reading and analysis of selected plays from the history of American drama, with emphasis on the period from O'Neill to the present. 3 hours.
255. **Survey of American Literature, I.** American literature and its cultural backgrounds to 1900. 3 hours.
256. **Survey of American Literature, II.** American literature and its cultural backgrounds in the twentieth century. 3 hours.
259. **Afro-American Literature, I.** Same as Afro-American Studies 259. Historical and critical study of Afro-American literature in its social and cultural context from the beginning to 1915. 3 hours.
260. **Afro-American Literature, II.** Same as Afro-American Studies 260. Historical and critical study of Afro-American literature in its social and cultural context since 1915. 3 hours.
273. **Intermediate Film Studies: Directors, Genres, Themes.** Critical study of narrative films, with viewing and discussion of a major film each week; in-depth study of selected directors, genres, and themes; emphasis on aspects of film aesthetics, criticism, and history. Prerequisite: English 104 or a college-level course in literature or film. 3 hours.
275. **Literature and Psychology.** Psychological and psychoanalytical theories as they bear on the interpretation of literature. 3 hours.
277. **Modern Literary Criticism.** Same as Comparative Literature 205. Important modern theories and methods of literary criticism and their relations to the study of literary texts. 3 hours.
280. **Women Writers.** Same as Women's Studies 280. Study of British and American women authors. 3 hours. May be repeated to a maximum of 6 hours as topic varies.

- 281. Women in the Literary Imagination.** A study of the way various writers, both men and women, have portrayed woman's image, social role, and psychology in English or American literature. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
- 283. Jewish Sacred Literature.** Same as Comparative Literature and Religious Studies 283. See Religious Studies 283.
- 284. Jewish Experience in Literature.** Same as Comparative Literature and Religious Studies 284. Selected topics involving works by Jewish and non-Jewish writers concerned with various aspects of Jewish life. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
- 290. Individual Study.** Study of selected topics. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours. Students may register in this course more than once in the same term.
- 291. Honors Individual Study.** Study of selected topics. Restricted to English and English education concentrators with a 4.25 average who are working towards the degree with Distinction in English or in English education. Enrollment in appropriate honors office necessary. Prerequisite: Consent of English honors or English education honors adviser. 1 to 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Independent research with a chosen tutor leading to the writing of a thesis. Restricted to English or English education majors with a 4.25 average who have satisfied all other requirements towards the degree with distinction; enrollment in the English Honors Office necessary. 3 hours. (Counts for advanced hours in LAS.)
- 296. Honors Seminar, I: Themes, Movements, and Forms in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
- 297. Honors Seminar, II: Periods in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
- 298. Honors Seminar, III: Major British and American Authors.** Each seminar considers one or two major authors. Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. 3 hours. May be repeated as topic varies.
- 301. Introduction to the Study of the English Language.** Language theories and modes of language study applied to English. 3 hours or 1 unit.
- 302. Descriptive English Grammar.** Same as Business and Technical Writing 302. 3 hours or 1 unit.
- 303. Historical Introduction to the English Language.** 3 hours or 1 unit.
- 311. Chaucer.** A selection read in Middle English. Prerequisite: One year of college literature, or consent of instructor. 1 unit.
- 315. Poetry and Prose of the English Renaissance, 1500-1600.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 316. The Drama of Shakespeare's Contemporaries.** Tudor and Stuart drama. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 318. Shakespeare, I.** Earlier tragedies, comedies, and history plays. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 319. Shakespeare, II.** Mature tragedies, dark comedies, and late romances. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 321. Poetry and Prose from the Metaphysicals to 1660.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 323. Milton.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.

- 326. The Age of Dryden, Pope, and Swift.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 327. The Age of Johnson.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 328. English Drama of the Restoration and Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 329. Restoration and Eighteenth-Century Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 331. English Romantic Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 334. Victorian Poetry and Nonfiction Prose.** Study of such major poets as Tennyson, Browning, Arnold, and Hardy; and of prose writers including Carlyle, Mill, Arnold, Pater, and Huxley. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 335. Nineteenth-Century British Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 341. British Literature in the Twentieth Century to 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 342. British Literature in the Twentieth Century Since 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 343. The Plays of Bernard Shaw.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 347. Literature of the American Renaissance.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 350. American Literature from the Civil War to the First World War.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 351. American Literature from the First World War to the Present.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 355. Major Authors.** Intensive study of the work of one or two major authors. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
- 361. Topics in English and American Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
- 362. Topics in Modern Fiction.** Topics including theme, genre, and literary movements, predominantly in English nineteenth- and twentieth-century fiction, with occasional consideration of continental fiction in English translation; topics may vary from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
- 365. Comedy.** Same as Comparative Literature 365. History and theory of stage comedy. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 366. Topics in Modern Drama.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 367. The International Folk Tale.** Same as Comparative Literature 359. Origin, nature, and distribution of the folk tale. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 368. The Ballad and Folksong in the United States.** English-language traditional songs and ballads, transplanted and native. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 370. Modern African Fiction.** Same as African Studies, Comparative Literature, and French 310. See African Studies 310.
- 375. Topics in the Relation of Other Disciplines to the Study of Literature.** See Timetable for current topics. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
- 381. Theory and Practice of Written Composition.** History and theory of written composition; basic rhetorical principles; and guidance and criticism of student writing. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.

- 383. Literary Criticism from 1800 to the Present.** Same as Comparative Literature 305. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 385. Literature for the High School.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 387. Topics in Folklore.** Same as Comparative Literature, German, Slavic and Speech Communication 387. Presents selected topics in folklore studies that deal with a particular theme, ethnic group, region, genre, or interpretive approach; topics vary. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary to a maximum of 6 hours or 2 units.
- 400. Introduction to Research and Critical Techniques.** Introductory course in methods and techniques in research and literary criticism. 1 unit.
- 404. Seminar in the English Language.** Study of English linguistics. 1 unit.
- 407. Old English.** Introduction to the language before 1000 A.D. 1 unit.
- 408. Beowulf.** Prerequisite: English 407 or consent of instructor. 1 unit.
- 411. Chaucer: *Troilus and Criseyde* and the Minor Poems.** 1 unit.
- 412. Chaucer: *The Canterbury Tales*.** 1 unit.
- 413. Middle English Literature and Its Cultural Background.** 1 unit. May be repeated as topic varies.
- 414. Seminar in Medieval Literature.** Prerequisite: A college course devoted entirely to an aspect of medieval studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 419. Seminar in Shakespeare.** Prerequisite: A college course devoted entirely to an aspect of Shakespeare's work, or consent of instructor. 1 unit. May be repeated as topic varies.
- 420. Seminar in Sixteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 424. Seminar in Seventeenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 427. Seminar in Restoration and Eighteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of eighteenth-century studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 433. Seminar in Romantic Literature.** Same as Comparative Literature 452. Prerequisite: A college course devoted entirely to an aspect of Romantic studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 437. Seminar in Victorian Literature.** Prerequisite: A college course devoted entirely to an aspect of Victorian studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 443. Seminar in Modern British Literature.** Prerequisite: One college course devoted entirely to an aspect of modern British studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 447. Seminar in Earlier American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 453. Seminar in Later American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 463. Seminar in Literary Themes and Movements.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 464. Seminar in Literary Modes and Genres.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 469. Seminar in the Stage History of Classic English Plays.** Same as Speech Communication 469 and Theatre 405. Analysis and reconstruction of past productions of classic plays, with special reference to Shakespeare. Prerequisite: One year of work in dramatic literature or theatre history, or consent of instructor. 1 unit.

- 478. Seminar in the Relation of Other Disciplines to the Study of Literature.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 481. Seminar in Literary Theory and Criticism.** Prerequisite: A college course devoted entirely to criticism, or consent of instructor. 1 unit. May be repeated as topic varies.
- 484. Narrative Semiotics.** Same as Comparative Literature, French, and Religious Studies 484. See French 484.
- 491. Research in Special Topics.** Independent study under the guidance of a member of the graduate faculty. 1 unit. May be repeated to a maximum of 2 units.
- 492. Master's Comprehensive Examination Tutorial.** Reading for the Master's Comprehensive Examination under the guidance of the candidate's graduate adviser. 6 or 12 hours. May be taken once for 12 hours or twice for 6 hours each. No graduate credit.
- 493. Professional Seminar in the Teaching of College English.** Prerequisite: Graduate standing in the Department of English or consent of instructor. 0 to 1 unit. May be repeated by Ph.D. candidates as the topic varies but without credit after two units have been earned in this course. Students needing the proseminar for their programs will be given priority enrollment.
- 499. Thesis Research.** Guidance in writing theses for doctoral degrees. Prerequisite: Doctoral candidate standing. 0 to 4 units.

Rhetoric and Composition

- 102. Introduction to Composition.** Instruction in basic formats of expository writing; provides preparatory semester of composition for students with special needs; to be taken prior to Special Options Rhetoric 105. Does not fulfill campus rhetoric requirement. Prerequisite: Concurrent registration in Rhetoric 103; placement by the English Department based on ACT-English scores, reading test when pertinent, and writing samples. 3 hours.
- 103. Writing Laboratory.** Intensive tutoring in basic writing skills to be scheduled at the Writing Laboratory. Open only to students in the EOP Rhetoric Program or to those in the special option sections. Prerequisite: Concurrent registration in Rhetoric 102, 104 or 105; or written consent from the EOP Rhetoric Program Office. 1 hour. May be repeated to a total of 2 hours.
- 104. EOP Rhetoric.** An introductory writing course designed for EOP students. Concentrates on exposition and must be taken concurrently with Rhetoric 103, a 1-hour course offered at the Writing Laboratory. To be taken prior to EOP Rhetoric 105. Does not fulfill campus rhetoric requirement. 3 hours.
- 105. Principles of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. This course fulfills the campus rhetoric requirement. 4 hours.
- 108. Forms of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. Students are admitted on the basis of ACT verbal scores or equivalent. Students will type and revise their work at the computer. This course fulfills the campus rhetoric requirement. 4 hours.
- 133. Principles of Composition.** Practice in exposition, with emphasis on organization, paragraphing, and sentence structure. For the student whose career will require competence in writing clear, precise prose as an adjunct to another professional activity. Credit is not given for Rhetoric 133 and Rhetoric 143. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
- 143. Intermediate Expository Writing.** Practice in expository types, with emphasis on style and critical analysis. Recommended for rhetoric majors. Credit is not given for Rhetoric 143 and Rhetoric 133. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
- 144. Narrative Writing.** Introduction to and practice in the writing of narrative prose, with

- primary emphasis on short fiction. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
- 145. Poetry Writing.** Practice in the writing of poetry; experimentation with a number of fixed forms and free verse, but emphasis mainly on the student's freedom to develop a personal style. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Communications Workshop.** Independent writing projects and examination of literature as the cultural basis of the student's specialized fields. 3 hours.
- 205. Advanced Narrative Writing, I.** Practice in the writing of fiction, with emphasis on the short story. Prerequisite: Rhetoric 144 or equivalent, or consent of instructor. 3 hours.
- 227. Advanced Expository Writing.** Types of nonfiction prose, including the essay, criticism, biography, and historical writing. Prerequisite: Rhetoric 133 or 143, or consent of instructor. 3 hours.
- 302. Advanced Writing Topics.** Practice in various literary genres and in their combinations for mature students who have some writing experience and a background of data and impressions which they wish to develop in writing of near-professional quality. Individual conferences at hours to be arranged. Prerequisite: Rhetoric 133 or 143, or equivalent; or consent of instructor. 3 hours or 1 unit.
- 305. Advanced Narrative Writing, II.** Continued practice in the writing of fiction, with emphasis on the longer story. Prerequisite: Rhetoric 205 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 306. The Writing of Poetry.** Practice of the writing of poetry aided by intensive study of examples. Prerequisite: Rhetoric 145 or equivalent, or consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 355. Creative Writing Tutorial.** Personal direction in a writing project: fiction (novel or short stories), poetry, criticism, narrative, etc. Frequency of conference to be determined by the type of project. Prerequisite: A preparatory course in advanced writing (Rhetoric 205, 227, 305, or 306). 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.

ENGLISH AS A SECOND LANGUAGE

Director of Division: Professor Braj B. Kachru

Division Office: 3070 Foreign Languages Building, 707 South Mathews, Urbana

- 109. English as a Second Language.** Intensive course in basic English structure for foreign students who are inadequately prepared for either English as a Second Language 111 or 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois English Placement Test. 0 hours.
- 110. English as a Second Language.** Study of the sounds and intonation patterns of American English and the relation of sound to spelling; designed to improve the student's ability to speak and understand English at normal conversational speed. May also be taken with English as a Second Language 111 and 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois English Placement Test, or consent of instructor. 0 hours.
- 111. English as a Second Language.** Continuation of English as a Second Language 109. Rapid and intensive review of basic English structure and a study of more complicated sentence patterns with practice in simple oral and written composition. Designed for students inadequately prepared for English as a Second Language 114. Prerequisite: English as a Second Language 109 or recommendation from Illinois English Placement Test, or consent of instructor. 0 hours.
- 113. English Structure and Paragraph Development.** Examines basic English structure and paragraph development for those undergraduate non-native speakers of English who are

- U.S. permanent residents and U.S. high school graduates. Recommendation from Illinois English Placement Test determines placement in course and in section for specified credit. Prerequisite: Placement by Division of English as a Second Language. 3 or 6 hours.
114. **English as a Second Language.** Composition for undergraduate students whose native language is not English. Prerequisite: English as a Second Language 111, recommendation from overseas test or Illinois English Placement Test, or consent of instructor. 3 hours.
115. **Research Paper Writing Skills for ESL Students.** Composition for undergraduate students whose native language is not English. Prerequisite: English as a Second Language 114 or equivalent, recommendation from Illinois English Placement Test, or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
301. **Topics in Applied TESL/TEFL Theory.** Implications of TESL/TEFL theory and research for classroom practice: preparation of teaching and testing materials; evaluation of materials on the basis of ESL/EFL teaching experiences; adaptation to needs of different learner ages, language, and achievement backgrounds; and new teaching formats. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated as topic varies to a maximum of 8 hours or 2 units.
302. **Descriptive English Grammar for ESL Teachers.** Adapts modern English grammar to the needs of the ESL teacher, emphasizing the development of analytical skills that can be applied to syntactic and lexical analysis. 3 hours or $\frac{3}{4}$ unit.
305. **Introduction to Applied Linguistics.** Same as Linguistics 305. See Linguistics 305.
350. **Introduction to Sociolinguistics.** Same as Linguistics 350. See Linguistics 350.
356. **Impact of Cultural Differences in TESL.** Examines people as cultural beings; studies the effect of cultural differences on communication, both in the ESL classroom and in the community; and presents various methods of incorporating relevant elements of American culture into the ESL classroom. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as French, German, and Spanish 360. Studies theoretical and practical aspects of language testing; examines purposes and types of language tests in relation to theories of language use and language teaching goals; discusses testing practices and procedures related to language teaching and language research; and includes the planning, writing, and administration of tests, basic descriptive statistics, and test analysis. A project is required. Prerequisite: English as a Second Language 389. 3 hours or $\frac{3}{4}$ unit.
371. **Teaching Composition in the ESL Classroom.** Applies select principles of linguistics, rhetoric, crosscultural communication, and second language acquisition to developmental instruction in ESL writing; required projects: article reviews, instructional materials analysis and preparation, and ESL class observation. Prerequisite: English as a Second Language 301. 3 hours or $\frac{3}{4}$ unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, French, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
386. **Reading in a Second Language.** Same as Linguistics 385. Treats current research and reading theory with a view toward developing maximally efficient materials designed to teach reading in a second language; analyzes and evaluates teaching practices, however, places primary emphasis on materials development. Project is required. Prerequisite: English as a Second Language 302 and an introductory course in linguistics. 3 hours or $\frac{3}{4}$ unit.
388. **English Phonology and Morphology for ESL Teachers.** Same as Linguistics 388. Application of linguistics to language learning with special emphasis on learning the sound system of English. Prerequisite: Two years of a foreign language or equivalent; consent of instructor. 3 hours or $\frac{3}{4}$ unit.
389. **Theoretical Foundations of TESL Methodology.** Same as Linguistics 389. Applied linguistics in teaching and learning English as a second language with special emphasis on the applications of some principles of psycholinguistics, sociolinguistics, and ethnolinguistics along with the related disciplines of education, psychology, and anthropology to structured teaching and learning situations. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 400. Verbal Communication in English as a Second Language for Graduate Foreign Students, I.** Language laboratory course concentrating on the typical writing problems that a graduate or research student encounters in an American university. Prerequisite: Graduate standing and English as a Second Language 111, or consent of instructor. 0 to 4 hours. No graduate credit.
- 401. Verbal Communication in English as a Second Language for Graduate Foreign Students, II.** Language laboratory course dealing with individual, immediate, and specialized speaking and writing problems, with particular attention to orienting graduate or research students to the techniques of the American university in thesis and other specialized writing, and in the oral presentation of such material. Prerequisite: Graduate standing and English as a Second Language 400, or consent of instructor. 0 to 4 hours. No graduate credit.
- 402. Introduction to General Linguistics.** Same as Anthropology and Linguistics 400. See Linguistics 400.
- 406. Oral Communication for Foreign Teaching Assistants.** Focuses on use of English at the discourse level, with videotaping and critique of student presentation and development of teaching strategies related to university classroom and laboratory contexts. Prerequisite: Consent of instructor. 0 units.
- 410. Generative Phonology in English Teaching.** Generative phonological analyses of English and the teaching of English pronunciation: reevaluation of teaching goals, content, presentation, and methodology; required projects involve research into English phonology leading to the development and evaluation of lesson materials for ESL classes. Prerequisite: English as a Second Language 301 and English as a Second Language 388. 1 unit.
- 412. Pedagogical Grammar.** Same as Linguistics 413. Surveys English grammar and texts for teaching grammar in ESL, with special emphasis on the development of skills in explanation of grammatical phenomena in ESL classes. Prerequisite: English as a Second Language 302 or equivalent. $\frac{3}{4}$ unit.
- 419. Contrastive Linguistics.** Same as Linguistics 419. See Linguistics 419.
- 460. Research Methods in Language Learning.** Seminar focusing on the formulation of language learning and teaching issues as research questions. Specific topics include: types of research problems, research designs, methods, and strategies; and the analysis, interpretation, and reporting of research findings. Discusses illustrative research and evaluation studies. Students participate in seminar presentations and develop a research proposal. Prerequisite: English as a Second Language 360 or consent of instructor, and English as a Second Language 389. $\frac{3}{4}$ unit.
- 463. College Teaching of Foreign Languages.** Same as French, Russian, German, and Spanish 463. See French 463.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, German, Russian, and Spanish 481. See French 481.
- 487. Seminar in the Teaching of English as a Second Language.** Discussion of and research into various topics of current interest to persons involved in teaching English as a second language; emphasis on new approaches to problems facing the field and the development of understanding methods; study of materials leading to possible solutions. Prerequisite: English as a Second Language 388 or 302, or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated as the topic varies.
- 491. Research in Special Topics.** Independent study under guidance of a member of the graduate faculty. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. Prerequisite: Consent of thesis supervisor. 0 to 2 units. May be repeated to a maximum of 2 units.

ENTOMOLOGY

Head of Department: Professor S. Friedman

Department Office: 320 Morrill Hall, 505 S. Goodwin, Urbana

- 118. Insects, Man, and Environment.** Nontechnical course which considers basic aspects of entomology and ecology, especially as they relate to problems in the use of pesticides and environmental pollution. 3 hours.
- 120. Introduction to Applied Entomology.** Same as Forestry 120. Lectures, laboratory, and field practice in the recognition and management of important insect pests of agricultural, forest, and urban ecosystems: classification, structure, and physiology; life histories and behavior involved with injury; and methods of control. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Special Problems.** For students ready to undertake a special investigation to be completed as an undergraduate study or as the beginning of a thesis problem for an advanced degree. It also may be used to prepare a thesis for scholastic honors. Prerequisite: Consent of instructor. 2 to 5 hours.
- 301. Introduction to Entomology.** Integrated studies of the principal morphological, physiological, and ecological relationships among insects. Tutorials, field experience, and/or insect collections will be required for 4 or 5 hours, or 1 unit credit. Prerequisite: Biology 111 and Chemistry 131. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.
- 302. Classification and Evolutionary History of Insects.** Analytical survey of the classification and evolution of the orders and principal families of insects, with practical experience in the identification of insects at these taxonomic levels; field trips required. Prerequisite: Entomology 301 or concurrent registration in Entomology 410; consent of instructor. 4 hours or 1 unit.
- 304. Genomic Analysis of Insects.** A comprehensive and integrated presentation of insect genomic analysis from the molecular level to that of the population; applies these concepts to certain aspects of insect population regulation. Prerequisite: Genetics and Development 210 and Biology 371 and Biochemistry 350, or equivalents; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 315. Insect Ecology.** Discussion of the practical and theoretical aspects of ecology in relation to insects as individuals, populations, and communities; emphasis on the role of insects in the environment. Prerequisite: Ecology, Ethology, and Evolution 212 or consent of instructor. 3 or 5 hours, or $\frac{3}{4}$ or 1 unit. 3 hours or $\frac{3}{4}$ unit, lecture only; 5 hours or 1 unit with laboratory.
- 319. Fundamentals of Insect Pest Management.** Study of the principles underlying the control of important insect pests of agriculture and of human and animal health; emphasis on integrated pest management involving a systems approach which combines biological, cultural, and chemical suppressive factors into ecologically sound and socially and economically acceptable technology. Prerequisite: Entomology 120, or 301 and 302, or consent of department. 4 hours or 1 unit.
- 320. Insect Pathology.** Examines the general principles of pathology as they apply to insects; includes non-infectious and infectious diseases caused by viruses, bacteria, fungi, protozoa, and nematodes. Studies the epizootiology of naturally occurring insect disease and the use of insect pathogens as microbial control agents. Lecture and laboratory. Prerequisite: Entomology 319 and Microbiology 200 or equivalent. 4 hours or 1 unit.
- 321. Biological Control of Insect Pests.** Same as Agronomy 321. Examines uses of biological methods for the control of insect pests; emphasizes the use of natural enemies in control programs; and discusses life history characteristics of parasitoids and predators, ecological principles of population regulation, and techniques and protocols in implementation of control programs and related topics. Prerequisite: Entomology 315 or 319, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 410. Insect Morphology.** Comprehensive study of internal and external structures of insects from the comparative viewpoint. Prerequisite: Biology 111 or equivalent; consent of instructor. 1 unit.

- 413. Medical and Veterinary Entomology.** Training in recognition, classification, methods of injury, habits, and control or destruction of insects, mites, and ticks which are predators, parasites, or disseminators of disease among humans and domestic animals. Prerequisite: Entomology 302, or Ecology, Ethology, and Evolution 320; consent of instructor. 1 unit.
- 420. Chemistry and Toxicology of Insecticides.** Comprehensive study of the relation of chemical structure to toxic action of insecticides, their physiological and biochemical modes of action, and their fate and degradation in the total environment; overall emphasis on the environmental toxicology of insecticide. Prerequisite: One year of biology or equivalent in animal science; organic chemistry; or consent of instructor. 1 unit.
- 422. Insect Physiology.** Study of principal physiological and biochemical functions of insects. Prerequisite: Entomology 301 or equivalent, organic chemistry, and consent of instructor. 1 unit.
- 426. Seminar in Entomology.** Discussions, reviews, and appraisals of special topics in the field of entomology. Prerequisite: Consent of instructor. 0 or ¼ unit. May be repeated to a maximum of 1 unit.
- 490. Individual Topics.** Individual topics in research and/or reading conducted under the supervision of faculty members in the Department of Entomology; particularly designed for students enrolled in the entomology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their advanced degrees. Prerequisite: Consent of instructor. ¼ to 2 units. May be repeated.
- 499. Thesis Research.** Work may be taken in the following subjects: morphology and embryology of insects; applied entomology; systematic entomology; biology and ecology of insects; insect toxicology; and insect physiology. 0 to 4 units.

ENVIRONMENTAL STUDIES

Director of Institute: Professor R. A. Minear

Institute Office: 408 South Goodwin Avenue, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 236. Tomorrow's Environment.** Same as Health and Safety Studies 266. Introduction to interdisciplinary methods of analysis of environmental problems in a finite world; examination of the concepts of the limits to growth; development of a working understanding of natural systems and environmental economics; and examination of various management strategies (technical, economic, and social) that can be used to improve environmental quality. Prerequisite: One course in the life sciences and one course in the social sciences, or consent of instructor. 3 hours.
- 241. Introduction to Radiation Protection.** Same as Nuclear Engineering 241. See Nuclear Engineering 241.
- 283. Introductory Ecology for Educators.** Same as Forestry 283. See Forestry 283.
- 299. Individual Studies of Environmental Topics.** Individual studies of environmental problems and their solutions. Studies are accomplished under the immediate supervision of faculty of the Institute for Environmental Studies. Prerequisite: Consent of instructor. 0 to 4 hours.
- 317. Introduction to Natural Resources Economics.** Same as Agricultural Economics and Forestry 317. See Agricultural Economics 317.
- 319. Environment and Plant Ecosystems.** Same as Agronomy and Forestry 319. See Agronomy 319.
- 331. Toxic Substances in the Environment.** Explores toxicological, public health, environmental, industrial, economic, and legal aspects of the use and release of toxic substances in the environment; emphasizes biochemical toxicology and epidemiological aspects of environmental pollution; and features case histories of environmental toxicants. Prerequisite: One year of college chemistry or consent of instructor. 2 hours or ½ unit.

- 332. Genetic Toxicology.** Same as Agronomy 332 and Genetics and Development 332. Introduces the field of genetic toxicology; includes the study of physical and chemical induced mutagenesis, survey of genetic indicator organisms and genetic assays, distribution of environmental mutagens and their biochemistry, analysis of case histories of environmental mutagens and risk assessment. Prerequisite: Genetics and Development 210 or Agronomy 110; Chemistry 102; Biochemistry 350, or 352 and 353, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 341. Air Resources Management.** Same as Civil Engineering 341. See Civil Engineering 341.
- 344. Social Impact Assessment.** Same as Leisure Studies 344 and Rural Sociology 344. Social Impact Assessment and Social Soundness Analysis are methodologies that identify the human and social consequences of man-made alterations in the natural and physical environment; teaches the SIA and SSA methods within the context of planned change based on environmental and technological assessment of project development in both first and third world countries. Prerequisite: Rural Sociology 100 or Sociology 101; Rural Sociology 277 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 346. Energy, Environment, and Society.** Same as Rural Sociology 346. Examines historical and modern impacts of environmental alteration and pollution and resource limitations on human populations in the context of various social change theories; explores the environmental movement, population explosion, the "limits to growth" debate, and the impacts of environmental change on food production, land, and water. Prerequisite: Rural Sociology 100 or Sociology 100; Rural Sociology 277 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 348. Atmospheric Chemistry.** Same as Civil Engineering 348. See Civil Engineering 348.
- 349. Basic Toxicology.** Emphasizes the physiology and biochemistry of intoxication; discusses the types of cellular response to toxic compounds and the role of species variation in the economic use of toxins as pesticides and therapeutic agents. Prerequisite: Biochemistry 350 or 352, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 351. Organic Compounds in the Aquatic Environment.** Surveys the natural and anthropogenic constituents of water and their physical, chemical, and biological transformations; emphasizes absorption, evaporation, photochemical reactions, hydrolysis, and microbial metabolism; discusses oxidative processes in detail. Prerequisite: Chemistry 131 or 136, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 374. General Epidemiology.** Same as Health and Safety Studies, Medical Sciences, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
- 397. Selected Environmental Problems.** Advanced study of problems related to the environment. Each unit of instruction focuses on a coherent problem area centered primarily within the subject matter of one or more interrelated disciplines comprising the Institute and taught by one or more faculty members from these disciplines. Prerequisite: Senior or graduate standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 449. Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Mechanical Engineering 412. See Civil Engineering 449.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Economics, and Forestry 463. See Agricultural Economics 463.
- 464. Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Economics 464. See Economics 464.
- 468. Molecular Toxicology.** Examines the biochemical processes involved in the interaction of toxic compounds and their metabolites with the body; enzyme alteration, membrane integrity, receptor interaction, and the biochemical basis for the primary site of toxicity. Prerequisite: Environmental Studies 349 or consent of instructor. $\frac{3}{4}$ unit.
- 495. Environmental Studies Seminar.** Interdisciplinary seminar on topics of current interest. Students, faculty, and visiting lecturers present seminars based upon their study, research, and/or professional activities in the selected environmental topic area. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated as topic varies.
- 496. Interdisciplinary Toxicology Seminar.** Same as Veterinary Biosciences 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
- 497. Studies of Environmental Topics.** Individual or group research and study of environmental

topics. Subjects for individual study, selected by the student, must be approved by the student's adviser and by the Director of the Institute. (Note: This is not a thesis research course.) Group study focuses on environmental problems and their solutions. Prerequisite: Consent of instructor. 0 to 4 units. May be repeated.

FAMILY AND CONSUMER ECONOMICS

Acting Head of Department: Assistant Professor J. L. Wysocki

Department Office: 271 Bevier Hall, 905 S. Goodwin, Urbana

- 170. Consumer Economics.** Introduction to the study of the consumer in the American economy; sources of consumer information and consumer protection; and examination of current consumer issues within an economic framework. 3 hours.
- 175. Energy in the Home.** Examines household energy use emphasizing energy sources and patterns of energy use in the home; studies the effect of energy supply on life styles, national policies, and the management of energy use by families and society. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Consumer Economics Internship.** A supervised off-campus experience through a cooperative program with an agency, business, industry, financial or educational institution, or legislative body having a consumer component. Prerequisite: Junior standing and consent of department head; not available to students on academic probation. 4 hours.
- 270. Family Financial Management.** Examines principles of family financial resource management with attention given to research findings on the interdependence of financial decisions and energy, time, and other resources used to attain family goals and maintain family values. Prerequisite: Junior standing and Economics 101, or consent of instructor. 3 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 313. Economics of Consumption.** Same as Economics 313. Introduces the concepts, theories, and methods for analysis of the micro and macro aspects of consumption; includes standards and content of consumption and description of consumption patterns and trends in the U.S.A. and selected other countries. Prerequisite: Economics 101 or equivalent; a course in statistics; junior standing. 3 hours, or $\frac{3}{4}$ or 1 unit. Students may not receive credit for both Family and Consumer Economics 313 and 413.
- 361. Development and Function of Family Housing.** Same as Agricultural Mechanization and Interior Design 361. See Agricultural Mechanization 361.
- 370. Family Economics.** Same as Agricultural Economics 370, and Economics 346. Examines the economic welfare of American families: application of economic theory to the behavior of families and individuals with respect to time allocation between the home and the market; family forms; human capital accumulation; sex differences in income; income adequacy; and poverty. Considers the role of public policy. Prerequisite: Economics 101 or equivalent; a course in applied statistics; senior standing. 3 hours, or $\frac{1}{2}$ to 1 unit. Students in family and consumer economics may receive 1 unit credit; students in agricultural economics may receive $\frac{3}{4}$ unit credit; and students in economics may receive $\frac{1}{2}$ unit credit.
- 371. The Family as a Consuming Unit.** Analyzes choice-making, buying, using, and disposing of consumer goods by families from a social policy perspective. Prerequisite: 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 375. Home Equipment.** Principles related to the selection, use, and care of household equipment; individual problems include library research of sources of information on equipment and laboratory evaluation of equipment. Prerequisite: Foods and Nutrition 231,

- Family and Consumer Economics 373, or Textiles and Apparel 380. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 378. Problems in Management, Equipment, and Housing.** Individual investigations on problems in the fields of family resource management, household equipment or housing. Prerequisite: Senior standing; Family and Consumer Economics 270 or 373 or 375. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 379. Problems in Family, Consumer, and Consumption Economics.** Individual investigations and reports of specific problems in the field of family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313, 370, 371, or consent of instructor; senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 405. Research Methods in Home Economics.** Same as Textiles and Apparel 405. See Textiles and Apparel 405.
- 413. Consumption Economics.** Same as Economics 413. Examines theoretical and empirical analysis of consumer demand; topics include theory of consumer behavior, as well as extensions and applications in a static context (characteristics analysis and product quality, price indices, measurement of consumer welfare) and in a dynamic context (intertemporal choice, habit and stock adjustment modes, choice under uncertainty). Prerequisite: A course in microeconomic theory and a course in statistics. 1 unit. Students may not receive credit for both Family and Consumer Economics 313 and 413.
- 470. Seminar in Family and Consumption Economics.** Same as Agricultural Economics 470. Discussion of current topics and review of the literature in family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313 or 370, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 472. Economics of the Family.** Discusses and analyzes advanced literature on the economics of the family, developed within the models of human capital and allocation of time; emphasizes the theory and empirical applications. Prerequisite: Economics 400 or 402; Economics 470 or Sociology 385, or equivalent. 1 unit.
- 473. Seminar in Social Theories of Family Management.** Same as Human Development and Family Ecology 473. Critical examination of theoretical frameworks applied to family management research. Prerequisite: Family and Consumer Economics 373 or Human Development and Family Ecology 310; or equivalent. 1 unit.
- 493. Advanced Studies in Family and Consumer Economics.** Research or practical experience with specific problems of limited scope. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{2}$ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

FINANCE

Chairperson of Department: Professor Charles M. Linke

Department Office: 340 Commerce Building (West), 1206 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 235. Investment Analysis.** The investment environment; analysis of the aggregate market, industry, and the individual firm analysis; valuation methods, with a concentration on applications to common stocks and bonds. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 237. Portfolio Analysis.** Examines alternative investment instruments; conceptual foundations of portfolio theory; methods of selecting, evaluating, and revising portfolios of assets. Prerequisite: Finance 235. 3 hours. (Counts for advanced hours in LAS.)
- 252. Structure, Regulation, and Management of Financial Institutions.** Studies the functions, policies, organization, historical development, management, and regulation of financial institutions. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)

- 254. Introduction to Business Financial Management.** Development and study of a decision framework for financial management; an introduction to the analysis of past and future needs; an analysis of the management of short-term assets; an introduction to a decision framework for capital investment management with an analysis of the cost and sources of long-term capital; and integration of the concepts of financial management into a total systems approach to business decision making. Prerequisite: Accountancy 200 or 202; credit or concurrent registration in Economics 172. 3 hours. Credit is not given for both Finance 254 and 257.
- 258. Money, Credit, and Financial Markets.** Surveys the structure and activity of the financial sector of the economy; impact of money on output, employment, and prices; financial asset types and their uses; interest rates; roles played by financial intermediaries; influence of macroeconomic policies on the financial sector. Prerequisite: Economics 301. 3 hours. (Counts for advanced hours in LAS.)
- 260. Economics of Insurance.** Survey course in insurance which serves as a common introductory course to the fire, marine, casualty, surety, and life branches of the insurance business. Prerequisite: Economics 101 or equivalent. 3 hours.
- 262. Life Insurance and Related Financial Services.** Introductory study of the life insurance industry and related financial services, including banks, investment companies, and government financial security programs, personal income, gift, and estate taxation, inflation, risk-adjusted returns, legal rights, and savings-investment alternatives; develops techniques for contingent present value calculations, life insurance cost comparisons, and personal financial analysis; uses computer systems, including PLATO, as tools for financial analysis. Prerequisite: Economics 101 or equivalent. 3 hours.
- 264. Fundamentals of Real Estate.** Surveys real estate finance, appraisal, investment brokerage, and management; gives special attention to the analysis of aggregate real estate and mortgage markets to the individual transactions of which the markets are composed and to the legal and institutional factors which have an impact on these markets. Prerequisite: Economics 101 or equivalent. 3 hours.
- 280. Advanced Financial Management.** Integration of the capital investment, long-run financing working-capital decision processes; use of simulation, cases, and other techniques to study each decision process. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 281. Short-Run Financial Management.** Introduces short-run financial planning and integrates it into the capital investment model; uses cases and simulation to study fund-flow analysis and the management of liquidity, receivables, inventory, payables, and operating leverage. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 294. Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 295. Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 354. Multinational Business Finance.** Development and study of a framework for the financial decisions of multinational businesses; includes the management of working capital, investment and financing decisions of the firm in an international environment, foreign exchange markets, exchange risk, and international diversification. Prerequisite: Finance 254 and Economics 328. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. Financing Small Business.** Size and nature of small business; significance and limitations of small business; financial structure and problems; financial assistance to small business;

and future prospects of small business. Prerequisite: Finance 254 or 257. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 360. Employee Benefit Plans.** Same as Labor and Industrial Relations 360. Analysis of the economic and financial issues involved in designing and administering employee benefit plans; major emphasis on group life, disability income, and medical care plans, and on qualified pensions and profit-sharing plans for regular employees; and some attention to special supplementary plans for the executive employees. Prerequisite: Finance 260, Economics 240, or Business Administration 351, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 363. Seminar in Life and Health Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving life and health insurance; discussion of legal and financial problems involving life and health insurance product development, life and health insurance in estate planning, government regulation of the life insurance industry, and the economic aspects of the industry. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 365. Urban Real Estate Valuation.** Examines the terminology, theory, and techniques of real estate appraisal; a modern view of the three approaches to value: market comparison, income, and cost. The first half of the course emphasizes residential property, while the second half emphasizes income property. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 366. Real Estate Investment.** An approach to the evaluation of real estate investment opportunities: begins with the identification of the investor's goals and ends with an investment decision; also considers legal, physical, locational, and financial constraints, aggregate real estate and financial markets, tax considerations, and investment criteria. Prerequisite: Finance 264 or 464, and Finance 254; or consent of instructor. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 367. Urban Economics.** Same as Economics 361. See Economics 361.
- 368. Real Estate Financial Markets.** Discusses theory and institutions of the real estate credit market and the impact of the credit market on the real estate markets; emphasizes creative financing techniques. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 369. Legal Environment of Real Estate.** Overviews the legal environment in which the real estate business functions; stresses terminology, sources, principles, and issues of real estate law. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 370. Risks and Risk Management.** Analysis of the financial problems in the risks of property damage or bodily injury (in business situations), and evaluation of the alternative methods for dealing with such problems. Prerequisite: One of the following: Accountancy 200 or 202, or Finance 254 or 257; Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 371. Seminar in Property and Liability Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving property-liability insurance; analysis of legal problems involving insurance coverages, financial aspects, and governmental regulation of the property-liability insurance enterprise, and economic aspects of the insurance industry. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 400. Theory of Financial Decision Making.** Examines theoretical frameworks for financial decision making under certainty and uncertainty, as well as perfect and imperfect capital markets; discusses state preference, mean-variance, and continuous time models; emphasizes the structure of individual utility functions. Prerequisite: Economics 402; Statistics 310; and admission to doctoral program or consent of instructor. 1 unit.
- 420. Macrofinance: Policies, Institutions, and Markets.** Overview of the workings of the financial sector of the macro economy; includes the roles of financial institutions, financial markets, macroeconomic policies, interest rates, and the flows of funds. Prerequisite: Economics 301 or 401, or Business Administration 401. 1 unit.
- 425. Management of Financial Institutions.** Studies the portfolio behavior, policies, risks, and management of a variety of financial institutions including commercial banks, savings institutions, mutual funds, pension funds, and insurance companies; includes flow of funds, regulation, and industry structure. Prerequisite: Finance 254 or Business Administration 451, or equivalent. 1 unit.

- 427. Seminar in Macrofinance and Financial Institutions.** Reports and explores research in areas of commercial bank models and behavior, bank structure and regulation, interest rate theories, financial markets, and the impact of macroeconomic policies and procedures on financial markets and institutions; discusses current research and research procedures. Prerequisite: Finance 400 and Economics 403. 1 unit.
- 444. International Financial Management.** Studies international financial markets to include Euromarkets and foreign exchange markets; studies the financing and investment decisions of multinational organizations to include working capital, capital budgeting cost of capital, and capital structure decisions in an international environment. Prerequisite: Finance 254 or Business Administration 451; or equivalent. 1 unit.
- 452. Long-Term Financial Decision Making.** Same as Business Administration 452. An analytical approach to the theoretical and applied aspects of decision making in business finance; assumes a long-term planning horizon; and emphasizes valuation and cost of capital theories, capital investment decisions, risk analysis, and capital structure and dividend policies. Prerequisite: Finance 254 or Business Administration 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
- 453. Working Capital Management.** Same as Business Administration 453. A study of working capital management processes and of theoretical linkages between working capital and long-run financial management; uses a variety of models to study the theory of working capital management and to analyze relationships among variables in the short-run financial decision-making process; and combines theory and applications to provide insight into the total financial decision-making process. Prerequisite: Finance 254 or Business Administration 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
- 454. Seminar in Corporate Financial Theory.** Theories, paradigms, and models of nonfinancial corporations: investigates the theoretical foundations and empirical evidence regarding corporate resource allocation, capital structure decisions, and dividend policies; covers in detail contingent claim analysis, signaling theory, and agency theory. Prerequisite: Finance 400 and Economics 471. 1 unit.
- 455. Seminar in Investments.** Investigates portfolio theory, CAPM, OPM, and arbitrage pricing theory theoretically and empirically; uses both mathematical statistics and modern econometric models to empirically analyze investment decisions and portfolio management. Prerequisite: Finance 400 and Economics 471. 1 unit.
- 456. Investment.** Same as Business Administration 456. Introduction to investment analysis, including the functioning of capital markets, changes in markets, and analysis and tests of the efficient markets hypothesis; introduction to portfolio theory; and consideration of valuation theory applied to the aggregate market, alternative industries, and individual firms. Prerequisite: Business Administration 451 or equivalent. 1 unit.
- 457. Security Analysis.** Same as Business Administration 457. A theoretical and empirical analysis of selected financial markets; considers markets for stock options, bonds, warrants, and convertibles, as well as foreign exchange and financial futures; covers the mechanics of participation in these markets in addition to the analytical material. Prerequisite: Finance 456. 1 unit.
- 458. Portfolio Management.** Same as Business Administration 458. Conceptual foundations and implementation of strategies for the selection, evaluation, and revision of portfolios of financial assets; examination of research related to portfolio and capital market theory. Prerequisite: Finance 456. 1 unit.
- 460. Theory of Insurance.** Study of the nature and cost of risk in our economic society, and of the methods of handling it. 1 unit.
- 464. Real Estate and Urban Land Economics.** Discusses the theory and practice of real estate and urban land economics; emphasizes real estate market analysis, finance, appraisal, and investment. Prerequisite: Economics 300, or consent of instructor. 1 unit.
- 469. Problems in Urban Land Economics.** Examines theoretical and empirical research into selected problems in urban land economics. Prerequisite: Finance 264 and Economics 300; or Finance 464; or consent of instructor. 1 unit.

- 470. Risk Management and Control.** Same as Business Administration 455. Analysis of the risk management problem in the business enterprise with emphasis on methodology for risk analyses; techniques for risk and loss control; models for risk management decision making; and procedures for administering risk management policy relating to nonspeculative (insurable) risk. Prerequisite: Finance 452 and Business Administration 460, or equivalent, or consent of instructor. 1 unit.
- 471. Seminar in Insurance.** Reviews recent contributions to the insurance literature concentrating upon current issues and research methodology; requires students to review selected recent articles on a variety of topics; gives attention to application of finance and economic theory to insurance issues and to empirical techniques for testing hypotheses. Examples of issues include the application of asset pricing models to insurance pricing, portfolio optimization for insurance companies, capital markets and insurance cycles, moral hazard and adverse selection. Prerequisite: Finance 400. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. $\frac{1}{2}$ to 1 unit.
- 499. Thesis Research.** Required for those writing master's and doctoral theses in finance. 0 to 4 units.

FINE AND APPLIED ARTS

Program Administrator: Professor J. H. McKenzie

Program Office: 110 Architecture Building, 608 E. Lorado Taft Drive, Urbana

- 185. Kabuki.** Same as Asian Studies 185. Combines academic studies in the Japanese and Asian theatre arts and the actual production of a Japanese classic kabuki play or some other Asian theatre art form; includes all the essential elements of the theatrical arts. 2 hours. May be repeated once with consent of instructor.
- 190. Exploring the Arts.** An introduction to the fine arts through lecture-discussions with a teacher-practitioner in each of the arts and through written critiques of exhibits, concerts, and plays; provides creative experiences by a final individual or small group project. 2 or 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 299. FAA Study Abroad.** Provides campus credit for foreign study and/or travel. A detailed proposal for study abroad must be submitted for approval by the appropriate committee of the department in which the student is studying and the college dean's office prior to such study abroad. Final determination of credit and its application toward the degree is made after a review of the student's work abroad by the above committee and college office. Prerequisite: Junior standing in the department; approval of the student's proposal by the departmental committee and the college office. 0 to 12 hours (summer session, 0 to 6 hours).

FOOD SCIENCE

Head of Department: Professor A. J. Siedler

Department Office: 567 Bevier Hall, 905 S. Goodwin, Urbana

- 101. Food in Modern Society.** Emphasizes the importance of food in providing adequate nutrients for modern society; introduction to processing and preservation of foods as well as the historical, geographical, chemical, and microbiological ramifications which exist in the food industry. 3 hours.
- 202. Sensory Evaluation of Foods.** Same as Foods and Nutrition 202. See Foods and Nutrition 202.

- 206. Field Trip.** Inspection of typical food preservation and manufacturing plants. Four-day trip required of all seniors in food science and food industry; see Timetable for current fees. Prerequisite: Junior standing in food science or consent of instructor. 1 hour.
- 213. Food Analysis, I.** Principles and application of the chemical, physical, and instrumental methods used to determine the constituents of foods; special considerations applicable to the analysis of certain foods. Lecture and lab. Prerequisite: Chemistry 131. 4 hours.
- 214. Survey of Food Chemistry.** Chemical composition of foods and the chemistry of the processing of meats, vegetables, fruits, milk, and cereals. Prerequisite: Chemistry 131. 3 hours. Credit is not given for both Food Science 214 and 314.
- 260. Raw Materials for Processing.** Lectures, reference readings, and laboratory experiments concerning the problems involved with procurement, harvesting, handling, and storage of fruits, vegetables, cereal grains, dairy products, and meat for the food-processing industry. Field trips to specialized operations. Prerequisite: One course in biological science and Food Science 101, or consent of instructor. 4 hours.
- 300. Special Problems.** Supervised research on special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. Not open to undergraduates who are on probation. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department with consent of the instructor. 1 to 5 hours, or $\frac{1}{4}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 2 units.
- 301. Food Processing, I.** Principles and applications of food preservation and processing by heat, low temperatures, and mechanical operations; lecture, laboratory, and field trips. Prerequisite: Food Science 213, 260, and 363, or consent of instructor. 5 hours or 1 $\frac{1}{4}$ unit.
- 302. Food Processing, II.** Principles and applications of food preservation and processing by moisture removal, fermentation, and special operations; lecture, laboratory, and field trips. Prerequisite: Food Science 301 or consent of instructor. 5 hours or 1 $\frac{1}{4}$ units.
- 311. Food and Industrial Microbiology.** Same as Microbiology 311. See Microbiology 311.
- 314. Food Chemistry and Nutrition, I.** Examines the chemical aspects of major food components: water, carbohydrates, proteins, and lipids; properties of pigments, salts, and food dispersions. Prerequisite: Chemistry 131 and 134. 4 hours or 1 unit. Credit is not given for both Food Science 214 and 314.
- 315. Food Chemistry and Nutrition, II.** Examines metabolism and nutritional aspects of carbohydrates, proteins, lipids, vitamins, minerals, food additives and toxicants of food; studies chemical changes that occur in these food components during processing and storage and their effects upon nutritional quality. Prerequisite: Food Science 214 or 314, and Chemistry 131 and 134; or equivalent. 4 hours or 1 unit.
- 324. Biochemical Aspects of Human Nutrition.** Same as Foods and Nutrition 324 and Nutritional Sciences 324. Advanced treatment of human nutrition, with emphasis on the biochemical functions of nutrients essential for humans; integrates, throughout the course, the molecular mechanisms by which individual nutrients interact to allow for homeostasis or create imbalances. Prerequisite: Biochemistry 350 or both Biochemistry 352 and 353, and a course in nutrition. 3 hours or $\frac{3}{4}$ unit.
- 332. Sanitation in Food Processing.** Studies the principles of sanitation with emphasis on practical considerations as they apply to various food-processing industries; control of insects, rodents, and micro organisms; fundamentals of detergency; sanitation of water supplies; waste disposal methods; and government and public health regulations. Field trips to local food-processing plants. Prerequisite: Chemistry 102 and Microbiology 101. 2 hours or $\frac{1}{2}$ unit.
- 335. Food Marketing.** Same as Agricultural Economics 335. See Agricultural Economics 335.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Dairy Science, Forestry and Horticulture 340. See Agronomy 340.
- 363. Engineering for Food Processing.** Fundamentals of material and energy balances, thermodynamics, fluid flow, heat transfer, psychrometry, refrigeration, and process control for the food process industry. Prerequisite: Introductory courses in physics and calculus, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

401. **Physical Chemical and Colloidal Phenomena of Food Products.** Studies physical, chemical, and colloidal phenomena involved in the processing of food products including such topics as food emulsion, foams, gelation, coagulation, rheology, and membrane phenomena in foods. Prerequisite: Chemistry 340. 1 unit.
402. **Advanced Topics in Food Processing.** Studies selected topics in food processing and engineering; includes extensive treatment of special processing techniques and elucidation of theory with laboratory exercises. Lecture and laboratory. Student may register only once for a given topic. Prerequisite: Food Science 302 or equivalent. $\frac{1}{4}$ to 1 unit.
406. **State and Metabolism of Lipids.** Advanced study of the state of lipids in animal tissues and in biological fluids, and of the metabolism of lipids in relation to dietary fats and other food constituents. Prerequisite: Biochemistry 350 or consent of instructor. 1 unit.
410. **Current Topics in Nutritional Research.** Same as Dairy Science and Nutritional Sciences 410. See Nutritional Sciences 410.
411. **Chemistry of Nutritional Processes.** Same as Dairy Science and Nutritional Sciences 411. See Nutritional Sciences 411.
421. **Seminar.** Discussions on specialized topics and current literature relating to food technology. Required of all graduate students in food science. 0 or $\frac{1}{4}$ unit.
473. **Advanced Food Microbiology.** Detailed examination of food and industrial processes dependent on fermentation and other microbial activities. Prerequisite: Organic chemistry, calculus, and Microbiology 311. $\frac{3}{4}$ unit. Offered in alternate years.
481. **Advanced Special Problems in Food Science.** Supervised individual study on advanced special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. $\frac{1}{4}$ to 2 units (summer session: $\frac{1}{2}$ to 1 unit).
491. **Chemistry of Lipids in Foods.** Detailed examination of the chemical and physical properties of lipids in foods. Offered in alternate years. Prerequisite: Food Science 314 or consent of instructor. $\frac{3}{4}$ unit.
499. **Thesis Research.** 0 to 4 units.

FOODS AND NUTRITION

Acting Head of Department: Professor Joseph Tobias

Department Office: 386 Bevier Hall, 905 S. Goodwin, Urbana

120. **Contemporary Nutrition.** Fundamental principles of human nutrition and their application to the selection of adequate diets; current topics of nutritional importance. 3 hours.
130. **Food Selection and Preparation.** Elementary study of foods in relation to market selection, preparation methods, and standards; comparative costs and food values; and principles of meal planning. 3 hours.
131. **Food Management.** Application of food preparation principles and techniques in the preparation of standard food products; principles of food management and their application in the planning and preparation of meals. A laboratory fee is assessed each student. Prerequisite: Foods and Nutrition 130. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Sensory Evaluation of Foods.** Same as Food Science 202. The physiology, psychology, and chemistry of flavor and flavor perception; tactual, visual, and auditory components affecting food acceptability; principles and application of preference and discrimination testing; and interpretation of panel evaluation data. 3 hours.
220. **Principles of Nutrition.** Nutritive value of foods and metabolism of essential nutrients; application of principles of nutrition to the requirements of normal individuals throughout the life cycle. Prerequisite: Chemistry 102 or 103; Physiology 103. 3 hours.
231. **Science of Foods.** Fundamental composition and behavior of foods; applies chemistry and other physical sciences to principles of food preparation and preservation. Prerequisite: Chemistry 102 or equivalent; Foods and Nutrition 131. 3 hours.

- 240. Quantity Food Production and Service.** Application of the principles of food preparation and service to institutional and commercial feeding. Prerequisite: Food handler's certificate; Economics 101; Foods and Nutrition 231. 3 or 5 hours.
- 250. Foods and Nutrition Internship.** Supervised learning experience through a cooperative program with a foods and nutrition related agency, business, or industry. Prerequisite: Junior standing and consent of department head; not open to students on probation. 4 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 305. Pediatrics and Nutrition.** Same as Elementary and Early Childhood Education 305 and Human Development and Family Ecology 305. Basic principles of nutrition, health and disease relevant to infants and children in group settings. Presents bio-medical concepts necessary for an understanding of subject matter. Not recommended for students majoring in nutrition or related field of study. Prerequisite: 3 hours of social sciences and 6 hours of natural sciences courses. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Nutritional Aspects of Disease.** Same as Nutritional Sciences 320. Examines nutritional, biochemical, and physiological aspects of disease processes and studies the role of nutrition in prevention, management, and treatment of disease. Prerequisite: Foods and Nutrition 220 or comparable course with a physiology prerequisite; Biochemistry 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 321. Experimental Nutrition.** Principles and application of nutrition research methodology, including animal feeding experiments, body composition studies, and nutrient analyses; laboratory and discussion. Prerequisite: Foods and Nutrition 220, Chemistry 122, Chemistry 134, and credit or concurrent registration in Biochemistry 350. 3 hours or $\frac{3}{4}$ unit.
- 322. Nutrition Through the Life Cycle.** Examines physiological changes that occur during gestation, postnatal growth, and aging and the influence of these changes on nutritional requirements. Prerequisite: Foods and Nutrition 220; senior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 323. Recent Advances in Foods and Nutrition.** New developments in foods and nutrition; readings, lectures, and discussions. Offered every other summer only. Prerequisite: Foods and Nutrition 220 and 231, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 324. Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Nutritional Sciences 324. See Food Science 324.
- 325. Problems in Nutrition Research.** Individualized instruction in experimental nutrition. Prerequisite: Biochemistry 350, Biochemistry 355, and credit or concurrent registration in Foods and Nutrition 324. 1 to 5 hours, or $\frac{1}{4}$ to 1 $\frac{1}{4}$ units.
- 326. Communications in Foods and Nutrition.** Selection of problems and organization of materials for demonstrations and other presentations in foods and nutrition subject matter. A laboratory fee is assessed. Field trip; see Timetable for approximate cost. Prerequisite: Foods and Nutrition 120 or 220 and 231, or equivalent; senior standing. 4 hours or 1 unit.
- 330. The Experimental Study of Foods.** Principles and techniques of foods research, including consideration of the effects of formula and preparation variations on chemical, physical, and sensory qualities of food. A laboratory fee is assessed. Prerequisite: Foods and Nutrition 231 or equivalent. 4 hours or 1 unit.
- 331. Problems in Foods.** Individual problems in food preparation and preservation. Prerequisite: Foods and Nutrition 330. 3 hours or $\frac{3}{4}$ unit.
- 345. Food Purchasing and Equipment Selection.** Purchasing food and selecting equipment for quantity food service; factors affecting the purchase of food; and the relationship of floor plans and equipment to service. Field trip; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Foods and Nutrition 240; Economics 101. 3 hours or $\frac{3}{4}$ unit.
- 350. Institution and Restaurant Management: Organization and Administration.** Organi-

- zation and administration of food service operations; management problems in various types of food services; personnel, costs, and sanitary control. Field trips; see Timetable for approximate cost. Prerequisite: Foods and Nutrition 120 and 240. 4 hours or 1 unit.
- 355. Specialized Quantity Food Production and Management.** Advanced application of food production and management principles to specific food service demands; emphasis on artistry in preparation, serving, and merchandising high quality food in quantity. Prerequisite: Foods and Nutrition 345 and credit or concurrent registration in Foods and Nutrition 350. 4 hours or 1 unit.
- 422. Seminar in Nutrition.** Discusses and evaluates current literature related to topics in nutrition. Prerequisite: Undergraduate degree in foods and nutrition, or comparable undergraduate degree in biochemistry, microbiology, physiology, or other biological science; consent of instructor. ½ unit.
- 432. Seminar in Foods.** Discusses and evaluates current literature related to specialized topics in foods. Prerequisite: Undergraduate degree in foods and nutrition, or comparable background in chemistry, microbiology, physiology, or other biological science; consent of instructor. ½ unit.
- 445. Current Topics in Food Service Systems Research.** Studies recent research related to food service systems; extensive investigation of research data and techniques on special topics each semester. Prerequisite: Graduate standing in foods and nutrition or related fields; Food Science 340; consent of instructor. ½ or 1 unit. May be repeated to a maximum of 1 unit.
- 493. Advanced Studies in Foods and Nutrition.** Library or experimental research on specific problems of limited scope; cannot be supervised by thesis advisor. Prerequisite: Consent of instructor. ½ to 1 unit.
- 499. Thesis Research.** Original research designed and conducted under graduate faculty supervisor. 0 to 4 units.

FORESTRY

Head of Department: Professor G. L. Rolfe

Department Office: 110 Mumford Hall, 1301 W. Gregory, Urbana

- 101. Introduction to Forestry.** The forest as a renewable natural resource; the aims and scope of forestry; economic and social importance of forests to the nation; the principal forest regions and species; forests for timber supply, for water conservation, for recreation, and for wildlife; the principles of forest management and protection; and the development of public and private forestry in the United States. 3 hours.
- 120. Introduction to Applied Entomology.** Same as Entomology 120. See Entomology 120.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Special Problems.** Supervised research on special problems in forestry. Prerequisite: A minimum grade-point average of 3.75; senior standing; consent of instructor and head of department. Specific approval of the associate dean is required in advance of registration for a second and/or third special problem course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 3 hours.
- 201. Wildland Recreation (Summer Field Studies).** Field study of wildland recreational resources and facilities, user characteristics and preferences, and management techniques within the multiple-use concept. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
- 211. Forest Ecology (Summer Field Studies).** Introduction to forest ecology and the application of ecological principles in silviculture and management practices. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.

- 213. Silviculture.** The art and science of controlling forest establishment, composition, and growth that will best fulfill the objectives of the owner. Required field trip. Prerequisite: Forestry 211. 3 hours.
- 220. Dendrology.** Taxonomy, geographical distribution, economic importance, and elementary silvics of the important forest trees in the United States and Canada. Prerequisite: Plant Biology 100. 4 hours.
- 221. Forest Measurements (Summer Field Studies).** Introduction to forest measurements, including individual tree and stand measurements, inventory methods, and determination of the growth of trees and stands; topics in surveying and aerial photogrammetry. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
- 231. Wood Utilization, I (Summer Field Studies).** Field and classroom exercises in logging and milling, conversion of raw wood to useful products, visits to plants, and industrial aspects of wood use. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
- 232. Wood Utilization, II.** Principles and methods of harvesting, grading, and transporting forest products; conversion of logs, bolts, and cordwood; physical-mechanical properties and defects of wood; and specifications and uses of lumber, veneer, plywoods, pulp, paper, and chemical derivatives. 3 hours.
- 236. Physical Properties of Wood and Wood-Base Materials.** Physical properties of wood materials, emphasizing the influence of anatomy, density, and moisture content; wood-liquid relations; thermal, electrical, and acoustical properties; and study of the theory and practice of wood seasoning for determining dimensional stability. Prerequisite: One year of college physics and one year of college chemistry, or consent of instructor. 3 hours.
- 256. Surveying Agricultural and Forest Lands.** Same as Agricultural Engineering 256. See Agricultural Engineering 256.
- 271. Wood Anatomy and Identification.** Study of the macroscopic, microscopic, and ultramicroscopic structure of wood and the identification of many important commercial woods by means of anatomical characteristics; fundamental physical and chemical properties of wood. 3 hours.
- 273. Adhesives and Laminates.** Physical and chemical properties of the principal adhesives used to bond wood and other materials; principles of adhesion; and manufacture, properties, and uses of plywood, laminated wood, and other products. 3 hours.
- 277. Interpretation of Aerial Photographs.** Same as Geography 277. See Geography 277.
- 281. Introduction to Forest Resource Management (Summer Field Studies).** Field introduction to forest resource management, including wildlife management, watershed management, and forest protection. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
- 283. Introductory Ecology for Educators.** Same as Environmental Studies 283. Intended primarily for education students. Basic ecological concepts and how they may be incorporated into the classroom; includes ecosystem structure and function, communities and population, energy flow and nutrient cycling, and integrating ecology/environmental education into the classroom. Eight-hour field trip required; see Timetable for approximate cost. 3 hours.
- 290. Urban Forestry.** The management of wooded areas in urban and community settings, including how trees contribute to improving the urban environment and how they react to urban stresses. Includes laboratory. Prerequisite: Forestry 220, Horticulture 202, or Landscape Architecture 252, or equivalent. 3 hours.
- 301. Forest Recreation.** Same as Leisure Studies 301. The management of forest lands for recreational uses; biological and physical resources; users' behaviors, needs, and desires; and principles involved in managing the forest resource and the users. Prerequisite: Leisure Studies 100, Forestry 201, or consent of instructor. 2 hours or ½ unit.
- 312. Diseases of Urban Trees.** Same as Plant Pathology 312. See Plant Pathology 312.
- 314. Diseases of Forest Trees.** Same as Plant Pathology 314. See Plant Pathology 314.
- 315. Forest Soils.** Study of the physical, chemical, and biological properties of forest soils;

- includes the relationship of forest soils to the total environment, forest hydrology, tree growth, and stand development; weekend overnight field trip required. Prerequisite: Agronomy 101. 2 hours or $\frac{1}{2}$ unit.
- 316. Advanced Forest Ecology.** Emphasizes the relationship between environmental factors and tree growth; discusses silvicultural and site-improvement practices in relation to their ecological basis; weekend overnight field trip required. Prerequisite: Forestry 211 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Introduction to Natural Resources Economics.** Same as Agricultural Economics and Environmental Studies 317. See Agricultural Economics 317.
- 318. Tropical Forest Ecosystems.** Studies interactions between climate and soils and the structural and functional characteristics of tropical forests, including both natural and managed forest ecosystems. Prerequisite: Forestry 316 or credit in one course in general ecology; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 319. Environment and Plant Ecosystems.** Same as Agronomy and Environmental Studies 319. Examines relationships between environmental factors and structural characteristics and processes in ecosystems; impact of human activities on the environment and their effect on plant ecosystems. Draws examples from agricultural and forest ecosystems. Prerequisite: One course in biology, and Chemistry 102 or equivalent; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 321. Forest Biometrics.** Introduction to statistical methods used in the management of natural resources; includes applied regression analysis and survey of sampling methods, with computer applications. Prerequisite: Forestry 221. 3 hours or $\frac{3}{4}$ unit.
- 326. Tree Physiology.** Studies tree functions as they relate to tree structure, environment, and cultural practices; emphasizes photosynthesis, carbohydrate metabolism, nitrogen metabolism, water relations, and symbiotic associations of trees. Prerequisite: Plant Biology 100 and Chemistry 102 or 103. 3 hours or $\frac{3}{4}$ unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Dairy Science, Food Science and Horticulture 340. See Agronomy 340.
- 345. Statistical Methods.** Same as Agricultural Engineering, Animal Science, and Dairy Science 345. See Dairy Science 345.
- 348. Wildlife and Land Management.** Same as Ecology, Ethology, and Evolution 348. See Ecology, Ethology and Evolution 348.
- 351. Forest Resource Economics.** Applies principles of economics to the establishment, development, and use of forest and related natural resources; major concepts studied include production economics, capital budgeting, forest taxation, regional analysis, and supply, demand, and marketing of major forest products. Prerequisite: Economics 101 and Forestry 321; or consent of instructor. 4 hours or 1 unit.
- 372. Mechanical Properties of Wood and Wood-Base Materials.** Static mechanics, strength properties, and structural designs of wood, plywood, particleboard, and hardboard, emphasizing the standard methods of testing wood and fibrous material, wood beam and column designing, and other factors concerning the strength of wood materials, particularly the derivation of allowable stresses. Prerequisite: Physics 102. 3 hours or $\frac{3}{4}$ unit.
- 377. Aerial Photograph Interpretation and Remote Sensing.** Same as Geography 377. See Geography 377.
- 381. Forest Resource Management.** An integration and synthesis of forestry concepts and quantitative decision making techniques applied to managing forests to meet the objectives of both public and private forest land owners. Prerequisite: Forestry 351 or consent of instructor. 4 hours or 1 unit.
- 383. Forest Resources Planning.** Integrates advanced study of decision models in forest planning with the functional, economic, and administrative aspects of managing forest resources for multiple products; student planning teams prepare management plans for a nearby forest. Prerequisite: Forestry 381 and 321; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 400. Forestry Seminar.** Discussions of current research and specialized topics in forestry; a seminar must be given by all students in order to receive credit. Required of all graduate students in forestry. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.

- 401. Special Problems.** Individual studies or investigations in selected branches of forestry. 0 to 1 unit. Not more than 2 units may be offered toward an M.S. degree.
- 414. Discussions in Forest Ecology and Physiology.** Individual and group discussions of developments and techniques in forest ecology and physiology based on classic and current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 415. Linear and Non-Linear Statistical Models for Biologists.** Same as Animal Science and Dairy Science 415. See Animal Science 415.
- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 433. See Biology 433.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 434. See Biology 434.
- 450. Advanced Forest Biometry.** Examines and discusses developments and techniques used in forest inventory, growth models and ecological models. Offered alternate years. Prerequisite: Forestry 321, Agronomy 440, or consent of instructor. $\frac{1}{2}$ unit.
- 460. Discussions in Forest Policy and Administration.** Individual and group discussions of the major relevant problems in the field of forest resources policy and administration (both public and private) based on current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Economics, and Environmental Studies 463. See Agricultural Economics 463.
- 499. Thesis Research.** Research may be conducted in various phases of forestry; subject must be approved by departmental committee. 0 to 3 units.

FRENCH

Head of Department: Professor P. A. Gaeng

Department Office: 2090 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. Elementary French, I.** Four-skill course leading to proficiency in oral expression, listening comprehension, reading, writing, and cultural understanding. Open only to students with no previous study of French. All students are required to attend language laboratory sessions several times a week, as needed. 4 hours. Credit is not given for both French 101 and 105.
- 102. Elementary French, II.** Continuation of French 101. Introduces cultural and supplementary enrichment materials; requires laboratory sessions as in French 101. Prerequisite: French 101 or one year of high school French. 4 hours. Credit is not given for both French 102 and 105.
- 103. Intermediate French, I.** Continuation of French 102. Introduces students to a full range of structures to complete their initial study of the grammatical system; emphasizes the development of all four skills and cultural understanding through readings and audiovisual enrichment materials. Students planning to major or minor in French should take French 133 in lieu of French 103. Prerequisite: French 102 or equivalent, or a placement score showing high school achievement equivalent to French 102. 4 hours. Credit is not given for both French 103 and 106.
- 104. Intermediate French, II.** Continuation of French 103. Comprehensive grammar review

with emphasis on oral expression and the continued development of reading and written skills. Completion satisfies graduation requirement in the College of Liberal Arts and Sciences. Students planning to take advanced French courses should take French 134 in lieu of French 104. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.

105. **French Active Review, I.** Reviews materials covered in French 101 and 102 in preparation for entrance into French 103 or 133. Open to students with high school French; by placement score or consent of department only. Not open to students with credit in French 101 or 102. Prerequisite: one or two years of high school French and placement score in 101 range. 4 hours.
106. **French Active Review, II.** Reviews materials covered in French 102 and 103 in preparation for entrance into French 104, 114, 124, or 134. Not open to students with credit in French 101, 102, or 103. Open to students with high school French; by placement score or consent of department only. Prerequisite: Three or four years of high school French with placement at 102 levels. 4 hours.
113. **Conversational Practice.** Oral practice for the development of elementary conversational skill and the improvement of pronunciation; designed as a supplement to third and fourth semester French courses. Prerequisite: Concurrent enrollment in third or fourth semester French course, or consent of instructor. 1 hour.
114. **Conversational French.** Practice in spoken French. May be substituted for French 104 to satisfy the graduation requirement in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
124. **Readings in French Literature.** Additional readings in English of authors treated will be assigned according to demonstrated interest. May be substituted for French 104 to satisfy the graduation requirements in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103; placement by virtue of high school units (usually three years). 4 hours.
133. **Accelerated Intermediate French, I.** Similar to French 103, but accelerated for those interested in pursuing French in advanced courses; includes comprehensive grammar review and readings in literature and culture. Prerequisite: French 102 or two semesters of college French, or a placement score showing high school achievement equivalent to French 102. Normally for students with a "B" average in French or with consent of instructor. 4 hours.
134. **Accelerated Intermediate French, II.** Continuation of French 133. Comprehensive grammar review and readings in French literature and culture preparatory for continued work at the advanced level; emphasizes all four skills and culture. Prerequisite: French 133, or French 103 with department approval, or three semesters of college French, or a placement score showing high school achievement equivalent to French 103. 4 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
205. **Oral French, I.** Training for the development of oral facility; exercises for the improvement of pronunciation and diction; and optional practice in the language laboratory. Prerequisite: French 104, or 103 and 113, or four years of high school French. 3 hours.
206. **Oral French, II.** Continuation of French 205; optional practice in the language laboratory. Prerequisite: French 205. 3 hours.
207. **Grammar and Composition.** Training in French syntax, translation from English into written French, and directed composition. Prerequisite: Four years of high school French or equivalent, or French 134 or, with departmental approval, French 104. 3 hours.
209. **Introduction to French Literature, I.** Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.

- 210. Introduction to French Literature, II.** Continuation of French 209. Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 217. Advanced Oral French.** Intensive practice in oral French to improve fluency, vocabulary, comprehension, pronunciation and syntax; activities include reports, discussion and role-play on topics selected and prepared by class participants; also includes weekly written assignments based on class activities. Prerequisite: French 206 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
- 220. Sixteenth-Century Literature.** General survey of the literature of the French Renaissance. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 223. French Literature of the Seventeenth Century, I.** Major French writers of the preclassical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 224. French Literature of the Seventeenth Century, II.** Major French writers of the classical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 227. French Literature of the Eighteenth Century, I.** Montesquieu, Voltaire, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 228. French Literature of the Eighteenth Century, II.** Diderot, Rousseau, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 230. French Literature of the Nineteenth Century, I: 1800-1850.** Major prerealist and romantic writers. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 231. French Literature of the Nineteenth Century, II: 1850-1900.** The evolution of romanticism and realism into the naturalist and symbolist movements. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 233. French Literature of the Contemporary Period, I.** Modern poetry from Baudelaire to Valéry; prose writers from 1900 to 1940. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 234. French Literature of the Contemporary Period, II.** Continuation of French 233. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 270. Parateaching.** Same as German, Latin, Russian, and Spanish 270. Parateaching prior to the practicum in local schools under the direct supervision of University of Illinois faculty and the teaching staff of participating schools. Prerequisite: Enrollment in a foreign language teaching curriculum or consent of an advisor in a foreign language teaching curriculum. 2 hours. May be repeated.
- 279. Introduction to Foreign Language Education.** Same as German, Humanities, Latin, Russian, and Spanish 279. See Humanities 279. 280. Teachers Course. Survey of resources, classroom materials, standard practices, and problems in the teaching of French with practical application to actual classroom situations. Required for teacher training majors in French. This course does not meet during the period teacher-training majors are off campus. Prerequisite: French 205, 206, 207, 209 and 210; or equivalent. 4 hours.
- 287. French Language and Culture Through Literary Analysis, Scriptwriting, and Recording.** Deepened appreciation of French culture and advanced practical language training through reading and discussion of key works of literature and other cultural documents, followed by the writing and recording in French of scripts based on these works. Prerequisite: French 205, 207, and 209, or equivalent, or consent of instructor. 3 hours.
- 288. French and Comparative Cinema, I.** Same as Comparative Literature 288. Selected world cinema trends to approximately 1960, with emphasis on French directors (Clair, Vigo, Renoir, Carne, Clouzot, etc.); aesthetic, sociopolitical, historical, literary, and technical aspects; meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French concentrators, one college-level film studies course or consent of instructor; no prerequisite for French concentrators. 4 hours.
- 289. French and Comparative Cinema, II.** Same as Comparative Literature 289. Continuation of French/Comparative Literature 288. Selected world cinema trends since approxi-

mately 1960, with emphasis on French directors (Chabrol, Godard, Truffaut, Resnais, Marker, Rohmer, etc); meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French concentrators, one college-level film studies course or consent of instructor; no prerequisite for French concentrators. 4 hours.

- 290. Individual Study: Major Tutorial.** A tutorial taken by students in the course of two of their last four semesters of undergraduate study. Students read the works on a departmental reading list with the guidance of a tutor, repeating enrollment for a total of 2 hours credit, normally at the rate of 1 hour per semester. Prerequisite: French 205, 207, 209, and 210, or equivalent; a declared field of concentration in French; junior standing. 1 to 2 hours. (Counts for advanced hours in LAS.)
- 292. Senior Thesis.** For candidates for honors in French and for other seniors. Prerequisite: Senior standing. 2 hours. May be repeated for a maximum of 4 hours credit. (Counts for advanced hours in LAS.)
- 298. Senior Seminar.** Studies in authors, genres, themes, and movements in French literature; conducted entirely in French. Prerequisite: Senior standing. 3 hours. May be repeated for credit. (Counts for advanced hours in LAS.)
- 299. Study Abroad.** Lectures, seminars, and practical work in French language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: French 209 and two of the following: French 205, 206, or 207; 3.75 overall average; 4.0 average in French courses. 0 to 17 hours per semester, to a maximum of 34 hours per academic year.
- 310. Modern African Fiction.** Same as African Studies and Comparative Literature 310 and English 370. See African Studies 310.
- 313. French Phonetics and Diction.** A systematic study of the sounds and sound patterns of French; training in the improvement of French pronunciation with special attention to the problems of teachers. Prerequisite: French 206, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 314. Advanced Grammar and Style.** Advanced theoretical and practical study of present-day French, with free composition and some consideration of stylistics. Prerequisite: French 207 (with a grade of C or better), or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 316. Structure of the French Language.** Same as Linguistics 316. General survey of the linguistic structure of modern standard French, including phonology, morphology, and syntax; emphasis on the differences between its spoken and written forms. Prerequisite: French 313 or equivalent training in phonetics. 3 hours or $\frac{3}{4}$ unit.
- 319. Techniques in Translating.** A practical course in the techniques of translating technical, commercial, scientific, and literary texts from English into French and vice versa. Prerequisite: French 314 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 320. Techniques in Interpreting.** A practical course in the technique of oral translation of spoken material covering a wide range of subject matter in a variety of settings. Prerequisite: French 319 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 335. French Civilization, I.** Survey of French life and French institutions, intended as a background for literary studies and as a preparation for the teaching of French; given in French. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 336. French Civilization, II.** Continuation of French 335. May be taken independently of French 335. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 343. Studies in French.** See Timetable for current topics. Prerequisite: Junior standing. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 355. France Today, I.** Social structures of France today and their manifestation in daily life and culture; study of the workings of various institutions and systems (political, judicial, economic, educational, etc.) for an understanding of current problems, providing background for closer study, in the second semester, of the forces affecting daily life. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 356. France Today, II.** Study of the conditions of daily life in France today, its organization, the major forces and issues affecting it; topics include class structure, youth culture, urban and minority problems, the press, media, and popular culture and the arts. 3 hours, or $\frac{3}{4}$ to 1 unit.

- 360. Principles of Language Testing.** Same as English as a Second Language, German, and Spanish 360. See English as a Second Language 360.
- 362. Introduction to Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 379. Studies in Francophonie.** Same as Comparative Literature 334. Studies of various genres, periods, and topics of French literature outside of France, with a different geographical emphasis each semester. Regions include black Africa, the Caribbean, Canada, North Africa, the Middle East, and Switzerland. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 12 hours or 4 units.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 385. Commercial and Economic French, I.** Studies French business practices: company structures, selling and buying techniques, banking, import/export and other commercial negotiations, employment, formalities, and conventions of letter-writing; involves both theory and practice. Prerequisite: French 314 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 386. Commercial and Economic French, II.** Emphasizes business correspondence and simulation of business practices in the areas introduced in French 385; also focuses on geographic and economic topics pertaining to France within the European community and Europe in general. Prerequisite: French 385 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 399. Study Abroad.** Lectures, seminars, and practical work in francophone literature and civilization, in a French-speaking country. Prerequisite: French 209 and 210, and two of the following: French 205, 206, and 207; or equivalent. Not open to undergraduates in the Paris program. 0 to 16 hours, or 0 to 4 units.
- 400. Beginning French for Graduate Students.** Basic grammar, vocabulary, and reading practice; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. 4 hours. No graduate credit.
- 401. Reading French for Graduate Students.** Grammar, vocabulary, and general and special reading; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. Prerequisite: French 400, or French 101 and 102, or equivalent. 4 hours. No graduate credit.
- 403. The Study of Culture: Fine Arts, History, and Literature, I.** A study of major artistic, historical, political, and literary aspects of France up to the French Revolution with emphasis on the relationship between literature and other aspects of French culture. 1 unit.
- 404. The Study of Culture: Fine Arts, History, and Literature, II.** Continuation of the approaches and emphases of French 403 from the French Revolution to the present. Prerequisite: French 403 or consent of instructor. 1 unit.
- 405. Techniques in Teaching College and Secondary French.** Examination and discussion of classroom procedures and language laboratory techniques in teaching French at the college and secondary level, associated with demonstration class and supervision of teaching practice. Required of new teaching assistants in the Department of French. $\frac{1}{2}$ unit.
- 425. Studies in Contemporary Critical Problems.** Same as Comparative Literature 425. Introductory course to some aspect of modern French critical theory; normally taught in English and texts may be read in English. 1 unit. May be repeated as topic varies.
- 430. Introduction to Research and Textual Criticism.** Proseminar in literary studies: research and methods; approaches to the literary text. Required of all M.A. and Ph.D. candidates. 1 unit.
- 431. Introduction to Old French Language.** Outline of Old French grammar and training in reading Old French (twelfth and thirteenth centuries). 1 unit.
- 432. Studies in Medieval French Literature.** Close study of one or more topics in Old French literature. See Timetable for current topics. Prerequisite: French 431 or consent of instructor. 1 unit.

- 433. Studies in Sixteenth-Century French Literature, I.** Major writers of the sixteenth century studied with reference to the most important intellectual and religious preoccupations of their century. 1 unit.
- 434. Studies in Sixteenth-Century French Literature, II.** Themes and techniques of major poets and poetic schools of the sixteenth century. 1 unit.
- 435. Studies in Seventeenth-Century French Literature, I.** 1 unit.
- 436. Studies in Seventeenth-Century French Literature, II.** 1 unit.
- 437. Studies in Eighteenth-Century French Literature, I.** 1 unit.
- 438. Studies in Eighteenth-Century French Literature, II.** 1 unit.
- 439. Studies in Nineteenth-Century French Literature.** Close study of one or more topics in nineteenth-century French literature; see Timetable for current topics. 1 unit. May be repeated to a maximum of 2 units.
- 441. Studies in Twentieth-Century French Literature, I.** 1 unit.
- 442. Studies in Twentieth-Century French Literature, II.** 1 unit.
- 443. French Studies.** A flexible course limited only by the concentration of its material in French; may be activated by student request or faculty proposal. 1 unit.
- 447. Introduction to Romance Stylistics.** Same as Italian, Portuguese and Spanish 447. See Spanish 447.
- 452. Studies in French and Comparative Cinema.** Same as Comparative Literature 472. Historical, aesthetic, social, and technical studies of the French cinema; its development and relation to world cinema and to literature. 1 unit. May be repeated to a maximum of 3 units.
- 462. Seminar in Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
- 463. College Teaching of Foreign Languages.** Same as English as a Second Language, German, Russian, and Spanish 463. Rationale for curricular objectives for college courses in foreign languages; the teaching and testing of pronunciation, listening comprehension, speaking, reading, writing, cultural understanding, and literary appreciation; the use of technology; and recent experimentation. $\frac{1}{2}$ or 1 unit.
- 470. Seminar in Old French Literature.** Discussion and research on some specialized topic in Old French literature. See Timetable for current topic. Prerequisite: French 431 or consent of instructor. 1 unit. May be repeated.
- 471. Seminar in Sixteenth-Century French Literature.** Discussion and research on some specialized topic in sixteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
- 472. Seminar in Seventeenth-Century French Literature.** Discussion and research on some specialized topic in seventeenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
- 473. Seminar in Eighteenth-Century French Literature.** Discussion and research on some specialized topic in eighteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
- 474. Seminar in Nineteenth-Century French Literature.** Discussion and research on some specialized topic in nineteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
- 478. Seminar in Twentieth-Century French Literature.** Same as Comparative Literature 478. Discussion and research on some specialized topic in twentieth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
- 479. Seminar in French Literature.** Discussion and research on some specialized area in French literature. See Timetable for current topic. 1 unit. May be repeated.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, German, Russian, and Spanish 481. Language teaching problems considered in the light of theoretical and experimental work in language acquisition, verbal learning and memory, motivation, speech perception, reading, error analysis, and language as an aspect of culture and societal relations. Prerequisite: Consent of instructor. 1 unit.

- 484. Narrative Semiotics, I.** Same as Comparative Literature 484. Examines fundamentals of semiotic analysis of various types of texts, with emphasis on methodology and analytic techniques; applicable in most humanistic fields and in some social sciences, with emphasis on the methodological presuppositions of semiotics and the pragmatic dimension of narrative, including the concepts of the actants, narrative programs, and the deep structure. In English. 1 unit.
- 485. Narrative Semiotics, II.** Same as Comparative Literature 485. Examines fundamentals of semiotic analysis of various types of texts, with emphasis on methodology and analytic techniques; applicable in most humanistic fields and in some social sciences; focuses on more recent and advanced developments such as the cognitive dimension of narrative, modalities and manipulation, as well as on more theoretical issues such as social, cultural, and historical semiotics, and the philosophical issues raised by semiotic theory. In English. Prerequisite: French 484. 1 unit.
- 490. Seminar in Contemporary Criticism, Methods and Theory.** Same as Comparative Literature 490. Deals with a particular individual, school, method or problematic in structuralist or post-structuralist thought; normally taught in English, and texts may be read in French or English, if available. Prerequisite: An introductory course in criticism, or consent of instructor. 1 unit. May be repeated as topic varies.
- 491. Individual Topics.** Prerequisite: Graduate standing with a major or minor in French. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

GENERAL ENGINEERING

Head of Department: Professor J. S. Dobrovolsky

Department Office: 117 Transportation Building, 104 South Mathews, Urbana

- 103. Engineering Graphics, I.** Integrated course in engineering graphics for all students in the College of Engineering. Freehand sketching; theory of orthographic projection and the analysis and synthesis of theoretical and practical problems involving the size, shape, and/or relative positions of common geometrical magnitudes such as points, lines, planes, and other surfaces and solids; theory of pictorial projections; basic dimensioning; and basic charts and diagrams. 3 hours. Credit is not given for both General Engineering 103 and General Engineering 105.
- 105. Elements of Drawing.** Theory, techniques, terms, symbols, and conventional practices used in making various types of projection and nonprojection drawings with instruments and freehand. For students in the aircraft maintenance curriculum. Prerequisite: High school plane geometry. 3 hours. Credit is not given for both General Engineering 105 and General Engineering 103.
- 193. Special Problems.** Individual investigations of any phase of general engineering selected by the students and approved by the department. Prerequisite: Consent of instructor. 0 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. History of Engineering.** Survey of the major contributions of the science and art of engineering from prehistory to the present; integrates the impact of engineering with the cultural aspects of the various periods. Prerequisite: Junior standing or consent of instructor. 3 hours.
- 221. Introduction to General Engineering Design.** Fundamental concepts in the classical and computer-based analysis and design of structural and machine components and assemblies; external and internal loads and displacements in statically determinate and indeterminate configurations; kinematics of linkages, gears, and cams; and cam profile design. Prerequisite: Theoretical and Applied Mechanics 212 and 221, and Computer Science 101. 3 hours.

- 222. Analysis of Dynamic Systems.** Introduction to the operational techniques used in describing the behavior of dynamic systems; elements of modeling; equilibrium and linearization; Laplace transformation techniques; system response via the transfer function; block diagrams and computer simulation; matrix operations; system response via state variables; and stability. Prerequisite: Mathematics 345; concurrent registration in Computer Science 101. 3 hours.
- 232. Engineering Design Analysis.** Studies stress/strain conditions, solution techniques, and analysis of various engineering materials and configurations, as applied to the development and application of design and analysis criteria. Prerequisite: General Engineering 221. 4 hours.
- 234. General Engineering Laboratory.** Prepares students for experimental projects, introduces mechanical and electrical instruments; basic measurement techniques; simulation of dynamic systems; applies microcomputers to control problems; measurement errors, relative and absolute; determines mechanical properties of selected materials; transducers and signal conditioning. Prerequisite: General Engineering 221 and 222. 3 hours. Credit is not given for both General Engineering 234 and either Theoretical and Applied Mechanics 223 or Mechanical Engineering 261.
- 241. Component Design.** Studies the design of basic engineering components: structural members, connections, and mechanical elements; applies principles including material failure, fatigue, buckling and other instabilities, reliability, and simulation. Prerequisite: General Engineering 222 and 232. 4 hours.
- 242. Project Design.** Design of various engineering devices and systems. Teams of two to four students work toward the development of engineering solutions to problems supplied by industry. A midterm and final report summarize the work of the semester for sponsor and faculty. Prerequisite: Credit or concurrent registration in General Engineering 241 and senior standing. 3 hours.
- 288. Economic Analysis for Engineering Decision Making.** Introduction to economic and operational analysis in the engineering decision-making process; mathematics of capital budgeting, mathematical programming, systems analysis, and the application of probability and simulation to decision making. Prerequisite: Junior standing or consent of instructor. 3 hours. Credit is not given for both Electrical Engineering 288 and General Engineering 288.
- 290. Legal Aspects of Engineering Contracts and Specifications.** Same as Civil Engineering 290. Laws governing various engineering contracts; tort law and professional liability of engineers; workmen's compensation; property law; and business and technical clauses of specifications. Prerequisite: Senior standing in architecture or engineering, or consent of instructor. 3 hours. Credit is not given for both Civil Engineering 290 and General Engineering 292.
- 291. General Engineering Seminar.** Series of lectures and discussions by department faculty and visiting professional engineers on ethics, professional registration, the role of technical societies, and the relation of engineering to such disciplines as economics, sociology, and government. Prerequisite: Senior standing in general engineering. 0 hours.
- 292. Engineering Law.** Nature and development of the legal system; legal relationships, rights and duties, and their importance in the engineering profession; and contracts, torts, agency, business transactions, and liability for defective products. Prerequisite: Senior standing in engineering or architecture, or consent of instructor. 3 hours. Credit is not given for both General Engineering 290 and 292.
- 293. Special Problems.** Individual investigations or studies of any phase of general engineering selected by the students and approved by the department. Prerequisite: Junior standing; consent of instructor. 0 to 4 hours.
- 324. Digital Control of Dynamic Systems.** Discrete systems, emphasizing digital computer control of dynamic processes; the z-Transformation Control design by transform and state space techniques; D/A and A/D conversion; real time digital control of analog systems. Prerequisite: General Engineering 222 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 334. Introduction to Reliability Engineering.** Same as Industrial Engineering 334. See Industrial Engineering 334.

- 392. Legal Problems in Engineering Design.** The law as it affects engineering design; products liability, product safety legislation, and product standards and certification; legal rights and duties of the design professional; and the patent system and protection of inventions. Prerequisite: Senior standing. 3 or 4 hours, or $\frac{1}{4}$ or 1 unit.
- 393. Special Problems.** Studies advanced problems related to general engineering. Prerequisite: Senior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 491. Simulation of Dynamic Systems.** Modeling and simulation of dynamic engineering systems; distinct modeling approaches for engineering devices; analog and digital computer simulation of dynamic systems; design criteria and performance and design measures; and extensive use of case studies and projects. Prerequisite: General Engineering 222 and Industrial Engineering 385, or equivalent. 1 unit.
- 493. Special Problems.** Advanced problems related to general engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated.
- 495. Evaluation and Management of Engineering Design Projects.** Quantitative evaluation and optimization of project plans, using mathematical programming and multiple-criteria decision making; optimal design and sizing of engineering projects; reliability of designs, studied by acyclic network analysis and network simulation; and implementation and control of engineering designs by network analysis. Prerequisite: General Engineering 288 and Industrial Engineering 385, or equivalent. 1 unit.
- 497. Project Design.** Engineering design projects emphasizing advanced engineering analysis, synthesis, optimization, and engineering economics. $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.
- 499. Thesis Research.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.

GENETICS AND DEVELOPMENT

Head of Department: Professor R. W. Tuveson (Acting)

Department Office: 515 Morrill Hall, 505 S. Goodwin, Urbana

- 106. Heredity and Society.** Provides nonscience students with an understanding of genetics so they can appreciate how recent discoveries and environmental changes may affect their future and the future of society. 3 hours. Students may not receive credit for both Genetics and Development 106 and 210.
- 107. Evolution.** Analysis of the theories of evolution, the mechanism of evolutionary changes, and the evolution of man. Prerequisite: Sophomore standing. 3 hours. Students may not receive credit for both Genetics and Development 107 and 301.
- 108. Biology of Human Aging.** Introduces the biological processes that characterize development, reproduction, and senescence. 3 hours. Students may not receive credit for both Genetics and Development 108 and 211.
- 210. Genetics.** Principles of heredity and the nature of genetic material. Prerequisite: Biology 111 or equivalent, or consent of instructor. 4 hours. Students may not receive credit for both Genetics and Development 210 and 106. (Counts for advanced hours in LAS.)
- 211. Development of Form.** Introduction to the unifying concepts and evolutionary aspects of organismic development with emphasis on descriptive aspects of growth, differentiation, and organogenesis. Prerequisite: Biology 111 or equivalent. 3 hours. Students may not receive credit for both Genetics and Development 211 and 108. (Counts for advanced hours in LAS.)
- 213. Cells and Tissues.** Lecture and laboratory introduction to the structure of animal and plant cells and tissues, including basic ultrastructure, with emphasis on animal histology. Prerequisite: Biology 111 or equivalent. 4 hours. Students may not receive credit for both Biology 151 and Genetics and Development 213. (Counts for advanced hours in LAS.)
- 290. Individual Topics.** Laboratory work or reading in fields selected in consultation with a

faculty member in the Department of Genetics and Development. Prerequisite: Fifteen hours of life science courses and consent of Genetics and Development faculty sponsor. 2 to 5 hours. May be repeated to a maximum of 10 hours.

- 301. Introduction to Evolutionary Biology.** Same as Ecology, Ethology, and Evolution 301. Introduction to the evidence for evolution and the origin and types of genetic variation, stressing various modes of selection and modern observations and experiments illustrating the evolutionary process. Prerequisite: Genetics and Development 210 or equivalent. 3 hours or $\frac{1}{4}$ unit. Students may not receive credit for both Genetics and Development 301 and 107.
- 304. Biological Clocks.** Study of the nature, mechanisms, functions, development, and evolution of the biological rhythms associated with geophysical cycles; emphasizes circadian rhythms and their role as biological clocks for the timing of photoperiodism, celestial orientation, and human physiology and behavior. Prerequisite: Biology 111 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 307. Immunology.** Introduction to fundamentals of immunology with emphasis on biological application; basic background for understanding immunological responses and techniques applicable to biological research. Prerequisite: Four semesters of college biology; a course in organic chemistry, or consent of instructor. 4 hours or $\frac{1}{4}$ unit.
- 309. Ecological Genetics.** Study of the effects of physical and biological factors on the genetic structure of populations, with emphasis on recent theories of genotype/environmental interactions and their relationship to evolutionary processes. Prerequisite: Genetics and Development 210. 3 hours or $\frac{1}{4}$ unit.
- 312. Developmental Genetics.** Mechanisms underlying the genetic control of eukaryote development at the molecular and cellular levels. Prerequisite: Biology 151 or Genetics and Development 210; Genetics and Development 211, Biology 251, or Genetics and Development 333; a course in biochemistry. 3 hours or $\frac{1}{4}$ unit.
- 313. Experimental Genetics.** Laboratory course to expose students to several types of organisms, experimental approaches, and methods of analysis utilized in genetical research. Prerequisite: Biology 151 or Genetics and Development 210; consent of instructor. 4 hours or 1 unit.
- 315. Human Genetics.** Study of the techniques employed for genetic analysis of human traits; discussion of genetic mechanisms operative in human development, metabolism, and behavior; and genetics and human disease. Prerequisite: Genetics and Development 210; biochemistry and statistics recommended. 3 hours or $\frac{1}{4}$ unit.
- 316. Population Genetics.** Same as Dairy Science 316. See Dairy Science 316.
- 317. Quantitative Genetics.** Same as Dairy Science 317. See Dairy Science 317.
- 332. Genetic Toxicology.** Same as Agronomy 332 and Environmental Studies 332. See Environmental Studies 332.
- 405. Molecular Genetics: Gene Action.** Structure, synthesis, and function of molecules and organelles concerned with the intracellular transmission of genetic information (including gene regulation, transcription, and translation). Prerequisite: Microbiology 330, Microbiology 316 plus biochemistry, or consent of instructor. $\frac{1}{4}$ unit.
- 410. Seminar in Genetics, Development, and Evolution.** Student presentations and discussions of selected current topics in genetics, development, and evolution. $\frac{1}{4}$ unit.
- 417. Advanced Quantitative Genetics.** Same as Dairy Science 417. See Dairy Science 417.
- 418. Concepts and Topics in Immunology.** Same as Veterinary Pathobiology 418. See Veterinary Pathobiology 418.
- 421. Cytogenetics.** Chromosome theory: the structure, behavior, and physiology of chromosomes in heredity and development. Prerequisite: Genetics and Development 210 or Microbiology 330, or consent of instructor. 1 unit.
- 425. Experimental Parasitology.** Same as Veterinary Pathobiology 425. See Veterinary Pathobiology 425.
- 490. Individual Topics.** Laboratory work and/or reading conducted under the supervision of faculty members in the Department of Genetics and Development. Prerequisite: Consent of the faculty member who will supervise the work. 0 to 4 units.

GEOGRAPHY

Head of Department: Professor G. J. D. Hewings

Department Office: 220 Davenport Hall, 607 S. Mathews, Urbana

101. **Geography of Developing Countries.** Examines the manner in which climate, land-forms, resources, and cultural factors promote and inhibit change in developing countries (i.e., India, Iran, Egypt, Nigeria, China, Kenya, Brazil, Venezuela, Guatemala); makes comparisons between these countries and others in both the developing and the developed world. 3 hours.
102. **Weather and Climate.** Introduction to the processes responsible for the spatial variation of weather and climate with a survey of world climatic patterns. 4 hours.
103. **Earth's Physical Systems.** Systems approach to the physical environment, including landform, soil, vegetation, and animal elements, from a human ecological perspective. 4 hours.
104. **Social and Cultural Geography.** Introduces the basic concepts of social and cultural geography, and the application of these concepts to a variety of topics; mental maps, territoriality, cultural regions, cultural elements and their diffusion, population movement and migration, settlement patterns, environmental hazards, and spatial patterns of social problems. 4 hours.
105. **Introductory Economic Geography.** Geographic analysis of the distribution of various kinds of economic activity; an examination of the patterns resulting from the human exploitation of the world's resources; and emphasis on the principles governing the location of mineral, manufacturing, and commercial activities. 4 hours.
110. **Geography of International Conflicts.** Focuses on contemporary cultural conflicts, competition among nations for economic and mineral resources; treats territorial disputes from a cultural and geographic perspective. Case studies vary to illustrate types of contemporary conflicts. 3 hours.
185. **Introduction to Social Statistics.** Same as Sociology 185. See Sociology 185.
198. **Freshman Honors Seminar.** Through discussions and research projects, the seminar is designed to provide an in-depth understanding of topics in the field of systematic or regional geography which are selected for group study. Appropriate geographic methodology is emphasized. Prerequisite: James Scholar standing or other designation as a superior student. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Fluvial Geomorphology.** A comprehensive review of the roles played by rivers and river systems in changing the earth's surface; evaluates river processes and ensuing forms within all contexts, ranging from the channel itself to entire drainage basins. Prerequisite: Geography 102 or 103, or Geology 101, 107, or 143. 3 hours.
204. **Cities of the World.** Introduces the form and function of cities around the world; emphasizes cross-cultural comparisons of urban landscapes and living environments as illustrated by case studies of specific cities. 3 hours.
205. **Business Location Decision-Making: Theory and Practice.** Same as Business Administration 205. Analyzes location decision-making emphasizing industrial and commercial location patterns; identifies important institutional factors and their changing roles over the recent past; and focuses on plant closings, economic disruptions, and problems of structural change. Prerequisite: Geography 105 or Economics 101, or equivalent. 3 hours.
210. **Contemporary Social and Environmental Problems.** Geographic perspectives on contemporary national and international problems. Topics vary each semester and include such themes as environmental quality, food production, urban problems, and particular social and political conflicts. 3 hours.
214. **Conservation of Natural Resources.** Survey of distribution of natural resources and major forms of utilization of these resources; emphasizes consequences of utilization systems which deplete or degrade resources and systems which conserve these resources with respect to future needs of human populations. 3 hours.

- 215. Resource Conflicts.** Surveys the physical and economic views of the importance of resources and a determination of the impacts of resource scarcity; treats the subject in a manner particularly suited to the engineer and physical scientist. Discusses case studies of actual resource conflicts. Prerequisite: Mathematics 132 or equivalent. 3 hours.
- 224. Geographic Patterns of Illinois.** A systematic analysis of the environmental and human processes that have shaped the regional landscapes of rural and urban Illinois. 3 hours.
- 271. Spatial Analysis.** An overview of the spatial analysis (nomothetic) approach to geographic research, both physical and human; includes discussion of the scientific method, with explanations and uses of analytic geographic concepts in studying real world problems. Prerequisite: A course in geography. 4 hours.
- 272. Introductory Field Geography.** Application of fundamental geographical field techniques to field mapping; develops field mapping skills, permits practical application of geographical principles, and provides a basic understanding of field procedures; and an introduction to advanced field geography for the student who later seeks an advanced degree. One ten-day field trip. 4 to 8 hours.
- 273. Spring Field Course.** Field observation and mapping of human and physical phenomena using basic geographic field techniques; required ten-day field trip during spring semester break. Prerequisite: Geography majors, or nonmajors with consent of instructor. 4 hours.
- 277. Interpretation of Aerial Photographs.** Same as Forestry 277. Principles and techniques in extraction and analysis of information derived from aerial photographs, including black and white, color, and color infrared; applications to problems in the natural and social sciences stressed in the laboratory. A beginning FORTRAN programming course is highly desirable but not required. Prerequisite: Knowledge of trigonometry (Math 114 or equivalent). 3 hours.
- 284. Population Geography.** Problems and issues surrounding the geographic distribution of populations at the world, regional, and local levels; emphasizes problems associated with population growth and decline, recent population redistribution, births and deaths, and elderly and minority populations. 3 hours.
- 290. Individual Study.** Supervised independent study of special topics or regions; required for students graduating with departmental distinction. Prerequisite: Junior standing; at least one formal course in the topic or region of interest; consent of instructor. 2 to 4 hours. May be repeated once. (Counts for advanced hours in LAS.)
- 291. Honors Individual Study.** Individual study and research projects for students who are working toward the degree with distinction in geography. Prerequisite: Junior standing; consent of honors adviser. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 294. Special Topics in Social Geography.** Introduction to current research in social geography; includes such topics as access to public facilities, geography of crime, innovation diffusion, geography of communications, spatial assimilation of minorities, and geography of social well-being. See Timetable for current topics. 4 hours. May be repeated.
- 303. Advanced Physical Geography: Methodology and Applications of Landform Studies.** Systematic analysis of the basic elements of physical geography and their interaction through time and surface expression, including the modifying effects of humans. Complementary to Geology 301. Prerequisite: Geography 103 or consent of instructor. 4 hours or 1 unit.
- 304. Soil Geomorphology.** Same as Geology 304. Analysis and review of the principles of soils as applied to geomorphology, archaeology, and geography. One weekend and several one-day field trips; student fees reflect actual field expenses. Prerequisite: Geography 103 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 305. Zoogeography.** Introduction to the principles of zoogeography; the central theme explains present distribution of animals, chiefly mammals. Prerequisite: Geography 102 and 103, Geology 102, or consent of instructor. 3 hours or 1 unit.
- 307. Periglacial Geomorphology.** Same as Geology 307. Examination of periglacial landscapes through analysis of the formative processes and their interaction with the resulting forms. Prerequisite: Geography 303, Geology 301, or consent of instructor. 4 hours or 1 unit.

- 308. Geomorphology of Coasts.** An analysis of the morphology of marine coasts including study of their distributions and of the physical factors that have influenced their development and distribution; analyzes effects of human-induced stress on modern beaches. Prerequisite: Geography 103 or equivalent. 4 hours or 1 unit.
- 314. Regional Problems in Resource Management.** Major problems of resource utilization examined in regions where problems are most acute; emphasizes interrelationships among resource management problems, environmental consequences of resource utilization, and the problems of public policy involved in resource management. 3 hours or $\frac{3}{4}$ unit.
- 315. Physical Climatology.** A survey of the basic concepts of energy balance climatology and synoptic climatology, with emphasis on the microscale and the global scale; lectures supplemented by calculations and field observations examining the effects of location and surface characteristics on determination of climate. Prerequisite: Mathematics 112, Physics 101, and Geography 102; or consent of instructor. 3 hours or 1 unit.
- 325. Historical Geography of American Landscapes to 1880.** Same as Landscape Architecture 325. Changing patterns of spatial organization in the United States and Canada, circa 1400 A.D. to 1880; focuses on landscape patterns through time (especially the built environment), perception of relic landscapes in the present day, and contemporary preservation of historic areas as historic places. 4 hours or 1 unit.
- 326. Historical Geography of American Landscapes Since 1880.** Same as Landscape Architecture 326. Review of the values and technologies which underlie the structuring of the American built environment during the past century; emphasizes the changing meaning of urban, suburban, small town, rural, and wilderness places in American life and is concerned with the image of place as a basis for historic preservation. 4 hours or 1 unit.
- 327. American Vernacular: The Cultural Landscape.** Same as Landscape Architecture 327. Focuses on vernacular structures in the cultural landscape, especially common houses, barns, and commercial and industrial structures; examines origin and geographical diffusion of vernacular architecture in the United States. 4 hours or 1 unit.
- 331. Geography of Caribbean America.** Surveys the physical environment and the sequent occupancy processes that have shaped contemporary rural and urban population and land use patterns in Mexico, Central America, Panama, and the West Indies. 3 hours or $\frac{3}{4}$ unit.
- 332. Geography of South America.** Surveys the physical environment and the sequent occupancy processes that have shaped contemporary rural and urban population and land use patterns in South America. 3 hours or $\frac{3}{4}$ unit.
- 342. Geography of Europe.** Analysis of the changing social, economic, and political geography of western Europe; special consideration to population changes and labor migrations and to planning problems in the underdeveloped regions and conurbations of the continent. 3 hours or $\frac{3}{4}$ unit.
- 353. Geography of the U.S.S.R.** Physical and cultural regionalism; a survey of natural resources and patterns of human occupancy including industry, agriculture, and transportation. 3 hours or $\frac{3}{4}$ unit.
- 355. Geography of Central and South Africa.** Regional geography of Africa south of the Sahara. 3 hours or $\frac{3}{4}$ unit.
- 361. Geography of Agricultural Land Utilization.** Geographic consideration of the nature of agricultural land utilization from the world, continental, and regional viewpoints; special emphasis on the geographical implications of various types of agricultural land use and upon the interrelationships between areas of different types of land utilization. 3 hours or $\frac{3}{4}$ unit.
- 363. Geography of Mineral Resources.** An examination of the spatial aspects of the production and use of mineral resources; concerns the adequacy of supply and the environmental and economic consequences of mineral use. 3 hours or $\frac{3}{4}$ unit.
- 365. Transportation Systems and Spatial Development.** Descriptors of transportation systems; allocation models; transportation as an industrial activity and public good; and transportation and spatial development, including the role of transportation in developing countries and in urban and regional development and problems involved in measuring the impact of transport investment. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 366. Location of Industry and Other Economic Activities.** Industrial site selection in theory and practice; examines the effect of factors such as materials, markets, labor, transportation, and environmental constraints on industrial location; and evaluates urban commercial patterns and factors affecting the location of commercial activities. 3 hours or $\frac{3}{4}$ unit.
- 367. The Origins and Impact of Energy Scarcity.** Examines the development of the physically based theories of scarcity and a comparison to the historical and most recent economic theories of scarcity of critical resources, especially energy, and their expected application in local, regional, national, and international situations. The course is a more technical extension of Geography 215. Prerequisite: Mathematics 132 or equivalent; Economics 101 or Geography 105. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Introduction to Quantitative Methods in Geography.** Introduction to statistical, numerical, and mathematical techniques used in geographic research; introduction to computer usage in geographic research. Prerequisite: Geography 185, one year of college mathematics, or one course in statistics, or equivalent. 4 hours or 1 unit.
- 371. Introduction to Research.** Alternative approaches to research in geography; detailed consideration of geographic research proposals; and discussion of methods of initiating geographic research projects, source materials for geographic research, and communicating research results. Prerequisite: Geography major. 3 hours or $\frac{3}{4}$ unit.
- 373. Map Compilation and Construction.** Instruction and practice in the basic techniques of map making followed by a consideration of problems involved in the construction of maps for presentation in a reproduced form (i.e., printed, photographed); the selection of proper source materials for the base and body of the map, the compilation and correlation of these materials, and methods of mechanical and photographic reproduction. 4 hours or 1 unit.
- 374. Thematic Map Design and Production.** Applies modern design principles to making thematic maps for various uses; the production of maps and atlases, emphasizing multicolor reproduction. Prerequisite: Geography 373 or equivalent. 4 hours or 1 unit.
- 375. Computer Cartography.** Introduction to concepts and techniques for computer mapping with spatial or statistical data; universal computer mapping strategies, with applications in the laboratory; cartographic data capture, covering data structures, devices, manipulation, and display; and a synthesis of geographic information systems. Prerequisite: Geography 185 or equivalent. 4 hours or 1 unit.
- 377. Introduction to Remote Sensing.** Same as Forestry 377. Fundamentals of energy-matter interaction mechanisms, and the manifestation of reflected and emitted radiation on photographs and images; introduces characteristics of aerial films and filters, electro-optical scanners, and digital processing are introduced; and emphasizes applications in environmental problems. Prerequisite: Geography 277 or equivalent, Geography 185 (beginning statistics) or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 378. Techniques of Remote Sensing Image Analysis.** Optical and digital information processing of imagery acquired from aircraft and satellite remote sensing platforms; includes systems design, mensuration theory, photographic enhancement techniques, and automatic digital classification for all of the standard sensor systems; and laboratory focusing on the design and implementation of information processing techniques with application limited to a survey of uses. Prerequisite: Geography 370 and 377, or equivalent. 4 hours or 1 unit.
- 380. Urban Form and Function in Pre-Industrial Western Society.** A review of urban landscapes and functions and of the development of city systems in the historical geography of western civilization prior to industrialization. Previous course work in history or historical geography is desirable. 3 hours or $\frac{3}{4}$ unit.
- 381. Russian Culture History and Ethnology.** Same as Anthropology 381. See Anthropology 381.
- 382. Siberian Culture History and Ethnology.** Same as Anthropology 382. See Anthropology 382.
- 383. Urban Geography.** Distribution, functions, and internal structures of cities; emphasizes contemporary metropolitan and central city problems. 3 hours or $\frac{3}{4}$ unit.

- 384. Migration and Spatial Interaction.** Theories and models of migration; contemporary migration patterns; information flow and individual movement in geographic space; and individual level and aggregate models of spatial interaction. 3 hours or 1 unit.
- 385. Cognition of the Geographical Environment.** An overview of theoretical approaches to environmental cognition, including personal construct theory, environmental learning theory, attitude theory, and sociological/cross-cultural perspectives; related geographical problems, including hazard perception, behavioral consequences of alternative environmental arrangements, spatial orientation, way finding, cognitive distance, environmental preferences, responses to environmental stress, and territoriality. 3 hours or 1 unit.
- 386. Political Geography.** Territorial behavior of nation-states; boundary conflicts and influences; regional voting patterns in the United States; malapportionment and gerrymandering; voting behavior of American minorities; and metropolitan fragmentation and spatial access to public services. 3 hours or $\frac{3}{4}$ unit.
- 387. Systems of Cities.** Theoretical and empirical issues in the study of macro-urban geography focusing on urban system structure and processes of growth and change within a system of cities. Prerequisite: Geography 105 or 204, or Urban Planning 101, or Sociology 276; or equivalent. 4 hours or 1 unit.
- 403. Physical Systems in Landform Analysis.** Same as Geology 403. A study of the phenomena of the physical landscape in terms of the basic principles of systems theory. Prerequisite: Geography 303 or equivalent, or consent of instructor. 1 unit.
- 404. Critical Analysis of Concepts and Models in Geomorphology.** The interpretation of a landscape and its evolution is dependent on which of the available models the geomorphologist accepts; the course focuses on the importance and ramifications of this choice. Prerequisite: Graduate standing and consent of instructor. 1 unit.
- 405. Seminar in Physical Geography.** Advanced study of one of several topics that vary from semester to semester and include: (a) paleogeography; (b) climatic change; (c) landform and climate; (d) numerical analysis of landforms; (e) research philosophy of physical geography; (f) quaternary problems; (g) urban physical environments; (h) ecological aspects of climatic change; (i) contemporary problems in physical geography; (j) economic impacts of weather and weather forecasting; and (k) laboratory and field methods in soils geography. Prerequisite: Advanced course work in physical geography and consent of instructor. $\frac{1}{2}$ to 1 unit.
- 406. Urban and Regional Analysis.** Same as Urban Planning 406. See Urban Planning 406.
- 429. The Evolution of Agricultural Economies.** Same as Agronomy 429 and Anthropology 429. See Anthropology 429.
- 450. Issues in Regional Development.** Same as Urban Planning 450. Establishment and articulation of regional development goals; includes trade-offs, the role of government in regional development, analytical problems in the evaluation of regional public policy, and comparison and evaluation of regional development programs in a number of countries. Prerequisite: Urban Planning 406. 1 unit.
- 456. Regional Science Methods: Economic and Demographic.** Same as Urban Planning 456. Examines models of regional growth and development, including export base, input-output and econometric, cohort component and spatial interaction; emphasizes socioeconomic impact analysis and forecasting subnational economic and demographic change. Prerequisite: Urban Planning 406 or consent of instructor. 1 unit.
- 457. Seminar in Regional Science.** Same as Urban Planning 457. Discusses advanced topics in regional science; prepares students for dissertation and thesis research, applied study for public agency, or other student research. Prerequisite: Urban Planning 456, Economics 461, or consent of instructor. 1 unit.
- 463. Historical Geography.** History and philosophy of historical research in geography. Research strategies for the analysis of individual and aggregate spatial behavior in the past, derived geographical patterns, changing spatial behaviors and patterns through time, and historical values underlying contemporary geographical decision making. 1 unit.
- 464. Problems in Historical Geography.** Research seminar focused on the interests of participating students and faculty; application of geographic theory to the study of past

geography, geographic change in the past, spatial behavior in the past, and/or evidence of spatial behavior in the contemporary scene. Prerequisite: Geography 370 or equivalent; prior preparation in historical geography. 1 unit.

- 470. Advanced Spatial Analysis.** Advanced techniques of spatial analysis, including spatial autocorrelation, trend surface analysis, grouping and regionalization procedures, and point pattern analysis. Prerequisite: Geography 370 or equivalent. 1 unit.
- 473. Problems in Cartography.** Subjects for map presentation are selected in the student's field of specialization or area of interest. Data are collected and maps compiled and carried to completion in final drafted form suitable for publication. Prerequisite: Geography 373 or consent of instructor. 1 unit.
- 478. Advanced Field Geography.** Field experience in some aspect of physical or human geography which normally involves primary data collection in the field through mapping, survey, interview, archival, or other procedures; work culminates in a written report. Prerequisite: Graduate standing in geography. ½ to 2 units.
- 494. Seminar in Social Geography.** Advanced study of a current research topic in social geography. Topic varies from semester to semester; prepares students for dissertation and thesis research through study of advanced literature and the completion of a research paper. Prerequisite: Geography 370 and 371, or equivalent; graduate coursework in social geography or in one of the social sciences. 1 unit.
- 495. Advanced Studies in Geography.** Seminar and directed individual investigation of selected problems or regions; designed to develop ability to conduct independent investigation. Scheduled seminars are detailed in each semester's Timetable. All students are required to register each semester in section Z (the departmental colloquium) for 0 units in addition to other 495 work which may be selected. 0 to 2 units.
- 497. Development of Geographic Thought.** Historical survey of the discipline from the Graeco-Roman period to the present. ½ unit.
- 499. Thesis Research.** 0 to 4 units.

GEOLOGY

Head of Department: Professor D. E. Anderson

Department Office: 249 Natural History Building, 1301 W. Green, Urbana

- 101. An Introduction to the Study of the Earth.** Primarily intended for nonscience students. Integrates all aspects of geological science into a unified theory of the evolution and continuing dynamic behavior of the earth. 4 hours.
- 102. History of the Earth.** Primarily intended for nonconcentrators in geology. History of the earth from the physical and biological points of view; methods of determining earth history. One-day field trip may be required. 4 hours.
- 104. Geology and Society.** Aspects of geology which are most significant to man and society, such as dynamic processes, geologic hazards, and energy and mineral resources; man's impact on the earth, including environmental degradation; and society's response to the geological framework, including land-use planning, management, and control. 3 hours. Students may not receive credit for both Geology 104 and 143.
- 105. Geology of Energy.** For nonconcentrators in geology. Geological constraints on the exploitation and utilization of fossil fuels, nuclear fuels, wind and water power, tidal energy and other energy sources; principles of estimating energy resources and their effect on economic and social planning; environmental problems of energy use; and other economic, social and political concerns. 3 hours.
- 107. General Geology, I.** Introductory course for science and science-oriented students. Concerned with the chemical and physical aspects of the earth, development of methods for investigating geologic problems, and a survey of the more significant observations and interpretations. Field trip required for geology concentrators, recommended for others. 4 hours.

- 108. General Geology, II.** Primarily intended for science and science-oriented students. Considers origin of the solar system and earth, origin of life, climatic changes, and other documented and inferred events of major and evolutionary significance during the past 5000 million years as well as predictable future events. Field trip required. Prerequisite: Geology 107 or consent of instructor. 4 hours.
- 115. Regional Field Study.** Field observations in a region of diverse geology. One- to two-week field trip. Credit is given only on completion of a satisfactory written report. Prerequisite: Any one of Geology 101, 102, 107, or 250; or consent of instructor. 2 hours.
- 142. Physical Science in Modern Society.** Physical science for nonscience majors; emphasizes the basic chemical and physical aspects of the earth's environmental systems and the impact of modern technology on these systems. 3 hours.
- 143. Environmental Physical Science.** Physical science for nonscience majors; emphasizes earth processes and resources relevant to modern society, including the availability and by-products of utilization of energy and water resources and the limitations imposed by earth processes on society. Students may not receive credit for Geology 143 and 104. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Geology for Engineers.** Physical geology with an emphasis on those aspects of the natural environment which are of importance to the engineer. Prerequisite: Theoretical and Applied Mechanics 150 or 152; sophomore standing in the College of Engineering. 3 hours.
- 290. Individual Study.** Research and individual study in geology. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member. 1 to 4 hours. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
- 291. Individual Honors Study.** Research and individual study in geology for honors credit. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member and of departmental honors advisor. 1 to 4 hours. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
- 292. Senior Thesis.** Research in geology, with thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member. 2 to 8 hours. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Research in geology with honors thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member and of departmental honors advisor. 2 to 8 hours. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
- 301. Geomorphology.** History, origin, and characteristics of land forms produced by fluvial, glacial, wind, and wave erosion or by a combination of these acting upon the major kinds of geologic materials and structures. Lectures, laboratory, and field trips. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
- 304. Soil Geomorphology.** Same as Geography 304. See Geography 304.
- 307. Periglacial Geomorphology.** Same as Geography 307. See Geography 307.
- 309. Sedimentology and Sedimentary Geology.** Introduces the dynamics of sedimentation and the geology of sedimentary basins. Topics include sediment entrainment, flow regime, bedforms, descriptive sedimentology, sedimentary facies, vertical sequences, depositional systems, anoxic sedimentation, cratonic sequences, sea level and seismic stratigraphy, global sedimentary cycles, basin classification, geodynamics of basins, sedimentary tectonics. Prerequisite: Geology 108; credit or concurrent registration in Geology 311 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 310. Field and Laboratory Procedures in Sedimentology.** Introduction to the field and laboratory study of Holocene sediments and sedimentary rocks, with emphasis on field sampling, sieve-size analysis, peel making of unconsolidated sediments and sedimentary rocks, x-ray radiography, disaggregation of sediments, heavy mineral analysis, mineral identification by staining, pH-Eh determinations, and thin-section preparation. Required field work. Prerequisite: Geology 108 or consent of instructor; concurrent registration in Geology 309. 1 hour or $\frac{1}{4}$ unit.

- 311. Structural Geology.** Rock deformation and its results. Lectures, laboratory, and required field trip. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
- 315. Field Geology.** Field mapping or study in a selected area of a specific geologic problem; involves preparation of a geologic map and/or report. Prerequisite: Geology 108 or equivalent; consent of instructor. 2 to 8 hours, or $\frac{1}{2}$ to 2 units.
- 317. Field Geology in the Rocky Mountains.** Field course conducted in the Rocky Mountains; introduction to field techniques, geologic mapping, and field training in stratigraphy, petrology, structure, and geomorphology. Offered in summer session only. Prerequisite: 8 hours of 300-level credit in geology, including Geology 321 or 332; or consent of instructor. 8 hours or 2 units.
- 320. Introduction to Paleontology.** A survey of the principles of paleontology and the major invertebrate groups; includes how fossils are studied, taxonomy, functional morphology, evolution, paleoecology, paleobiogeography, and biostratigraphy. Lectures, laboratory, and required field trip. Prerequisite: Any one of Geology 102 or 108, or Ecology, Ethology, and Evolution 320; or consent of instructor. 4 hours or 1 unit.
- 321. Principles of Stratigraphy.** Definition, description, and correlation of stratigraphic units; facies analysis, environmental interpretation, and historical inference; and laboratory work, including analysis of samples from the subsurface, interpretation of geophysical logs, and seismic stratigraphy. Emphasizes practical applications, especially to mineral fuel exploration and exploitation; required field trip. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
- 325. Paleobotany.** Same as Plant Biology 325. See Plant Biology 325.
- 332. Mineralogy-Petrology.** Introduction to the structure, chemistry, and stability of the major silicate minerals and their occurrence in rocks; required field trip. Prerequisite: Geology 108 or consent of instructor; Chemistry 102 or 108. 4 hours or 1 unit.
- 335. Optical Mineralogy.** Study of crystalline matter, especially minerals, by polarized light microscopy and powder x-ray diffractometry. Prerequisite: Geology 332, and at least Physics 101 or 106. 4 hours or 1 unit.
- 336. Igneous and Metamorphic Petrography.** Study of the constituents, composition, texture, structures, and classification of igneous and metamorphic rocks; laboratory study of rocks in hand specimen and thin section. Prerequisite: Geology 335. 4 hours or 1 unit.
- 338. Introduction to Sedimentary Petrography.** Introduction to the microscopic study of sedimentary rocks in thin section with emphasis on their textural properties as a basis for their classification and environmental interpretation. Prerequisite: Geology 335. 4 hours or 1 unit.
- 350. Introduction to Geophysics.** Introduction to basic concepts related to the physics of the earth's interior; includes formation and composition, gravity and shape, seismology, heat flow and internal temperatures, magnetism, rheology, and plate tectonics. Prerequisite: Mathematics 242 and Physics 107. 4 hours or 1 unit.
- 351. Geophysical Prospecting.** Same as Mining Engineering 351. Principles of geophysics and their application to mining processes. Prerequisite: Senior standing in engineering or geology, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 357. Glacial Geology.** Consideration of glacial processes, materials and landscapes, stratigraphic analysis of glacial deposits and the mid-continent Pleistocene glacial succession; field trip and required field work. Prerequisite: Geology 107 or consent of instructor. 4 hours or 1 unit.
- 360. Chemistry of the Earth.** Fundamental chemical and physical concepts applied to surficial and internal geologic processes. Topics include origin, distribution, and geochemical behavior of elements; use of stable and radiogenic isotope variations; equilibrium consideration; chemical evolution of the earth and geochemical cycles. Prerequisite: Geology 101 or 107, and Chemistry 102, and Mathematics 132; or consent of instructor. 4 hours or 1 unit.
- 370. Oceanography.** An investigation of the principal factors which control the origin and physiography of ocean basins, the composition and distribution of marine sediments, the composition and dynamics of ocean water. Prerequisite: Geology 101 or 107, and Chemistry 101, and Mathematics 120; or consent of instructor. 4 hours or 1 unit.

- 397. Special Topics in Geology.** Seminar or lectures in subjects not covered by regular course offerings; for advanced undergraduates and graduate students. See Timetable for current offerings. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 403. Physical Systems in Landform Analysis.** Same as Geography 403. See Geography 403.
- 415. Advanced Field Geology.** Field mapping or study in a selected region. Requires preparation of a geological map and/or report. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 420. Paleoecology.** Interpretation of life habit of fossil organisms from skeletal morphology and associated depositional features; reconstruction of marine ecosystem relationships from the study of assemblages of fossils. Prerequisite: Geology 320 or equivalent. 1 unit.
- 421. Topics in Paleontology.** Selected topics in macro- and micropaleontology. Intensive study of a selected invertebrate or algal group; special problems in the taxonomy, evolution, skeletal diagenesis, ecology, biogeography, and biostratigraphy of selected fossil organisms. Prerequisite: Geology 320, Ecology, Ethology, and Evolution 320, or consent of instructor. 1 unit. May be repeated.
- 422. Advanced Stratigraphic Geology.** Application of stratigraphic principles and techniques to solution of a selected geologic problem or problems. Selected problem may be in the area of regional stratigraphy, historical inference, or applied geology. Prerequisite: Consent of instructor. 1 unit.
- 431. Structural Mineralogy.** Crystal chemistry of minerals and survey of current knowledge about the structures and properties of selected minerals and mineral groups. Prerequisite: Consent of instructor. 1 unit.
- 432. Sedimentary Geochemistry.** Equilibrium assemblages among the principal organic and inorganic sedimentary solids and their associated liquids during weathering, deposition, and diagenesis; kinetics and mechanism of phase changes; and transport processes during diagenesis. Prerequisite: Geology 360 or equivalent, or consent of instructor; some background in physical chemistry desirable. 1 unit.
- 433. Isotope Geology.** Introduction to the theoretical basis for isotopic fractionation in nature; survey of isotopic variations in natural materials; and application of isotopic variations to problems of geological and environmental significance. Prerequisite: Consent of instructor. 1 unit.
- 434. Theoretical Petrology.** Use of thermodynamic and kinetic arguments in the solution of basic petrological problems. Prerequisite: Consent of instructor. 1 unit.
- 435. Igneous and Metamorphic Petrology.** Application of chemistry and physics to the study of crystalline rocks, with emphasis on the integration of theory with field and laboratory observations; topics selected on the basis of student interest and training. Prerequisite: Geology 336. 1 unit. May be repeated.
- 437. Basin Analysis and Sedimentary Geology.** Examines contemporary aspects of tectonics and sedimentation, cratonic sequences, seismic stratigraphy, geologic history of sea level, isotope chronostratigraphy, anoxic sedimentation, pelagic deposition, transgressive-regressive sequences, rates of sediment accumulation, sediment yield, maturation of organic sediments, global sedimentary cycles, basin classification, basin geodynamics, and examples of basin analysis. Prerequisite: Geology 309, 311, 350, 360 and 477; or equivalent; or consent of instructor. Consent of instructor required for students from other departments. 1 unit.
- 438. Sedimentary Petrography.** Microscopic study of sedimentary rocks in thin section with emphasis on detailed classification and genetic interpretation of carbonates. Prerequisite: Geology 335 or consent of instructor. 1 unit.
- 439. Carbonate Sedimentology.** Study of genesis and diagenesis of carbonate sediments covering: carbonate deposition, coordination of ultrastructural-petrographic properties and elemental-isotopic composition, nature and environments of diagenetic changes, and temporal trends in carbonates. Prerequisite: Geology 320 and 338, or equivalent; or consent of instructor. 1 unit.
- 444. Depositional Models for Petroleum Exploration.** Analysis and integration of stratigraphic, petrographic, and geochemical features of all types of sedimentary rocks into depositional models; application of these models to basin analysis and in particular to

exploration for oil and gas reserves. Prerequisite: Geology 338 or 438, or consent of instructor. 1 unit.

- 450. Principles of Engineering Geology.** Study of the effects that lithology, weathering, joints, faults, and ground water have upon engineering projects; the description and origin of geologic factors and their significance in the design, construction, and performance of civil engineering undertakings. Field trip or term paper required. Prerequisite: Geology 250 or equivalent, or consent of instructor. 1 unit.
- 451. Practice of Engineering Geology.** Review of modern geotechnical exploration techniques (borings, downhole logging, surface geophysics, and remote sensing) and study of case histories illustrating the influence of significant geologic features on exploration design, construction, and performance of civil engineering projects. Field trip or term paper required. Prerequisite: Geology 450 and Civil Engineering 383, or consent of instructor. 1 unit.
- 455. Hydrogeology.** Geology of the occurrence, storage, movement, and quality of water in the rocks of the earth's crust. Prerequisite: Consent of instructor. 1 unit.
- 457. Quaternary Geology.** Consideration of the Quaternary Period, its definition, stratigraphic and fossil records, and correlations; introduces climatic considerations. Prerequisite: Geology 357 or consent of instructor. 1 unit.
- 461. Mineralogy of Clays.** Same as Ceramic Engineering 461. Composition of various types of clays; the structure and properties of the clay minerals; and the origin and mode of occurrence of the clay minerals and clay materials. Field trip required. Prerequisite: Geology 336 or equivalent; consent of instructor. 1 unit.
- 462. Mineralogy of Clays.** Same as Ceramic Engineering 462. Properties of clay materials, their relation to the structure of the clay minerals, and methods of determination and control; the utilization of clays in various arts and industries; and required field trip. Prerequisite: Geology 461. 1 unit.
- 468. Microbeam Analysis.** Covers the theory and practice of scanning electron microscopy (SEM) and quantitative electron microprobe analysis with emphasis on geological applications; laboratory work utilizes both the SEM and an automated microprobe equipped with wave-length dispersive and energy dispersive spectrometers, and also covers specimen preparation. Prerequisite: Consent of instructor and endorsement of research advisor. ½ or 1 unit.
- 477. Recent Sedimentary Environments.** Review of sedimentary processes, physical sedimentary parameters, and sedimentary mineralogy in fluvial, lake, dune, beach, barrier island, bar, deltaic, tidal flat, lagoonal, bay, marsh, continental shelf, continental margin, submarine canyon, and deep ocean floor environments; sedimentological aspects of predicting occurrences of oil, natural gas, coal, uranium, and metalliferous deposits in ancient analogs of these environments; and sedimentological aspects of land usage, and conservation and preservation of man's environment. Prerequisite: Geology 437 or consent of instructor. 1 unit.
- 480. Mathematical Methods in Geology.** Introduction to and application of the mathematical topics utilized in the geological sciences. Prerequisite: Mathematics 242, or equivalent. 1 unit.
- 488. Advanced Structural Geology.** Analysis of geologic deformation based upon the principles of mechanics and utilizing research data from laboratory and field investigations; methods in structural analysis. Prerequisite: Geology 311 or consent of instructor. 1 unit.
- 489. Geotectonics.** Nature and distribution of major earth structures and geological and geophysical evidence bearing on their origin. Prerequisite: Geology 311 or consent of instructor. 1 unit.
- 493. Advanced Studies in Geology.** Work may be taken in the following fields: (a) general geology; (b) engineering geology; (c) geomorphology and glacial geology; (d) clay mineralogy; (e) ground-water geology; (f) micropaleontology; (g) mineral deposits; (h) mineralogy and crystallography; (i) paleontology; (j) geochemistry; (k) geophysics; (l) petrography and petrology; (m) sedimentology; (n) stratigraphy; (o) oceanography; (p) submarine geology; (q) structural geology and geotectonics; (r) mathematical geology; (s) sedimentary petrogra-

phy; (t) petroleum geology; (u) coal geology; (v) isotope geology and geochronology; (w) electron beam analysis; (x) vulcanology; (y) environmental geology; and (z) planetology. $\frac{1}{4}$ to 2 units.

- 499. Thesis Research.** Individual research under supervision of members of the faculty in their respective fields. 0 to 4 units.

GERMANIC LANGUAGES AND LITERATURES

(Including German, Germanic, and Scandinavian)

Head of Department: Professor J. M. McGlathery

Department Office: 3072 Foreign Languages Building, 707 South Mathews, Urbana

German

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. Elementary Course.** Oral practice, reading, and grammar for beginners. 4 hours.
- 102. Elementary Course.** Continuation of German 101. Prerequisite: One semester of college German or equivalent. 4 hours.
- 103. Intermediate Course.** Continuation of German 102. Prerequisite: Two semesters of college German or equivalent. 4 hours.
- 104. Intermediate Course.** Continuation of German 103. Prerequisite: Three semesters of college German or equivalent. 4 hours.
- 113. Intermediate Speaking.** Practice in speaking idiomatic German; emphasis on spontaneous expression. Prerequisite: Two semesters of college German or equivalent. 4 hours.
- 114. Intermediate Speaking.** Continuation of German 113. Prerequisite: Three semesters of college German or equivalent. 4 hours.
- 124. Intermediate Reading.** Practice in reading German, with emphasis on expository prose. Prerequisite: Three semesters of college German or equivalent. 4 hours.
- 153. Practice in Conversation.** Emphasis on learning to converse in German in an everyday manner. Prerequisite: Two semesters of college German or equivalent. 2 hours.
- 161. German Masterpieces in Translation I: The Middle Ages Through Classicism.** Introduces major works of German literature in English translation from the beginnings through the eighteenth century. Texts and lectures in English; not open to students concentrating in German. 3 hours.
- 162. German Masterpieces in Translation II: Romanticism to the Present.** Introduces major works of German literature in English translation from the nineteenth and twentieth centuries. Texts, discussions, and lectures in English; not open to students concentrating in German. 3 hours.
- 189. Living German—German Living.** Practice in speaking German for students living in the German House. Prerequisite: Elementary speaking knowledge of German. 1 hour. May be repeated to a maximum of 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. German Literature in Translation.** Same as Comparative Literature 224. Introduction to German literature for students with no knowledge of German. 3 hours. May be repeated as topics vary.

- 211. Conversation and Writing.** Prerequisite: German 104 or equivalent, or consent of instructor. 3 hours.
- 212. Conversation and Writing.** Continuation of German 211. Prerequisite: German 211 or equivalent, or consent of instructor. 3 hours.
- 215. German for Technology and Management.** German language course to meet the needs of students preparing for a career in the sciences: surveys history and organization of scientific research and technology in Germany; assimilates terminology of specific technical fields. Prerequisite: German 104 or equivalent; or consent of instructor. 3 hours.
- 220. German for Business.** Introduces German business language as used in basic operations in retail/wholesale, export/import, banking transactions. Prerequisite: German 104 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 221. German for Economics.** German language as used in professional contexts involving economic matters: texts and documents relating to forms of enterprises and their financing, to macroeconomic structures of domestic and foreign trade, and to reports on the economies of German-speaking countries. Prerequisite: German 104 or consent of instructor. 3 hours.
- 225. German-Speaking Europe Today.** Examines contemporary civilization and culture in the German-speaking countries of Europe, including reference to historical, political, and economic developments. Not open to German concentrators or German teacher trainees. 3 hours.
- 231. Introduction to German Literature, I.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Eichendorff, Buechner, Wedekind, Schnitzler, T. Mann, Borchert, Frisch, and Boell. Prerequisite: Two years of college German or equivalent. 3 hours.
- 232. Introduction to German Literature, II.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Storm, Keller, Hauptmann, Kaiser, Kafka, Brecht, and Duerrenmatt. Prerequisite: German 231 or equivalent. 3 hours.
- 270. Parateaching.** Same as French, Latin, Russian, and Spanish 270. See French 270.
- 279. Introduction to Foreign Language Education.** Same as French, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
- 280. Teachers' Course.** Introduction into the problems of the teaching of German and a study of textbooks. Prerequisite: Senior standing or consent of instructor. 4 hours.
- 293. Honors Senior Thesis.** Intended primarily for candidates for honors in German, but open to other seniors. Prerequisite: Senior standing; consent of instructor. 2 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
- 296. Special Topics in German Literature.** Same as Comparative Literature 228. Introductory study in such topics as individual authors, selected literary movements or periods, modes of inquiry in literary study, minor genres, subgenres, extraliterary influences, etc. Prerequisite: Reading fluency in German beyond the fourth-semester college level. 3 hours.
- 299. Study Abroad.** Lectures, seminars, and practical work in German language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: German 211 or equivalent; 3.75 overall average; 4.0 average in German courses. 0 to 17 hours. May be repeated to a maximum of 34 hours per academic year.
- 301. Advanced Conversation, Composition, and Syntax.** Intensive study of advanced problems of grammar, syntax, and style. Prerequisite: German 211 and 212, or equivalent. 3 hours or ½ unit.
- 302. Advanced Conversation.** Practice in free conversation with a native speaker. Prerequisite: German 301 or equivalent. 1 hour or 0 units.
- 303. Translation in Theory and Practice.** Theory and practice of translating technical, commercial, scientific, and literary texts from German into English and visa versa. Prerequisite: German 301 or consent of instructor. 3 hours or ¾ unit.
- 311. German Literature 750-1450.** Literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 750 to 1450. Prerequisite: German 232 or equivalent. 3 hours, or ¾ or 1 unit.

- 312. German Literature 1450-1770.** A literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 1450 to 1770. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 320. History of German Civilization.** Selected topical, historical, and pictorial analysis of Germany's culture and civilization. Prerequisite: German 232 or equivalent. 4 hours or $\frac{4}{4}$ unit.
- 330. Modern German Poetry.** Same as Comparative Literature 323. A poetical and metrical survey of modern German lyric verse. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 331. The German *Novelle*.** A study of the development of the German *Novelle* as a genre, together with reading and discussion of *Novellen* from Goethe to Grass. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. German Drama.** German drama from the classical to the modern period; selected works of representative playwrights, such as Lessing, Goethe, Schiller, Kleist, Grillparzer, Hebbel, Buechner, Hauptmann, Kaiser, Brecht, Frisch, Weiss, and Mueller. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 335. Literature and Culture of the German Democratic Republic.** History, politics, and literature of the German Democratic Republic. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 341. Martin Luther.** Same as Religious Studies 341. Special attention to Luther as an artist, and to his importance for the development of German language and literature; attention also paid to the historical and intellectual trends of the fifteenth and sixteenth centuries as well as to the significance of Luther in modern psychological and sociological thought. Prerequisite: A reading knowledge of German. 3 hours or $\frac{3}{4}$ unit.
- 342. Goethe.** Introduction to Goethe's life and works. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 343. Goethe's *Faust*.** Intensive study of Goethe's *Faust*, Parts I and II, with an examination of the theme's evolution in literature. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 360. Principles of Language Testing.** Same as English as a Second Language, French, and Spanish 360. See English as a Second Language 360.
- 365. Structure of the German Language, I (Phonology and Morphology).** Introductory survey of the phonological and morphological structure of the German language. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 366. Structure of the German Language, II (Syntax).** Introduction to German syntax; theory and practical applications. Prerequisite: German 365 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 387. Introduction to Myth and Folklore.** Same as Comparative Literature, English, Slavic, and Speech Communication 387. See English 387.
- 390. The German Cinema.** History and criticism of the German film from its beginnings through Expressionism and the New Objectivity of the 1920s, the Third Reich and the period of decline, to the young German film of the 1960s; weekly film screenings, lectures, and discussions. Knowledge of German useful but not required. 3 hours or $\frac{3}{4}$ unit.
- 396. Special Topics in German Studies.** Intensive study of restricted topics in German language, literature and culture. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit. May be repeated as topics vary up to a maximum of 9 hours or 2 $\frac{1}{4}$ units.
- 400. Beginning German for Graduate Students.** Introduction to the reading of German texts in the sciences and the humanities. 4 hours. No graduate credit.
- 401. Readings in German for Graduate Students.** Designed for graduate students preparing for the German reading requirements for the Ph.D. Prerequisite: German 400 or equivalent. 4 hours. No graduate credit.

- 410. Introduction to Graduate Study.** Bibliography and methodology of the study of the Germanic languages and literatures, with particular regard to German literature and Germanic linguistics; introduction to scholarship in general and the German profession in particular, including the modes and methods of scholarly endeavor. 1 unit.
- 415. Middle High German.** Prerequisite: German 365. 1 unit.
- 420. History of the German Language.** The internal and external history of German from prehistoric times to the present. Prerequisite: German 365 or equivalent. 1 unit.
- 430. Old High German.** Grammar and interpretation of the oldest literary documents. Prerequisite: German 365. 1 unit.
- 440. Middle High German Literature.** Prerequisite: German 415 or equivalent. 1 unit.
- 441. German Romanticism.** Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 442. Nineteenth-Century German Realism.** German realism as manifested in the literature between romanticism and naturalism, with emphasis on so-called poetic realism. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 444. The Eighteenth Century before Goethe.** The Enlightenment and the development of the classical ideal; emphasizes the work of Gottsched, Lessing, Wieland, Klopstock, and Herder. Prerequisite: German 312 or equivalent. 1 unit.
- 451. Naturalism, Symbolism, and Expressionism.** Same as Comparative Literature 441. Comparative analysis of German literature from the 1880s to the 1920s within the European context. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 452. German Literature from the Twenties to the Present.** Trends, problems, and personalities in recent German literature, including exile literature and literature of the Third Reich. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 460. Seminar in Older German Literature.** Topics range from the earliest known literature to the Enlightenment. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
- 461. Seminar in Modern German Literature.** Same as Comparative Literature 482. Topics range from the Enlightenment to the present. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
- 463. College Teaching of Foreign Languages.** Same as French, Russian, Spanish, and English as a Second Language 463. See French 463.
- 480. Teaching German in College.** Introduction to the problems of teaching German in college. ½ unit.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, Russian, Spanish, and English as a Second Language 481. See French 481.
- 493. Research in Special Topics.** ¼ to 2 units. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

Germanic

- 367. Introduction to Germanic Linguistics.** Same as Linguistics 367. Comparative and historical survey of the Germanic languages. Prerequisite: Completion of the foreign language requirement in the College of Liberal Arts and Sciences, or equivalent; some knowledge of German desirable. 3 hours or ¾ unit.
- 426. Gothic.** Synchronic and diachronic study of the Gothic language and its relationship to other Germanic and Indo-European languages; extensive reading of extant texts. Prerequisite: Germanic 367 or consent of instructor. 1 unit.
- 462. Seminar in Germanic Linguistics.** Varying topics dealing with problems in diachronic and synchronic Germanic linguistics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated as topics vary.
- 465. Comparative Germanic.** Reconstruction of the phonological and morphological systems of Proto-Germanic and their development into the Germanic languages and dialects. Prerequisite: Germanic 426 or consent of instructor. 1 unit.
- 467. Runic Inscriptions.** Detailed analysis of inscriptions in the "older" Germanic futhork, the

Anglo-Frisian futhorc, and the Scandinavian "younger" futharks; their relationships and the correlation between phonological and orthographic developments. Prerequisite: Germanic 465 or consent of instructor. 1 unit.

Scandinavian

- 101. **Elementary Scandinavian, I.** The first of four semesters leading to a reading knowledge of Danish, Norwegian, or Swedish, and to an oral command of one of these languages; linguistic structure, reading, and oral practice. 4 hours.
- 102. **Elementary Scandinavian, II.** Continuation of Scandinavian 101. Oral practice and reading of simple texts. Prerequisite: Scandinavian 101. 4 hours.
- 103. **Intermediate Scandinavian, I.** Readings in Danish and Norwegian, or in Swedish; structure of Swedish, or of Danish and Norwegian. Prerequisite: Scandinavian 102 or equivalent. 4 hours.
- 104. **Intermediate Scandinavian, II.** Continuation of Scandinavian 103. Readings in classical and modern Danish, Norwegian, and Swedish texts. Prerequisite: Scandinavian 103. 4 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Comparative Literature 215. Works by Jacobsen, Strindberg, Vesaas, Myrdal, and Nobel Prize winners Hamsun, Undset, Lagerkvist, and Johnson; readings and discussion in English. 3 hours.
- 251. **Germanic Mythology.** Studies pre-Christian beliefs of the Germanic peoples as reflected primarily in medieval Icelandic prose and poetry (in translation). 3 hours.
- 252. **Icelandic Sagas in Translation.** Same as Comparative Literature 252. Studies Old Norse-Icelandic literature: kings' sagas, family sagas, mythical-heroic sagas, and romances. Texts and lectures in English. 3 hours.
- 293. **Honors Senior Thesis.** Prerequisite: Senior standing; consent of instructor. 1 to 2 hours. (Counts for advanced hours in LAS.)
- 361. **Ibsen in Translation.** Same as Comparative Literature 326. Dramas in English translation; selected works of Ibsen's Scandinavian contemporaries. 3 hours or 1 unit.
- 362. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Comparative Literature 327. Major dramas and prose works of August Strindberg; selected plays by Kaj Munk, Kjeld Abell, Nordahl Grieg, and Par Lagerkvist. 3 hours or 1 unit.
- 390. **The Films of Ingmar Bergman.** Focuses on Bergman's major films of the late 1950s and 1960s; involves reading screenplays and extensive criticism in addition to viewing the films; and includes important artistic influences on Bergman as well as his own significance as a major twentieth-century artist. Knowledge of Swedish unnecessary. 3 hours or ¾ unit.
- 396. **Special Topics in Scandinavian Studies.** Individual study in selected topics, such as individual authors, literary movements, periods, genres, or themes, and Scandinavian culture. Prerequisite: Consent of instructor. 2 to 4 hours, or ½ to 1 unit. May be repeated.
- 405. **Old Norse-Icelandic, I.** Grammar and selected readings. 1 unit. Offered in alternate years.
- 406. **Old Norse-Icelandic, II.** Readings; selections from the Elder Edda and the sagas. Prerequisite: Scandinavian 405. 1 unit. Offered in alternate years.

GRAPHIC DESIGN

(See Art and Design)

HEALTH AND SAFETY STUDIES

Head of Department: Professor R. W. Armstrong

Department Office: 117 Huff Hall, 1206 S. Fourth, Champaign

100. **Contemporary Health.** Examines concepts of health and health promotion in contemporary society with emphasis on health and safety of individuals. Topics include: mental health and stress; exercise, nutrition and weight control; disease; sexuality; aging; environmental health; drugs, tobacco, and alcohol; and consumer health. 3 hours.
101. **Introduction to Public Health.** Introduction to the nation's public health system; includes an overview of historical roots and organizational structure, basic research tools, concepts and scope of varied public health programs, topical treatment of major contemporary health and safety problems. 3 hours.
111. **Professional Seminar.** Orientation to department; current views and issues of health and safety fields; career opportunities, and other related topics. 0 hours.
121. **First Aid.** American Red Cross standard course in first aid. 2 hours.
140. **Health Advocate, I.** Provides an overview of skills and content relating to the areas of sexuality, drugs, alcohol, mental health, fitness, nutrition, programming and referral. Successful completion of the course may result in American Red Cross certification in Multimedia First Aid and Modular Cardiopulmonary Resuscitation. 0 credit.
141. **Health Advocate, II.** Provides direct experience in the planning, implementation, and evaluation of health education programs within the student's individual living community. In addition, the person becomes a peer resource, acting as a liaison between the student and appropriate health resources, primarily McKinley Health Center. Prerequisite: Health and Safety Studies 140. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Mental Health.** Introduction to the science of mental health and illness including personality development, the genesis and manifestations of mental illness, and the maintenance of mental health; taught by a psychiatrist with emphasis on the preventive and medical aspects of mental health. 2 hours.
206. **Human Sexuality.** Emphasizes the behavioral aspects of human sexuality. Topics include: birth control; prenatal care, pregnancy and childbirth; sex roles; premarital sex; lifestyles; marriage and divorce. 2 hours.
208. **Introduction to Safety and Occupational Health.** Examines safety as a public health problem, its magnitude and character in many aspects of everyday life: home, sport, transportation, work; how safety is evaluated, predicted, and accidents prevented; accident proneness; exposure to risk. Also examines hazards of the work environment: effects of physical, chemical and biological agents, psychological factors, workplace design on injuries and illnesses of workers due to occupational exposures; case studies of accidents and preventive techniques. 3 hours.
210. **The Secondary School Health Education Program.** Examines the secondary school health education program with an in-depth study of the three program components: health services, healthful school living, and health instruction; emphasizes the secondary school teacher's role in each of these program components, particularly health instruction. Prerequisite: Health and Safety Studies 101 or consent of instructor. 4 hours.
225. **Sex Education for Teachers.** Theory and practice of family life and sex education. Includes basic issues, philosophy, and guiding principles; state laws and their implementation; needs, justification, and objectives; curriculum in human sexuality; content knowledge, microteaching and evaluation stressing classroom techniques appropriate to sex education at various levels K-12; resource materials and their use in the classroom; and coverage of controversial topics. Prerequisite: Junior standing. 4 hours.
243. **Drug Use and Abuse.** Psychosocial, pharmacological, and legal aspects of drug use and abuse; school and community responses to drug abuse; and the development of appropriate curricula, materials, and program strategies for combatting drug use and abuse. Prerequisite: Six hours of health and safety studies or consent of instructor. 2 hours.

266. **Tomorrow's Environment.** Same as Environmental Studies 256. See Environmental Studies 256.
274. **Introduction to Epidemiology.** Provides an overview of the basic concepts, principles, and methods of epidemiology for the surveillance and investigation of communicable and chronic diseases; discusses both descriptive and analytical epidemiology; employs case studies of actual disease outbreaks to familiarize students with applying appropriate epidemiological procedures. Prerequisite: Health and Safety Studies 100 and 101, or consent of instructor. 2 hours.
285. **Health Planning and Administration Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in health planning and administration with work experience in actual field situations. Students work for twelve weeks in University approved health agencies for a minimum of 480 hours. Prerequisite: Senior standing in health and safety studies and consent of instructor. 8 hours.
286. **Occupational Health and Safety Internship.** Supervised field experience in industrial, educational, or community safety agencies; designed to provide students in safety studies with work experience in actual field situations. Students work for a minimum of 480 hours in University approved safety departments or agencies. Prerequisite: Senior standing in health and safety studies and consent of instructor. 8 hours.
290. **Honors Seminar.** Same as Physical Education 290 and Leisure Studies 260. See Physical Education 290.
298. **Special Projects.** Special projects in research and independent investigation in any phase of health, physical education, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser and instructor; and approval of the head of department. 2 or 3 hours. May be repeated for a total of 4 or 6 hours.
308. **Delivery of Health Care: Problems and Perspectives.** Same as Social Work 308. See Social Work 308.
310. **Public Health Practice.** Theory and practice of community health education; adult health education through media such as radio, television, films, slides, posters, pamphlets, and newspapers; projects in preparing and using public health education materials, and evaluation of research in public health education. Prerequisite: Senior or graduate standing in health and safety studies, or consent of instructor. 3 hours or 1/2 unit.
312. **Health and Safety Education in the Elementary School.** Overview of the school health program to acquaint the teacher with modern concepts of health and safety education in the elementary school; consideration of the role of the classroom teacher in understanding and meeting the health needs of children; and focus on the legal requirements for Illinois schools, major health and safety problems of elementary children, the teacher's role in the school health program, and methods and materials in teaching modern health and safety education. Prerequisite: Junior standing. 3 hours or 1/2 unit.
318. **Curriculum Development in Nutrition Education.** Same as Vocational and Technical Education 318. See Vocational and Technical Education 318.
321. **Health Data Analysis.** Introduces health data analysis, sources and uses of health data, collection techniques and classification procedures, commonly used health indices, techniques of rate adjustment, graphic presentation of data as it relates to the planning, conducting, and evaluating of public and school health education programs. Prerequisite: Educational Psychology 290 or equivalent. 3 hours or 1 unit.
329. **Research and Evaluation in Health and Safety Studies.** A study of the research literature, research designs and program evaluation models employed in health and safety studies. Devotes special emphasis to developing student skills in analyzing research, assessing health behavior change and problem identification for thesis research. 2 hours or 1/2 or 1 unit.
341. **Consumer Health.** A study of consumerism including advertising, purchasing, consumer behavior and motivation, medical economics and protection. Prerequisite: Health and Safety Studies 114 and senior or graduate standing. 2 hours, or 1/2 or 1 unit.
345. **Family Planning and Population Policy.** Same as Social Work and Sociology 345. See Social Work 345.

- 355. Safety Management.** Industrial accident prevention from a statistical, historical, epidemiological, and primarily a management viewpoint; organizational and administrative aspects of management practices related to the development of safety programs, including practical approaches such as the use of safety committees and the control of hazards through systems analysis, employee selection and training, and design of equipment and work places. Prerequisite: Health and Safety Studies 208, and either Health and Safety Studies 321 or Educational Psychology 390, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 357. Health Planning.** Analysis of theory, principles and practices of health planning processes. Includes application of health planning as it relates to health systems agencies and the health care delivery system. Prerequisite: Health and Safety Studies 303, or consent of instructor. 2 hours, or $\frac{1}{2}$ or 1 unit.
- 358. Health Administration.** Examines management principles relative to health care institutions; emphasizing goal setting, decision making, system analysis, organizational structure, conflict resolution, and leadership theories. Prerequisite: Senior or graduate standing, or consent of instructor. 3 hours or 1 unit.
- 369. Environmental Health.** Appreciation of the concepts and mechanisms used to reduce or prevent environmental problems that may lead to infectious or environmentally-induced diseases; presents topics from a public health perspective which include water supply management, waste water treatment and disposal, radiation protection, pest control, and solid waste management. Prerequisite: Health and Safety Studies 274 or equivalent. 2 hours, or $\frac{1}{2}$ or 1 unit.
- 374. Principles of Epidemiology.** Same as Environmental Studies, Medical Sciences, and Veterinary Pathobiology 374. The epidemiology and natural history of infectious and noninfectious diseases, including integrated vector control and host resistance, and mental health and public health. Prerequisite: Microbiology 326, Veterinary Pathobiology 332, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 378. Epidemiology of Safety.** Applies the principles of epidemiology to the study of accidents and accident prevention. Studies types of accident data, accident reporting procedures, limitations of data, exposure to risk, accident analysis techniques; concepts and theories of accident causation; accident reconstruction; conflict measurement and other predictive data collection and analysis techniques. Evaluates the effectiveness of accident prevention methods; uses examples from various environments such as work and traffic. A relevant field study is completed involving collection and analysis of data and preparation of a report. Prerequisite: Educational Psychology 390, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 394. Special Topics.** Lecture-discussion course in topics of current interest; see Timetable for specific subjects. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 401. Issues in Health Education.** Analyzes current developments, trends, and controversies in health education from a historical perspective, with emphasis on developing student competencies for issue analysis; assesses the effect of philosophical, scientific, political, and legislative initiatives on professional practice; and examines issues affecting the health educator in various work settings, including occupational health and safety, patient care, public health, school health, and higher education. $\frac{1}{2}$ or 1 unit.
- 410. Problems in Public Health Practice.** Basic facts and principles of public health at the local, state, and national levels, including the relationships between public health departments, voluntary health agencies, and the school health program. $\frac{1}{2}$ or 1 unit.
- 424. Trends and Issues in Sex Education.** Critical analysis of current trends and basic issues of sex education; study of present status of sex education in the United States and selected foreign countries; and a critical analysis of philosophy, principles, methods, and current problems in sex education. Prerequisite: Undergraduate courses beyond the elementary level in the biological and social sciences, Health and Safety Studies 225 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 440. Theories of Health Behavior.** Examines the philosophical and behavioral science foundations of health science; principles of the determinants of human behavior and relationships to health. Students develop a frame of reference for understanding, predicting, and

facilitating change in human behavior. Prerequisite: Undergraduate courses beyond the elementary level in the biological and social sciences and in health and safety studies. ½ or 1 unit.

- 484. Community Health Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in community health with work experience in actual field situations. Students work for one semester in a University-approved health agency. Prerequisite: Health and Safety Studies 303, 310, 321, 374 and 410; graduate standing in Community Health. 2 units.
- 490. Seminar for Advanced Students.** Critical evaluation of research studies in health and safety studies, emphasizing research methods and experiment design and analysis; review of statistical techniques in factorial and correlational studies; and student reports of thesis literature reviews and research procedures. Prerequisite: Master's thesis. ½ unit. May be repeated to a maximum of 1 unit.
- 493. Special Projects.** Independent research on special projects. Prerequisite: Educational Psychology 390, Physical Education 495, and Health and Safety Studies 440 or equivalent. ½ to 2 units. May be repeated to a maximum of 2 units.
- 494. Special Topics in Health and Safety Studies.** Lectures on topics of current interest. ½ or 1 unit.
- 499. Thesis Research.** Preparation of theses in health and safety studies. 0 to 4 units.

HISTORY

Chairperson of Department: Professor Wm. C. Widenor

Department Office: 309 Gregory Hall, 810 S. Wright, Urbana

- 111. Western Civilization from Antiquity to 1660.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society before 1660; includes the Greek and Roman world, the German migrations, the rise of cities and the commercial revolution, medieval art, universities, and heresies, the Renaissance and Reformation, the Puritan Revolution, and the beginnings of the modern world. 4 hours.
- 112. Western Civilization from 1660 to the Present.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society since 1660; includes the rise of modern science, the French and Industrial revolutions, the Romantic movement, the growth of nationalism and socialism, imperialism, urban growth, the Russian Revolution, Nazi Germany, the world wars, and the West and the underdeveloped world. 4 hours.
- 131. History of England to 1688.** Survey of the political and constitutional, social and economic, church and cultural, and imperial history of the British people from the beginning of English history through the revolution of 1688. 4 hours.
- 132. History of England, 1688 to the Present.** Survey of the political and constitutional, social and economic, diplomatic and imperial, and cultural history of the British people from 1688 to the present. 4 hours.
- 147. Religion and Science.** Same as Religious Studies and Sociology 102. See Religious Studies 102.
- 151. History of the United States to 1877.** Colonial foundations, movement for independence, and early years of the republic. 4 hours. Students may not receive credit for both History 151 and either History 260 and 261.
- 152. History of the United States, 1877 to the Present.** A century of national life and organization. 4 hours. Students may not receive credit for both History 152 and 262.
- 168. Indian Civilization and Society.** Same as Anthropology 168. See Anthropology 168.
- 170. East Asian Civilizations: China, Japan, Korea.** Surveys the three major East Asian civilizations from ancient and classical times, through the period of Western intrusion,

- political revolution, and modernization, to the contemporary age and the emergence of East Asian superpowers. 3 hours.
172. **Southeast Asian Civilizations.** Same as Anthropology and Asian Studies 186. See Anthropology 186.
173. **Islamic History and Civilization in the Near and Middle East to 1700.** Development of Islamic beliefs, institutions, and culture in the nuclear Islamic region (the present area of the Arab countries and Israel, Iran, and Turkey) from Mohammed to the age of European expansion. 4 hours.
174. **Islamic History and Civilization in the Near and Middle East Since 1700.** Islamic civilization since the age of European expansion; imperialism, Westernization, nationalism, and modernization. Arab countries, Israel, Iran, and Turkey are covered. 4 hours.
175. **Latin America from Conquest to Independence.** Survey of Latin American history from the discovery of America to 1824. 3 hours. Credit is not given for both History 175 and 275.
176. **Modern and Contemporary Latin America.** History of the Latin American republics from their independence to the present; emphasis on Argentina, Brazil, Chile, Colombia, Cuba, and Mexico. 3 hours. Credit is not given for both History 176 and 275.
181. **The Ancient World.** Ancient empires and Greece. 3 hours.
182. **The Ancient World.** Rome. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Through research, reports, and discussion in a selected field of historical study, the seminar provides an in-depth understanding of the problems of that field and of the methodology of history as a discipline. Prerequisite: James Scholar standing or other designation as a superior student; consent of instructor. 3 to 4 hours. May be repeated to a maximum of 6 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **The Age of Localism: The Early Middle Ages.** The failure of imperial Rome and the rise of the Church; the organization of European society on a local basis through manorialism and feudalism. 3 hours.
204. **The Revival of Europe: The High and Later Middle Ages.** The revival of the economy; the expansion of Europe; and the rise of national states. 3 hours.
211. **The Contemporary World: Political, Ideological, and International Forces.** Interpretation of the contemporary world covering the legacy of imperialism, militarism, and world politics, the revolt of the masses, the totalitarian state, nationalism, internationalism, and such related topics. 3 hours.
212. **The Contemporary World: Economic, Social, and Cultural Aspects.** Interpretation of the contemporary world covering the economics of global power, ideological and social forces, the individual and the modern mind, the collective society, the personality in history, and such related topics. 3 hours.
213. **The Third World in Contemporary History.** Surveys the years from the close of the nineteenth century to the present, specifically the developments in Africa, Asia, Latin America, and the Middle East that led to the emergence of the "Third World." 3 hours.
215. **History of North and West Africa.** Survey of major themes and events in the history of North and West Africa from prehistoric times and the peopling of Africa through the advent of Islam; North and West African empires and states in the medieval period; the arrival and departure of European colonial powers; and the re-emergence of independent African states. 3 hours.
216. **History of East and Southern Africa.** Survey of major themes and events from the Bantu migrations and the rise of Aksum through the development of states and empires, Islam, the expansion of trade, European colonial rule, nationalism, and the persistence of white domination in the south. 3 hours.
219. **Survey of Russian History from Early Times to the Present.** Main themes and problems of Russian history from earliest times to the present. 3 hours.

- 222. Traditional China.** Historical background to the modern age, tracing the Chinese state and empire from the earliest times until 1644 A.D. Basic political, social, and economic patterns; cultural, intellectual, and technological achievements; and China's impact on Asia and the world. 3 hours.
- 224. Chinese Thought from Confucius to Mao.** Same as Religious Studies 224. Examination of China's principal philosophical, religious, and political schools of thought—such as Confucianism, Taoism, Zen Buddhism, and Maoism—as ways of understanding one of the world's major civilizations; the period of the classical philosophers, the glory years of empire, and the troubled era of western contact receive approximately equal attention. 3 hours.
- 230. Modern Business History.** Historical development of business enterprise from the early modern era to the present in broad international perspective; social and cultural values in business activity; business, government, and social responsibility; and theories of entrepreneurial behavior and detailed case studies of great business leaders. Prerequisite: Sophomore standing. 3 hours.
- 237. Contemporary Western Europe.** Same as Economics 237. An interdisciplinary approach to contemporary Western Europe; cultural, historical, economic, political, and social topics; and postwar issues, including economic recovery, position of Western Europe between the United States and the Soviet Union, economic and political integration, and current policy problems. Prerequisite: Sophomore standing. 3 hours.
- 247. Science in Western Civilization, I.** The intellectual and social history of science from antiquity through the Enlightenment; special emphasis on the scientific revolution of the seventeenth century. 3 hours.
- 248. Science in Western Civilization, II.** Topics in the intellectual and social history of modern science, 1789 to the present. 3 hours.
- 249. History of Medicine.** Rise and development of medicine in the West since the sixteenth century; interrelations of physiology, pathology, and social demands with the theory and practice of medicine; patterns of professionalization; social role of the physician; conflict among ideas of medicine as an art, a science, and a social service; and problems of mental illness, medical ethics, and nontraditional forms of practice. Prerequisite: One year of college biology or chemistry, one year of college history, or consent of instructor. 3 hours.
- 253. Afro-American History to 1877.** Same as Afro-American Studies 253. History of Africans in the Americas, surveying the African slave trade, slavery in the European colonies of the Americas, early United States slavery, and the Afro-American in the Civil War and Reconstruction. 3 hours.
- 254. Afro-American History Since 1877.** Same as Afro-American Studies 254. History of Afro-Americans in the age of white supremacy; the rise of modern protest organizations; the era of integration; and the black power movement. 3 hours.
- 260. Colonial Beginnings and Early United States History to 1815.** Social, economic, and political survey of the region and its relation to the evolving Atlantic community. Credit is not given for both History 260 and 151. 3 hours.
- 261. The United States in the Nineteenth Century.** History of the United States from 1815 to 1900. Credit is not given for both History 261 and 151. 3 hours.
- 262. The United States in the Twentieth Century.** One major emphasis on foreign policy, including the emergence of the United States as a great power after 1898; a second emphasis on the Progressive movement and recurrent attempts at the reform of American society; and racial and urban problems and the conservation of natural resources included. 3 hours. Credit is not given for both History 262 and 152.
- 265. Europe and the Romantic Revolution, 1770-1850.** Examines Romanticism as a basic psychological orientation that received its first elaborate cultural development and historical definition in the period indicated; treats various aspects of human activity, such as love, heroism, nature worship, morbidity, social idealism, and nationalism from the standpoint of the Romantic Movement. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 267. History of Korea.** Same as Asian Studies 267. See Asian Studies 267.

- 268. Religious Rebellions and Messianic Movements in History.** Same as Religious Studies 268. Comparative study of revolutionary religious movements from ancient times to the present. 3 hours.
- 272. History of Women in Europe, 1700 to the Present.** Same as Women's Studies 272. Focuses on the history of women in all social classes in Europe from pre-industrial times to the present; covers changes in attitudes towards women, female employment patterns, household roles and family lives, and women's political and social movements. 3 hours.
- 273. The History of American Women: Colonial Period to the Present.** Same as Women's Studies 273. Focuses on the changing legal, political, economic, and social status of women in the United States and the complex factors affecting change; includes a consideration of family life; and combines chronological and topical approaches. 3 hours.
- 274. United States and World Crisis, 1917 to Present.** History of American foreign relations since World War I. 3 hours.
- 275. Themes and Issues in Latin American History.** A thematic survey of major Latin American issues, trends, and events from the colonial period through the modern era. 3 hours. Credit is not given for both History 275 and either 175 or 176.
- 281. War, Military Institutions, and Society to 1815.** Land and naval warfare from prehistory to Napoleon; discusses traditional topics such as technology, tactics, and strategy at length and demonstrates how military institutions are integrated with society as a whole. 3 hours.
- 282. War, Military Institutions, and Society Since 1815.** Land and naval warfare since Napoleon; technology, tactics, strategy, administration, and military institutions in themselves and as they relate to western and nonwestern societies; and conventional nuclear warfare. 3 hours.
- 285. Premodern Japanese History.** Same as Asian Studies 285. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the earliest times to the sixteenth century. 3 hours.
- 286. Modern Japanese History.** Same as Asian Studies 286. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the mid-sixteenth century to the mid-twentieth century. 3 hours.
- 290. Individual Study.** Readings in selected fields in consultation with the instructor. Prerequisite: Junior or senior of high standing; written consent of the honors adviser. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Two-semester research project. Prerequisite: History concentrator with senior standing and 4.5 grade point average; written consent of supervising professor and honors adviser. May be taken by honors students in partial fulfillment of department honors requirements. 3 hours. Must be repeated for a total of 6 hours. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Topics are given on an experimental one-time-only basis. 3 hours.
- 298. Colloquium in History.** Prerequisite: Junior standing; 14 hours in history, or, with consent of instructor, 14 hours in the social sciences and/or humanities. 3 hours. May be repeated as topics vary to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 301. European Working-Class History: 1750 to the Present.** Same as Labor and Industrial Relations 301 and Sociology 301. Comparative study of the rise of the working class in European countries; formation, culture, and daily life; stratification within the working class; workers in organized labor and revolutionary movements. Prerequisite: One year of college history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 302. Evolution of American Cities.** Same as Urban Planning 302. See Urban Planning 302.
- 303. The Near and Middle East in the Twentieth Century.** Great power diplomacy, imperialism, nationalism, and problems of modernization studied through coverage of Arab states and Israel, Turkey, and Iran. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 304. Medieval Civilization.** Same as Religious Studies 304. The architectural, artistic, philosophical, political, and religious components of medieval culture, thought, and patterns of behavior; includes monasticism and society and the individual. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 305. The Age of the Renaissance.** Same as Religious Studies 305. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 306. The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as Religious Studies 306. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 307. Islam and the Near and Middle East from Mohammed to 1258.** Same as Religious Studies 307. The Koran and the Prophet; rule from the Atlantic Ocean to India; Arab and Persian Muslims; caliphate and sultanate; law, theology, mysticism, and heresies; Crusades; trade and commerce; and intellectual and cultural achievements. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 308. The Europeanization of the Near East, 1768-1914.** Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 309. Development of Modern Europe; Absolutism and Colonial Expansion, 1648-1789.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 310. Europe in the Age of the French Revolution and Napoleon.** Comparative survey of Western countries in the age of democratic upheavals; America, England, and Prussia as well as France; the rise of Napoleon and the response of Europe; and the fate of innovation and reform in the immediate aftermath of the Napoleonic Wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 311. European History from 1815 to 1871.** A synthesis of politics, economics, and culture; revolutions, reaction, liberalism, conservatism, socialism, nationalism, romanticism, and realism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 312. European History from 1871 to 1918.** A synthesis of politics, economics, and culture; new state systems, long depression, imperialism, racism, nationalism, imperialism, symbolism, fin de siècle, socialism, and World War I. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 313. European History from 1918 to 1939.** Survey of European society from 1918 to 1939, with emphasis on the impact of World War I, the Russian Revolution, fascism, and the intellectual trends of the twenties and thirties. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 314. European History from 1939 to the Present.** Survey of European society since 1939, with emphasis on the impact of World War II, the cold War, the establishment of the welfare state, and social developments. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 316. The Industrial Revolution in Europe, 1780-1900.** Comparative analytic study of industrial development in England, France, Germany, and Russia; social, cultural, and demographic consequences of rapid economic change. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 318. European International Affairs, 1815-1914.** The history of European international affairs from the Vienna Congress to the First World War, with the main focus on political developments, but with considerable attention also paid to the influence of domestic politics and social and economic changes on foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 319. European International Affairs, 1914 to the Present.** The history of European international affairs from the First World War to the present day, concentrating on political developments, especially the two world wars, but including the impact of domestic politics, ideological struggle, and socio-economic change upon foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 320. Russia from the Earliest Times to Peter the Great.** Political, economic, cultural, and social development of Russia during the Kievan and Muscovite periods. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Social History of Imperial Russia.** Social change during Russia's emergence as a modern western nation; evolution of the monarchy, clergy, townspeople, intelligentsia, and peasantry from 1700 to 1905 with special attention to the links among family, social estate, and the larger society. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 324. Intellectual History of Modern Europe, 1770 to the Present.** Survey of the seminal ideas in the fields of political, social, and economic thought which have influenced the development of modern Europe. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 325. Southern Africa: Race and Power.** Same as African Studies 325 and Political Science 333. See African Studies 325.
- 326. Intellectual and Cultural History of Russia.** Survey of major themes in the development of Russian culture and thought, with emphasis on the nineteenth and twentieth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 327. Revolutionary Russia, 1904-1939.** Russia and its empire from the Russo-Japanese War and the Revolution of 1905 through World War I, the Revolutions of 1917, the early years of the Soviet system, the rise of Stalin, and the Great Purge. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 328. Soviet Russia since 1939.** The multinational Soviet state from the Hitler-Stalin Pact through World War II, the postwar Stalin era, the emergence and dominance of Khrushchev, and the Brezhnev era to the present day. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Southeastern Europe, 1700-1918.** The political, economic, and cultural development of the Rumanians, South Slavs, Greeks, and Albanians; the impact of Ottoman rule; the rise of nationalism and the formation of national states; and the Orthodox Church. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
- 330. Eastern Europe, 1919 to the Present.** The political, economic, and cultural history of Poland, Czechoslovakia, Hungary, Rumania, Yugoslavia, Bulgaria, Greece, and Albania; particular emphasis upon the post-World War II era. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
- 331. Medieval Economic and Social History.** Includes the decline of Roman society, the age of localism, the revival of commerce and urbanism, medieval capitalism, and economic decline and social turmoil. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
- 332. Medieval England.** Economic, intellectual, religious, and social developments as reflected in the art and architecture of medieval England from the time of the German invasions to about the fifteenth century. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 333. England under the Tudors and Stuarts, 1485-1660.** Politics, religion, and society in the era of the Protestant Reformation and the Civil War. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 334. Great Britain Under the Later Stuarts and the Hanoverians, 1660-1815.** Principal political, economic, social, religious, and cultural developments in British history from the Restoration to the end of the Napoleonic wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 335. History and Culture of Venice.** Examines Venice from its origins at the time of the Roman Empire until the present. Includes economic, political, and social history; humanism; philosophy; art; architecture; literature; music; and popular culture. Fully illustrated with slides. 3 hours or 1 unit.
- 337. American Working Class History, 1780 to the Present.** Same as Labor and Industrial Relations 337. Focuses on working class formation, culture, ideas, and organization; examines daily experience of work and community life; special emphasis on race, ethnicity, and gender in the process of class formation; labor relations and the changing patterns of working class protest and accommodation. Prerequisite: One year of college level history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 338. History of Biology.** Same as Biology 338. Development of biological thought from antiquity to the present, emphasizing evolutionary theory and physiology in the nineteenth century and genetics in the twentieth century. Prerequisite: One year of college biology or history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 339. Scientific Thought, I.** Same as Philosophy 317. See Philosophy 317.
- 340. Scientific Thought, II.** Same as Philosophy 318. See Philosophy 318.
- 341. Modern Britain: the Victorian Era, 1815-1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 342. Modern Britain Since 1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 343. The Turks and the Ottoman Empire, 1100-1566.** Turkish migrations; the Crusades; Genghis Khan and the Mongols; Seljuks of Rum; Ottoman expansion; Islamic mysticism and law; society and economy; and international trade routes in the Black Sea and eastern Mediterranean. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. The Ottoman Empire, 1566-1924.** Economy, society, law, and government; the Ottomans and Mediterranean society; Ottoman culture and Islamic tradition; minorities; trade, diplomacy, and capitulations; "decline" and dismemberment; and traditional and westernizing attempts at revival. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 347. History of Roman Law and Legal Tradition.** Examines Roman law and legal tradition in the context of historical, political, and social developments; origins of law in primitive and ancient classical societies; surveys development of precedent, codification, and preservation of Roman law, and the impact of Roman law on western legal traditions. Prerequisite: One year of college history, political science, or classical civilization; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 350. History of American Immigration to 1880.** The migrations which peopled Colonial America and the United States and their role in the shaping of American society and culture; research opportunities provided. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 351. History of American Immigration Since 1880.** The migrations of the late nineteenth and twentieth centuries and their impact on American society and culture. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 352. Colonial Beginnings of American Life and Institutions.** Study of the seventeenth- and eighteenth-century colonies to 1763. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. The Era of the American Revolution, 1763-89.** Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. Federalists, Jeffersonians, and the Era of Good Feeling.** United States history from 1789 to 1828, with emphasis on the conflict between nationalism and sectional interests. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. America in the Age of Jackson.** Political, social, and cultural study of the United States from the 1820s to the 1850s, including the humanitarian reform movements, manifest destiny, and the Mexican War. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 359. Civil War and Reconstruction.** The United States between 1850 and 1877, with emphasis on the causes of the war, wartime problems of the North and South, and efforts to create a new Union after the war. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 360. History of the United States, 1877-1909.** Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 361. History of the United States, 1909-1932.** Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 362. History of the United States since 1932.** Discusses the New Deal, the Cold War, all the presidents since Roosevelt, the structure of American imperialism, and America's role in world politics. Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 363. Social History of Industrial America to 1918.** The impact of industrialization, immigration, and urbanization on American society to the end of World War I. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 364. Social History of Industrial America Since World War I.** Study of the impact of industrial technology, business enterprise, immigration, and urbanization of American society. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 365. The History of Illinois to 1900.** The development of Illinois, first as a region and then as a state, with emphasis upon its political, economic, social, religious, and cultural growth in the eighteenth and nineteenth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 366. The History of Illinois in the Twentieth Century.** The development of a modern American state in the twentieth century with emphasis upon its political life, economic growth, social and intellectual problems, and contribution to the nation. Includes Chicago's expanding role in the history of Illinois. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 367. The Trans-Mississippi West.** The West in American history since the Louisiana Purchase; western stereotypes, order and violence, racial minorities, the urban sector, natural resources, and environmental policy. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 368. The South in American History.** Same as Afro-American Studies 368. Exploration of the history of the American South identifying and explaining differences between the South and the rest of the nation; examines the correlates of economic change in the realms of politics, social structure, and cultural values. Race relations provides a central theme of the course. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 369. Constitutional Development of the United States to 1865.** Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 370. Constitutional Development of the United States Since 1865.** Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 371. American Intellectual and Cultural History to 1865.** Same as Religious Studies 381. Examines the role of religious, scientific, political, social, educational, and artistic thought and institutions in shaping a distinctive American culture, emphasizing Puritanism, the Enlightenment, and the Romantic movement. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 372. American Intellectual and Cultural History since 1859.** Same as Religious Studies 382. Treats the leading intellectual and cultural influences in shaping modern and contemporary America, emphasizing the impact of Darwinism and naturalistic thought, science and technology, the American university, divisions in religious thought (Modernism, Fundamentalism, Neo-Orthodoxy), the Counterculture, and the New Conservatism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 373. History of American Foreign Relations to 1917.** 3 hours, or $\frac{1}{2}$ or 1 unit.
- 374. Imperialism, 1870 to the Present.** Deals thematically with controversial issues concerning imperialism in the past century; includes various theories on the origins of imperialism, the diverse character of European empires before 1914, the impact of the world wars on empire, and American and Soviet "imperialism" since World War II. Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 375. Andean Countries of South America, 1532 to the Present.** The history of Colombia, Ecuador, Peru, Bolivia, and Chile; emphasizes common problems and diverse responses, from the conquest in the sixteenth century to the struggles for development in the twentieth. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 376. Reform and Revolutionary Movements in Twentieth-Century Latin America.** Comparative historical treatment of mass political movements in twentieth-century Latin America stressing Chile, Peru, Brazil, Argentina, Mexico, Bolivia, and Cuba; social science concepts supplement the historical analysis of causes, leaders, followers, programs, tactics, and results of these movements. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 377. History of Modern Brazil, 1808 to the Present.** Problems of a neocolonial society; themes include family structure, slavery, imperialism, modernization, and the crisis of

traditional institutions. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

378. **History of Mexico, 1519 to the Present.** The development of Mexico from the conquest to the postrevolutionary present. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
379. **Slavery and Race Relations in Latin America.** Same as Afro-American Studies 379. Selected topics on Indians and Spaniards, whites and blacks, emphasizing Mexico, the Caribbean, and Brazil. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
380. **Europe and the 'Scramble for Africa.'** Analysis of the politics and economics of the European partition of Africa with particular reference to Britain, France, and Germany (1870-1900) and African responses to alien rule. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
381. **Ancient Greek States.** History of the Greek states from the earliest times to 334 B.C. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
382. **Alexander and His Successors.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
383. **History of the Roman Republic to 44 B.C.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **The Roman Empire.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **African Independence and Underdevelopment: 1945 to the Present.** Same as Political Science 332. Historical investigation of African political economies based on selected case studies; includes development of the colonial economy, economic bases of African nationalism, and postindependence underdevelopment and attempts to escape from it. Prerequisite: One year of college history or enrollment in the African Studies program. 3 hours, or $\frac{1}{2}$ or 1 unit.
388. **India from Colony to Nation.** Mughal Empire and British Raj, Indian national awakening, and struggle for independence under Ghandi and Nehru. 3 hours, or $\frac{1}{2}$ or 1 unit.
390. **China Under the Ch'ing Dynasty.** The period of Manchu domination in China (1644-1912); emphasis on Chinese reactions to Western influences during the nineteenth century. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
391. **History of Blacks in Urban America.** A survey of historic conditions of Afro-Americans in nineteenth and twentieth century cities; an examination of Black life, slave and free, in antebellum cities, migration patterns, the origins of the ghetto, ethnic conflicts, socio-economic patterns of urban Blacks, community institutions, political participation, urban policy issues, and social and demographic effects of urbanization. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
393. **Social-Economic History of Modern China.** Disintegration of traditional social and economic systems during the nineteenth and twentieth centuries, and the political effects of that disintegration; examines changes in the agricultural economy, changing rural elites, urbanization, and emergence of new social classes. It is recommended that students take History 390 and 394 before enrollment in History 393. 3 hours, or $\frac{1}{2}$ or 1 unit.
394. **Twentieth-Century China.** Chinese state and society in revolutionary transition; emphasis on the Nationalist and Communist revolutions and their results. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
397. **History of Spain and Portugal.** Iberian history from pre-Roman times to the present with emphasis on the modern period. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
398. **The Habsburg Monarchy, 1526-1792.** A history of the Habsburg Monarchy from the union of Austria, Bohemia, and Hungary to the end of the period of reform. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
399. **The Habsburg Monarchy, 1792-1918.** Social, cultural, economic, and political development; evolution of the central institutions of the monarchy and the monarchy's place in

the European state system; and internal history of the constituent peoples of the monarchy: Germans, Magyars, Czechs, Slovaks, Poles, Slovenes, Croats, Serbs, Ruthenians, and Rumanians. Prerequisite: One year of college history or consent of instructor. 3 hours, or ½ or 1 unit.

- 411. **Seminar in Ancient History: Greece.** 1 unit.
- 413. **Seminar in Ancient History: Rome.** 1 unit.
- 415. **Seminar in Medieval History.** 1 unit.
- 419. **Seminar in European History, 1648 to 1815.** 1 unit.
- 421. **Seminar in European History Since 1815.** 1 unit.
- 423. **Seminar in English History to 1688.** 1 unit.
- 425. **Seminar in English and British Empire History Since 1688.** 1 unit.
- 427. **Seminar in Russian History.** 1 unit.
- 443. **Seminar in South Asian History.** 1 unit.
- 448. **Seminar in African History.** Prerequisite: History 215, 216, and one upper-level African history course. 1 unit.
- 451. **Seminar in Early American History to 1789.** 1 unit.
- 453. **Seminar in American History Since 1789.** 1 unit.
- 461. **Seminar in Latin American History.** 1 unit.
- 471. **Seminar in the History of Science.** 1 unit.
- 472. **Seminar in History of Medicine: Selected Topics from Antiquity to the Present.** 1 unit.
- 475. **Problems in Ancient History.** 1 unit.
- 476. **Problems in Medieval History.** 1 unit.
- 478. **Problems in European History since 1815.** 1 unit.
- 479. **Problems in English History before 1688.** 1 unit.
- 480. **Problems in English History since 1688.** 1 unit.
- 481. **Problems in Russian History.** 1 unit.
- 482. **Problems in Military History.** Prerequisite: Graduate Standing. 1 unit.
- 486. **Problems in American History to 1830.** 1 unit.
- 487. **Problems in American History since 1815.** 1 unit.
- 488. **Problems in Latin American History.** 1 unit.
- 489. **Problems in African History.** 1 unit.
- 490. **History and Social Theory.** Introduces recent historical work drawing upon theories and concepts from the social sciences; considers fields of inquiry which include family history, demographic history, labor history, prosopographical and entrepreneurial studies, local and regional studies, and others. 1 unit.
- 491. **Quantitative Techniques for Historians.** Focuses on the use of quantitative techniques in historical research, exploring problems in research design, data management and computer techniques, and the evaluation of statistics used by historians. Prerequisite: Sociology 385 or consent of instructor. 1 unit.
- 495. **Individual Research Project.** Directed research in special fields; may be taken in lieu of seminars in fields in which seminars are seldom offered. 1 unit.
- 496. **History of Historiography.** Introduction to the great historians from early times to the present. 1 unit.
- 497. **Reading Course.** Directed readings in special fields. Primarily, but not exclusively, for students with a master's degree or equivalent, who are preparing for the preliminary examination in history and who need instruction in areas not provided by current course offerings. Prerequisite: Consent of instructor. 1 unit.
- 498. **Problems in the Teaching of College History.** Prerequisite: Candidate for Ph.D. degree in history. ½ unit.
- 499. **Thesis Research.** Individual direction in research and guidance in writing theses for advanced degrees. 0 to 4 units.

HISTORY OF ART

(See Art and Design)

HORTICULTURE

Acting Head of Department: Professor David B. Dickinson

Department Office: 124 Mumford Hall, 1301 W. Gregory Dr., Urbana

- 100. Introduction to Horticulture.** Basic principles of plant growth and development as they apply to the production, marketing, and utilization of fruits, vegetables, and ornamental plants. Prerequisite: Credit or concurrent registration in Plant Biology 100 or equivalent. 3 hours.
- 110. Plant and Animal Genetics.** Same as Agronomy, Animal Science, and Dairy Science 110. See Agronomy 110.
- 122. Greenhouse Management.** Commercial greenhouse construction and operation, including heating, cooling, soils, potting, fertilizers, and watering; lectures, readings, demonstrations, and greenhouse practice. 3 hours.
- 125. Survey of Landscape Horticulture.** Consumer analysis of horticultural elements and non-plant items utilized in the development of residential, commercial, and community landscapes; includes analysis of objectives, site, plants, installation, and maintenance; and considers selection and development of specialty gardens and interior landscapes in order to develop analytical skills in evaluating needs, materials, and services available. Not open to students in ornamental horticulture curriculum. 3 hours.
- 131. Introduction to Floral Design.** Introduces the art of arranging flowers, foliages, and accessories according to the principles of design. Lecture and lab; fee required. 2 hours. Credit not given for students in ornamental horticulture.
- 190. Home Vegetable Gardening.** Principles and practices of producing vegetables in the home garden by traditional and organic methods; lecture and laboratory. 3 hours. Credit is not given to horticulture majors. All other students: may not receive credit for both Horticulture 190 or 242.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Identification and Use of Woody Ornamental Plants, I.** Systematic approach to the identification, ornamental characters, culture, propagation, production, and use of woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
- 202. Identification and Use of Woody Ornamental Plants, II.** Systematic approach to the identification, ornamental characters, culture, propagation, production and use of woody ornamental conifers, broadleaf evergreens, vines, ground covers and woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 and Horticulture 201, or consent of instructor. 3 hours.
- 210. Home Grounds Planning and Design.** Practice of developing home grounds; emphasis on analysis and practical solutions of typical site problems; and evaluation of plants and garden structures as elements in home grounds planning and design. Prerequisite: Horticulture 202 or consent of instructor. 4 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only. Credit allowed toward fulfilling requirement in Group III, ornamental horticulture curriculum, only if Horticulture 211 is also completed.
- 211. Home Grounds Development and Construction.** Continuation of Horticulture 210, with emphasis on development of home grounds and construction methods and techniques. Prerequisite: Horticulture 202 and 210, or consent of instructor. 3 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only.

- 212. Landscape Contracting.** Interpretation of the landscape architect's plans and specifications; estimating quantities of materials; and computing costs and procedures for bidding and executing landscape construction. Prerequisite: Horticulture 211. 3 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only.
- 221. Plant Propagation.** Examines theory and methods employed in propagation of plants, emphasizing anatomical, physiological, and ecological principles involved in sexual propagation (seeds) and asexual propagation (division, cuttings, budding, grafting, tissue culture, etc.). Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
- 223. Floricultural Crops Production, I.** Commercial production of major cut-flower crops in the greenhouse and field. Prerequisite: Horticulture 122. 3 hours.
- 224. Floricultural Crops Production, II.** Commercial production of pot plants and minor greenhouse and field-grown cut flowers. Prerequisite: Horticulture 223. 3 hours.
- 226. Bedding Plant Production, Use, and Identification.** Examines the commercial production, use, and identification of herbaceous, frost-tender ornamental plants, largely flowering annuals, grown for outdoor bedding purposes. Includes field trip. Prerequisite: Plant Biology 100. 3 hours.
- 227. Indoor Plant Culture, Use and Identification.** Culture, use, and identification of indoor plants in relation to their application in interior situations; discusses the influence of water, fertilizer, soil type, light (natural and artificial), relative humidity, storage and shipping. Students design and maintain an interior plant area; lecture and lab. A field trip is required. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
- 230. Herbaceous Perennials: Identification and Use.** Identification of herbaceous perennials; cultural requirements and uses in the landscape; discussion of perennial border design for continuous flowering. Prerequisite: Plant Biology 100. 3 hours.
- 231. Floral Design, I.** Applies principles of design to the composition and decorative use of flowers, foliage, and accessories. 3 hours. Registration limited to horticulture majors, students in ornamental horticulture curriculum, or students in agricultural occupations for secondary teachers curriculum only.
- 232. Flower Shop Management and Floral Design, II.** Introduces flower shop management; includes the location, establishment, and financing of a new or existing shop and basic skills in management, pricing, buying, delivery, and display. Covers advanced floral design skills. Prerequisite: Horticulture 231. 3 hours.
- 233. Floriculture for the Home.** Fundamentals of home gardening and the effective use of ornamentals as a part of the home environment; subjects include the selection, culture, and use of garden annuals, biennials, perennials, bulbs, and house plants; garden tools and equipment; soil preparation; plant propagation; principles of design and planting methods; garden maintenance; use of fertilizers; pest control; training and pruning; lawn care; hybridizing; growing structures; and care of cut flowers. Not open to students in the ornamental horticulture curriculum. 3 hours.
- 234. Nursery Management.** Studies the various practices and methods of operating a commercial nursery for the production of ornamental woody plants used in landscaping. Lectures, assigned reading, and laboratory exercises. Prerequisite: Plant Biology 100. 3 hours.
- 236. Turfgrass Management.** Examines principles and practices used in management of turfgrasses in areas of general and specific use; of value to students interested in one or more aspects of turfgrass utilization. Prerequisite: Plant Biology 100. 3 hours.
- 242. Commercial Vegetable Production.** Commercial vegetable production with emphasis on cultural considerations and harvest and handling of selected vegetable crops; integrates principles of plant growth into vegetable production schemes; covers vegetable classification, growing practices and handling in the context of current commercial production systems. Prerequisite: Horticulture 100 and Soils 101. 3 hours.
- 250. Horticulture Internship.** A supervised off-campus learning experience of at least 300 hours in a horticulture related enterprise. Prerequisite: Junior status; good academic standing; major in ornamental horticulture, horticulture, or agricultural science with

horticulture emphasis; completion of a 200- or 300-level course appropriate to the internship activities; and consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.

- 251. Arboriculture.** Principles in the care and maintenance of ornamental trees and shrubs in the established landscape; consideration of environmental factors, soils, nutrition, pruning, tree surgery, and insect and disease control. Prerequisite: Agronomy 101. 3 hours.
- 261. Small Fruit and Viticulture Science.** Technological application of biological principles to the culture of strawberry, grape, blueberry, raspberry, blackberry, currant, gooseberry, and miscellaneous small fruits. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours.
- 262. Tree Fruit Science.** Examines biological principles, cultural methods and practices involved in the growth and production of the apple, pear, peach, cherry, plum, apricot, almond, and miscellaneous citrus and nut crops. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours.
- 300. Special Problems.** Supervised research on individual problems in any phase of horticulture; includes anatomy, breeding, physiology, ecology, or general culture of fruit, vegetable, or ornamental plants. Prerequisite: Not open to students on probation; written consent of the instructor and authorized departmental approval required prior to advanced enrollment and registration. 1 to 5 hours, or $\frac{1}{2}$ to 2 units.
- 307. International Food Crops.** Various international food crops studied; production and problems created by diseases and insects emphasized; tropical and subtropical crops stressed; temperate food crops of international importance included; and ecological factors affecting fundamentals of food crop production and plant protection examined. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 321. Floricultural Physiology.** Studies the physiology and metabolism of floricultural crops during their development from seeds through flowering. Lectures and discussion. Prerequisite: Agronomy 101, Plant Biology 100, or consent of instructor. 4 hours or 1 unit.
- 322. Plant Nutrition.** Studies the mechanisms of and factors affecting the absorption, transport, distribution, and functions of the essential elements required by higher plants. Lectures and discussions. Prerequisite: Soils 101; Plant Biology 234 or 330. 4 hours or 1 unit. Offered in alternate years.
- 323. Principles of Plant Breeding.** Same as Agronomy 323. See Agronomy 323.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Plant Biology 333. See Plant Biology 333.
- 336. Perennial Grass Ecosystems.** Same as Agronomy 336. Different levels of ecological organization in perennial grass ecosystems. Provides advanced study for students in turfgrass and forage management. Cultural programs are derived from an understanding of interrelationships between different components of the ecosystem, including man and animals. Term paper required. Field trips; see Timetable for approximate cost. Prerequisite: Horticulture 236 or Agronomy 322. 4 hours or 1 unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Dairy Science, Food Science and Forestry 340. See Agronomy 340.
- 345. Growth and Development of Horticultural Crops.** Factors affecting growth, development, and quality of horticultural crops, such as photoperiodism, growth regulators, carbon dioxide levels, etc. Lecture and discussion. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
- 398. Postharvest Physiology of Horticultural Crops.** Physiology, biochemistry, and anatomy of fruits and vegetables during development, maturation, and ripening in situ and in storage. Prerequisite: Plant Biology 100 and Chemistry 102 or 103, or equivalent. 4 hours or 1 unit. Offered in alternate years.
- 424. Enzymes and Metabolic Pathways of Plants.** Same as Agronomy and Plant Biology 424. See Agronomy 424.

- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Plant Pathology 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Plant Pathology 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Plant Pathology 433. See Biology 433.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Forestry, and Plant Pathology 434. See Biology 434.
- 447. Horticulture Seminar.** Discussion of current research and literature pertaining to problems of horticulture and related fields. Prerequisite: Graduate standing in horticulture or related fields. $\frac{1}{2}$ unit.
- 488. Plant Pigments.** Same as Plant Biology 488. A comprehensive presentation of the nature, function, distribution, biosynthesis, degradation, separation, and spectroscopic properties of pyrrrole, carotenoid, quinone, and anthocyanin pigments. Prerequisite: Plant Biology 330 or consent of instructor. 1 unit. Offered in alternate years.
- 490. Research Methods in Horticulture.** Lectures, discussions, demonstrations, and laboratory exercises dealing with methods and apparatus used in horticultural research. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 1 unit.
- 492. Special Topics in Horticulture.** Readings and discussion in selected phases of horticulture including such topics as genetics, physiology, anatomy, morphology, and ecology of horticultural crops. $\frac{1}{2}$ to 2 units.
- 494. Professional Orientation in Horticulture.** The philosophy and components of graduate education, with development of the principles useful in teaching, research, and extension in horticulture. Prerequisite: Graduate standing in horticulture. $\frac{1}{4}$ unit.
- 499. Thesis Research.** Research on problems in floriculture, ornamentals, plant breeding, pomology, turfgrass, or vegetable crops. Prerequisite: Graduate standing in horticulture. 0 to 4 units (summer session 0 to 2 units).

HUMAN DEVELOPMENT AND FAMILY ECOLOGY

Acting Head of Department: Professor Leann Birch

Department Office: 206 Child Development Laboratory, 1105 West Nevada, Urbana

- 105. Introduction to Human Development.** Systematic overview of the biological, psychological, familial, and cultural factors related to human growth and development throughout the life cycle. 3 hours.
- 106. Observation and Assessment of Human Development.** Studies human behavior in laboratory and natural settings, with emphasis on the developing child; includes observation and assessment of cognitive, social affective, and motor development. Prerequisite: Human Development and Family Ecology 105, or consent of instructor. 3 hours.
- 110. Introduction to Family Ecology.** Overview of family development, including courtship, marriage, parenting, the aging family, and family crisis; emphasizes the application of research findings to individual decision-making. 3 hours.
- 143. Biological Bases of Human Behavior.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 143. See Anthropology 143.
- 145. Introduction to Women's Studies in the Social Sciences.** Same as Sociology 145 and Women's Studies 112. See Women's Studies 112.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Development of Curriculum for Infants and Preschoolers.** Introduces development of curriculum for children from birth to age five; integrates child development theory and principles with programming for young children in preschool and childcare settings. Prerequisite: Human Development and Family Ecology 105, or equivalent. 3 hours.

- 203. Infancy and Early Development.** Reviews development during the first two years of life including biological, cognitive, and social aspects of early development; lab involves first-hand observation of infants to supplement and extend lecture material. Prerequisite: Human Development and Family Ecology 105, or Psychology 216; or consent of instructor. 4 hours.
- 204. Motor Development in Childhood.** Same as Physical Education 262. See Physical Education 262.
- 205. Children with Special Needs.** Same as Sociology 205. See Sociology 205.
- 210. Comparative Family Organization.** Same as Anthropology 210. A cross-cultural examination of the family in relation to its environment, the family relevant as an environment, and the family structure as it changes over time; evaluates findings in anthropology, sociology, and psychology; examines current issues in American family life. Prerequisite: Junior standing or consent of instructor. 3 hours.
- 211. Social Context of Human Sexuality.** Surveys current research on social aspects of human sexuality from cross-cultural, social, familial, and life-span development perspectives. 3 hours.
- 214. Introduction to Aging.** Same as Psychology 214. A multi-disciplinary introduction to the study of aging; the social, psychological and physiological context of changing roles in later life; public and private policies that affect older people and their families. Prerequisite: Human Development and Family Ecology 105, or 3 hours of social science. 3 hours.
- 215. Courtship and Marriage.** Development of cross-sex and same-sex relationships that lead to marriage or intimate living over the life cycle; the dissolution of such relationships; emphasizes the effects of social and cultural environments on intimate relationships. 3 hours. Students may not receive credit for both Human Development and Family Ecology 215 and Sociology 321.
- 220. Organization and Administration of Child Development Programs.** Examines principles and practices of organization and administration of programs and community services for young children and their families with special focus on leadership; emphasizes daily planning and operation of programs and services, and internal and external factors influencing program management and effectiveness. Prerequisite: Human Development and Family Ecology 202, or consent of instructor. 3 hours.
- 242. Family Violence.** Same as Sociology 242. See Sociology 242.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 301. Issues in Socialization and Development.** Presents and uses theories of socialization to evaluate and analyze current issues and socialization practices; delineates historical and philosophical trends in socialization, and discusses the implications of these trends for generating social policy affecting the developing individual. Prerequisite: Human Development and Family Ecology 202 and 203; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 302. Sex Roles.** Same as Sociology 302. See Sociology 302.
- 304. Gerontology.** An interdisciplinary approach to the study of aging and the aged from developmental, behavioral, and social perspectives. Prerequisite: Senior standing. 3 hours or 1 unit.
- 305. Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Elementary and Early Childhood Education 305. See Foods and Nutrition 305.
- 310. Contemporary American Family.** Examination of the variety of forms families assume in the United States as responses to different environments. Families are compared in the areas of kinship, family organization, patterns of interpersonal relationships, socialization, values, and integration with the larger society. Prerequisite: Human Development and Family Ecology 210 or consent of instructor; and 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 315. Critical Transitions in Families.** A life-span development approach to the study of normative changes and non-normative events and their impact on marriage and family

relationships; gives attention to variations in the socio-economic contexts of family transitions, and to methods for reducing the negative effects of such transitions. Prerequisite: Six hours of human development and family ecology courses, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

319. Day Care Practicum. Same as Psychology 319. See Psychology 319.

330. The Family in International Settings. Examines the impact of technological change on the family in developing nations, compared with the Western World; includes coverage of the effects of various development approaches and projects on family roles, form, and resource access, and the effects of family characteristics on the success of development projects. Prerequisite: Human Development and Family Ecology 210, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

349. Music in Early Childhood. Same as Music 349. See Music 349.

350. Practicum in Human Development and Family Ecology. A supervised on or off-campus learning experience related to human development or family ecology, supervised in cooperation with an appropriate agency or institution. Prerequisite: Human Development and Family Ecology major; junior standing. Not available to students on probation. 4 to 12 hours, or 1 to 3 units. (Only 1 unit of the course may be applied to the total required for a graduate degree in Human Resources and Family Studies, Option 2. At the undergraduate level only 4 hours may be applied to the total HDFE courses required.)

354. Growth and Physical Development of Children. Same as Physical Education 354. See Physical Education 354.

370. Family Conflict Management. Examines processes of conflict management in family and community disputes from a cross-cultural perspective; emphasizes negotiation and mediation as modes of dispute settlement. Prerequisite: Human Development and Family Ecology 210 or 310; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

388. Special Topics in Human Development and Family Ecology. Prerequisite: Senior standing and consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours, or 2 units.

390. Human Development: Theory and Methodology. Discussion and evaluation of theories of human development and critical examination of current research; examples from current literature illustrating research methods and the differing theoretical orientations shaping research directions in human development. 4 hours or 1 unit.

410. Family Interaction. Observation and qualitative analysis of the family as a small group; how family organization emerges, is maintained, and changes through social interaction. Prerequisite: Human Development and Family Ecology 310 or equivalent. 1 unit.

418. Seminar in Human Development. An overview of theories and research in human development; focuses on major issues regarding development, differing conceptualizations of those issues, and relevant research. Prerequisite: Consent of instructor. 1 unit.

419. Seminar in Family Research and Theory. Presents an advanced, multidisciplinary approach to current theoretical and research issues in the areas of marriage and the family. Prerequisite: Human Development and Family Ecology 310, or consent of instructor. 1 unit.

420. Contemporary Topics in Human Development. An in-depth analysis of a current issue in human development with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Ecology or a related area, and consent of instructor; courses in statistics and Human Development and Family Ecology 390, or equivalent. 1 unit.

421. Contemporary Topics in Family Studies. An in-depth analysis of a current issue in family studies with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Ecology or a related area, and consent of instructor; courses in statistics and Human Development and Family Ecology 390, or equivalent. 1 unit.

457. Sensorimotor Development. Same as Physical Education 457. See Physical Education 457.

- 470. Family Mediation: Theory and Techniques.** Applies mediation theory and techniques to decisions faced by families in conflict, e.g., divorce; emphasizes the development of professional conflict management skills to assist individuals and families in their ability to resolve disputes. Prerequisite: Human Development and Family Ecology 370 or equivalent. 1 unit.
- 473. Seminar in Social Theories of Family Management.** Same as Family and Consumer Economics 473. See Family and Consumer Economics 473.
- 493. Advanced Studies in Human Development and Family Ecology.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. For non-thesis students only. $\frac{1}{2}$ or 1 unit.
- 498. Special Problems in Human Development and Family Ecology.** Research or independent study on a special problem that is not part of thesis work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Original research designed and conducted under faculty supervision. 0 to 4 units.

HUMAN RESOURCES AND FAMILY STUDIES, SCHOOL OF

(Please refer to individual alphabetical listings: Family and Consumer Economics, Foods and Nutrition, Human Development and Family Ecology, Human Resources and Family Studies, and Textiles and Interior Design.)

Director of School: Professor Coby Simerly

School Office: 260 Bevier Hall, 905 S. Goodwin, Urbana

HUMAN RESOURCES AND FAMILY STUDIES

Acting Director of School: Professor Coby B. Simerly

School Office: 260 Bevier Hall, 905 S. Goodwin, Urbana

- 100. Contemporary Issues in Human Resources and Family Studies.** Introduces and analyzes contemporary issues and trends in human resources and family studies; examines the integrative nature of Human Resources and Family Studies and life planning theories, models and research; includes orientation to the School of Human Resources and Family Studies. Required of all freshman and transfer students in the School of Human Resources and Family Studies. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Agriculture 268. See Agriculture 268.
- 269. Cooperative Extension: Summer Experience.** Same as Agriculture 269. See Agriculture 269.
- 290. Leadership Development.** Same as Agriculture 290. See Agriculture 290.
- 298. International Experience.** Same as Agriculture 298. See Agriculture 298.
- 369. Educational Programs in Cooperative Extension.** Same as Agriculture 369. See Agriculture 369.

HUMANITIES, SCHOOL OF

(Please refer to individual alphabetical listings: Classics, Comparative Literature, English, French, Germanic Languages and Literatures, History, Humanities,

Linguistics, Philosophy, Religious Studies, Slavic Languages and Literatures, Spanish, Italian, and Portuguese, and Speech Communication.)

Director of School: Professor N. Baym

School Office: 112 English Building, 608 S. Wright, Urbana

HUMANITIES

Director of School: Professor N. Baym

School Office: 112 English Building, 608 S. Wright, Urbana

- 131. Introduction to Renaissance Civilization.** A study of major historical, intellectual, and artistic achievements of the period; organized around a series of topics, each focusing on a society, movement, or historical event as reflected in literature, art, and the history of ideas. 3 hours.
- 141. Introduction to American Civilization, I.** An introduction to the multidisciplinary study of major aspects, events, and periods of the American experience; includes a series of topics, each focusing on one society, movement, or historical event as reflected in literature, art, history, and politics. 3 hours.
- 142. Introduction to American Civilization, II.** Continuation of Humanities 141. 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 261. Survey of World Cinema, I: The Beginnings through the Coming of Sound.** Survey of the development of equipment, techniques, and themes of the cinema from its origins through the coming of sound; lectures, discussions, and showings of selected films. 3 hours.
- 262. Survey of World Cinema, II: The Thirties to the Present.** Survey of the development of equipment, techniques, and themes of the cinema from the coming of sound to the present; lectures, discussions, and showings of selected films. 3 hours.
- 279. Introduction to Foreign Language Education.** Same as French, German, Latin, Russian, and Spanish 279. Introduction to the theory and methodology of second language teaching, including the history of foreign language education, contemporary practices and perspectives, and current research in second language acquisition. Prerequisite: Sophomore standing and enrollment in a teacher education curriculum, or consent of instructor. 3 hours.
- 285. The Jewish Experience in Film.** Selected topics focusing on various aspects of Judaism and Jewish culture as it has been portrayed in world cinema along with an examination of the contributions of selected Jewish artists to the cinema. Prerequisite: One college course in literature or film studies. 3 hours.
- 290. Individual Study.** Supervised reading and research on interdisciplinary humanities topics chosen by the student in consultation with a faculty member. Prerequisite: Consent of humanities advisor (an approved Learning Agreement must be submitted to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 2 to 4 hours. May be repeated to a maximum of 8 hours.
- 292. Senior Thesis.** Individual research for concentrators in humanities leading to the completion of a thesis. Prerequisite: Senior standing, a declared option in humanities field of concentration, and consent of advisor. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 295. Special Topics: Interdisciplinary.** Interdisciplinary topics in the humanities; topics vary, but are normally related to one of the options in the humanities field of concentration. 3 hours. May be repeated as topics vary; students may register for two different topics in the same semester.

- 297. Special Topics: Junior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities field of concentration. Prerequisite: Junior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
- 298. Special Topics: Senior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities field of concentration. Prerequisite: Senior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
- 361. Film Theory and Criticism.** Study of major aesthetic and critical theories about film; study of theory and practice of film criticism. Prerequisite: One cinema studies course at the 200 or 300 level and one college course in literature, or consent of instructor. 3 hours or 1 unit.
- 366. Japanese Cinema.** Same as Asian Studies 366. Examines the influence of Japan's traditional aesthetics on its cinema and surveys its major film movements, genres, and directors. Prerequisite: Two college level courses in film studies or Asian Studies, or graduate standing. 3 hours or 1 unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Slavic, and Spanish 382, and Linguistics 386. Theory and practice of computer-assisted instruction, with special emphasis on problems and techniques of foreign-language instruction. General principles; survey of existent and probable future CAI systems; and practical experience with lesson design and programming on the PLATO system. Linguistics majors are advised to complete Linguistics 306 before registering for this course. Prerequisite: Two years college language or equivalent, and consent of instructor. 4 hours or 1 unit.
- 395. Special Advanced Topics: Interdisciplinary.** Offers interdisciplinary topics in the humanities; topics vary, but normally relate to the interdisciplinary areas of study within the humanities concentration or to the special humanities facilities (e.g., the Language Learning Laboratory). Prerequisite: Prerequisites will vary according to topic. See Timetable. 3 hours or 1 unit. May be repeated as topic varies to a maximum of 6 hours or 2 units.

INDUSTRIAL DESIGN

(See Art and Design)

INDUSTRIAL ENGINEERING

(See Mechanical and Industrial Engineering)

INTERIOR DESIGN

(See Textiles and Interior Design)

JOURNALISM

Head of Department: Professor T. B. Littlewood

Department Office: 120A Gregory Hall, 810 S. Wright, Urbana

114. **Agricultural Communications Media and Methods.** Same as Agricultural Communications 114. See Agricultural Communications 114.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
204. **Typography.** Studies type lore and design; type dimensions; printer's arithmetic and copyfitting; platemaking; printing processes; shop organization; and terminology. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours. News-editorial majors do not receive credit for this course.
214. **Agricultural Communications Strategy.** Same as Agricultural Communications 214. See Agricultural Communications 214.
217. **History of Communications.** Same as Communications 217. Nature and development of communication systems; history of communication media; history of journalism, advertising, and broadcasting; and communications in the modern world. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
218. **Communications and Public Opinion.** Same as Communications 218. Theory of public opinion and of communications; relation of communication systems to public opinion, social systems, and the political order. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
220. **Communications and Popular Culture.** Same as Communications 220. See Communications 220.
223. **Photojournalism.** A basic photography course designed to give students a proficiency in picture taking and processing and to acquaint them with picture editing and other illustrative problems. For current fees, see Timetable; cameras provided by the college. Prerequisite: Registration in the College of Communications or consent of instructor. 3 hours. News-editorial majors do not receive credit for this course.
231. **Mass Communication in a Democratic Society.** Same as Communications 231. Studies the philosophical bases of the functions and the responsibilities of mass communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
241. **Law and Communications.** Same as Communications 241. Historical background of the nature and meaning of the law as it relates to journalism and contemporary problems of freedom of expression. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
251. **Social Aspects of Mass Communications.** Same as Communications 251 and Sociology 251. Media structures related to cultural content and functions; problems of life and society as treated in mass-produced communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
291. **Special Problems.** Special projects, research, and independent reading in journalism for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of head of department. 1 to 3 hours.
293. **Journalism Seminar.** Seminar based on summer internship experience; offered only in the fall for students who participated in a spring pre-internship orientation class and then completed an approved summer internship. Prerequisite: Journalism 350; open only to undergraduate journalism majors who have taken a non-credit internship orientation. 0 to 2 hours.
326. **Magazine Article Writing.** Preparation of feature stories and articles; techniques of marketing, market analysis, and publishing articles written in the course. Prerequisite: Journalism 350; registration in the College of Communications or consent of the college. 3 hours or ½ unit.
330. **Magazine Editing.** Basic principles of editing for consumer, business, trade, and company magazines; communications theory, market analysis, editorial process, design process,

production process, and distribution process as they relate to magazine publishing. Prerequisite: Credit or concurrent registration in Journalism 326 or consent of instructor. 3 hours or ½ unit.

- 340. News Publication Management.** An introduction to the administration and management of print media news organizations. Prerequisite: Journalism 350 or Advertising 391; and consent of the department. 3 hours or ½ unit.
- 350. Reporting, I.** Fundamentals of journalistic writing; reporting news of public affairs. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 360. Graphic Arts.** Rational and aesthetic standards of visual communications; principles and techniques of making visual statements; and uses of visual technology in wedding verbal and nonverbal languages. For current fees, see Timetable. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 362. Broadcast News Production.** Introduces radio and TV news production designed to acquaint students with techniques, principles, and equipment used in the studio and in the field; emphasizes planning, producing, and directing individual news and public affairs programs and news stories, and serving on production teams. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 370. News Editing.** Newspaper editing and headline writing; the makeup and design of newspaper pages. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 372. Broadcast News Writing and Gathering.** Gathering, writing, and editing news for radio and television; critical analysis of broadcast news practices, past and present; ethics of broadcast journalism; audio and visual communication principles as applied to news dissemination; editing and writing to film, tape and graphics. Individual and team projects. Prerequisite: Journalism 350 and 362; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 380. Reporting, II.** The interviewing, analytical, and writing techniques of reporting complex news stories with clarity and depth. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 382. Broadcast News Editing.** Principles of editing audio tape, video tape, and scripts with audio-visual materials; editing story units for broadcast; assembling news and public affairs programs; broadcast news editing ethics, research, and criticism. Prerequisite: Journalism 372; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 390. Advanced Reporting.** Advanced reporting projects in specialized fields; recommended for news-editorial seniors. Prerequisite: Journalism 350 and 380. 3 hours or 1 unit.
- 392. Broadcast Journalism Practicum.** Individual and team produced advanced enterprise projects in specialized fields. Subject matter to be coordinated with Journalism 390. Prerequisite: Journalism 382; enrollment as a major in the Department of Journalism or consent of department. 3 hours or 1 unit.
- 400. Issues in Journalism.** Seminar on issues of contemporary importance in journalism. Prerequisite: Consent of department. ½ unit.
- 468. The Political Economy of Communications.** Same as Communications 468. Analyzes the structure, policy, and behavior of such media of communication as newspapers, magazines, books, postal service, telegraph, telephone, broadcasting, and film; special emphasis on their relationships to political order and the economy. Prerequisite: Consent of College of Communications. 1 unit.
- 470. Communications and Popular Culture.** Same as Communications 470. Problems of cultural analysis related to the media of communications; social implications of communications research. Prerequisite: Consent of College of Communications. 1 unit.
- 471. Proseminar in Communications, I.** Same as Communications 471. General discussion of the mass media of communications, their role as social institutions, and their control and support; content, audience, and effect of the mass media. Prerequisite: Consent of College of Communications. 1 unit.

- 472. Proseminar in Communications, II.** Same as Communications 472. General discussion of the problem of communications, including the individual as a communicating system, symbolic processes, analysis of messages, psycholinguistics, and language as social behavior. Prerequisite: Consent of College of Communications. 1 unit.
- 473. History and Theory of Freedom of the Press.** Same as Communications 473. Development of the Anglo-American press system and the idea of freedom of the press; contemporary mass media and their implications for freedom and democracy. Prerequisite: Consent of College of Communications. 1 unit.
- 474. Communications Systems.** Same as Communications 474. Analyzes the structure and development of communications systems; examination of the role of communication in social change, political movements, and formal organizations. Prerequisite: Consent of College of Communications. 1 unit.
- 490. Special Topics in Journalism.** Prerequisite: Consent of head of department. ½ or 1 unit.
- 492. Research Methods in Communications.** Same as Communications 492. See Communications 492.
- 499. Thesis Research.** Prerequisite: Graduate standing in journalism. 1 to 2 units.

LABOR AND INDUSTRIAL RELATIONS

Director of Institute: Professor W. Franke

Institute Office: 247 Labor and Industrial Relations Building, 504 E. Armory, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 301. European Working-Class History: 1750 to the Present.** Same as History 301 and Sociology 301. See History 301.
- 315. The Economics of Poverty and Income Maintenance.** Same as Economics 315. See Economics 315.
- 318. Industry and Society.** Same as Sociology 318. See Sociology 318.
- 337. American Working Class History, 1780 to the Present.** Same as History 337. See History 337.
- 341. Economics of Labor Markets.** Same as Economics 341. See Economics 341.
- 345. Economics of Human Resources.** Same as Economics 345. See Economics 345.
- 347. Labor Law, I.** Same as Law 357. See Law 357.
- 355. Industrial Social Psychology.** Same as Psychology 355. See Psychology 355.
- 357. Psychology of Industrial Relations.** Same as Psychology 357. See Psychology 357.
- 360. Employee Benefit Plans.** Same as Finance 360. See Finance 360.
- 409. Organizational Behavior.** Same as Business Administration 409. See Business Administration 409.
- 418. Seminar in Industrial and Economic Sociology.** Same as Sociology 418. Industrialization, labor-management relations as group relations, the interrelations of industry and community, technology and controls in industry, problem of social economics and stratification in industry. 1 unit.
- 420. Formation of Public Policy.** Same as Political Science 420. See Political Science 420.
- 422. Government Regulation.** Focuses on government policies affecting collective bargaining and personnel practices; includes an introduction to theories of political science and public policy for an understanding of government regulation in the employment area. Prerequisite: Labor and Industrial Relations 347 or 491, or consent of instructor. 1 unit.
- 430. Foundations of Industrial-Organizational Psychology.** Same as Psychology 430. See Psychology 430.
- 435. Motivation and Morale in Industry.** Same as Psychology 435. See Psychology 435.
- 440. Labor Economics.** Same as Economics 440. See Economics 440.
- 441. Labor Economics.** Same as Economics 441. See Economics 441.
- 442. Collective Bargaining.** Same as Economics 442. Development of a theory of the continu-

ing interactions between union and management which define and modify the role of each and the terms of employment; use of appropriate social science concepts; and emphasis on the negotiating process, the structure of bargaining, and such issues as wages, worker security, and management authority, and on the interactions between the parties and the governmental process. Prerequisite: Consent of instructor. 1 unit. Graduate credit is not given for both Economics 343 and Labor and Industrial Relations 442.

- 443. Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Law 361. Seminar in the policies and practices of labor contract administration; comparative study of the fundamentals of grievance handling; analysis of mediation and fact-finding techniques; and special emphasis on the use of arbitration as a means of reducing industrial conflict. 3 hours or 1 unit. Hourly credit only applicable to Law 361.

- 444. Problems and Policies in Human Resources.** Same as Economics 444. See Economics 444.

- 445. Investment in Human Resources.** Same as Vocational and Technical Education 445. Activities which influence future monetary and psychic income by improving the resources in people; coverage of investments, including schooling, on-the-job and other training, migration, and the search for information on jobs and incomes; emphasis on human capital concepts, public human resources policy, and problems of special groups. Prerequisite: An introductory course in economics and in quantitative methods, as specified by the department. 1 unit.

- 447. Labor Union Organization and Administration.** Same as Economics 447. Analyzes the structure, functions, and government of the modern American trade union movement; surveys the environmental factors, objectives, and action programs with considerable emphasis on economic and internal institutional factors, including the roles of leaders, policy determination and execution, jurisdictional disputes, and governmental regulations; and examines of various labor union theories in America. Prerequisite: Major in social science or consent of instructor. 1 unit.

- 448. Problems of Personnel Management.** Same as Business Administration 411. See Business Administration 411.

- 451. Labor Law and Public Policy.** Same as Law 360. Analyzes current major policy issues in labor law and administration through the concepts and techniques of the lawyer and the labor relations specialist. Prerequisite: For law students, Law 357 or consent of instructor; for Institute of Labor and Industrial Relations and other graduate students, one semester of labor and industrial relations course work or consent of instructor. 3 hours or 1 unit. Hourly credit only applicable to Law 360.

- 454. Comparative Industrial Relations Systems.** Same as Law 356. Examines the history and structure of industrial relations systems in industrialized market economies; the organization and policies of major labor movements as well as their international organizations; the role of national governments and international organizations in establishing industrial relations policies; comparative analysis of such topics as industrial conflict, industrial and economic democracy, and the relation between industrial relations and national economic policy. 3 hours or 1 unit. Hourly credit only applicable to Law 356.

- 455. Labor in Less Developed Countries.** The role and place of LDCs in the world; colonialism, independence, and nation-building; economics, power, and stratification; development of labor markets and labor movements; economic, political, and social consequences of international trade, finance, and investment; international diffusion of technology and ideology; nation-states, multi-national corporations and world community; and UN, ILO, UNCTAD, UNIDO and other international and regional organizations and their impact on labor in LDCs. Prerequisite: Economics 101 or 109, or equivalent. 1 unit.

- 456. Industrial Relations Theory, I.** An integrated analysis of the principles of labor relations through the study of the works of the major theorists and their critics. Prerequisite: Consent of instructor. 1 unit.

- 457. Industrial Relations Theory, II.** Continuation of Labor and Industrial Relations 456. Prerequisite: Labor and Industrial Relations 456. 1 unit.

- 458. Faculty-Student Workshop.** Training and experience for Ph.D. students in the applica-

tion of social science and industrial relations theory and research methodology to contemporary industrial relations problems through presentation and discussion of faculty and student research. Ph.D. students are required to give at least one paper, lecture, or other acceptable workshop presentation and to participate in workshop discussions during the entire period of their campus residency. Prerequisite: Labor and Industrial Relations 456 and 457. 0 to 1 unit.

- 461. Compensation Systems.** Compensation theory and practice. Topics include theories of motivation and performance, merit and incentive pay systems, internal and external labor market analysis, theory and measurement of jobs, job evaluation, comparable worth, theories of equity, determinants and measurements of pay satisfaction, and union effects on compensation policy and practices. 1 unit.
- 462. Human Resources Planning and Staffing.** Examines conceptual issues, policies, and practices relating to the attraction, selection, and development of human resources in both private and public organizations. 1 unit.
- 490. Individual Topics.** A student in labor and industrial relations may register for this unit with the consent of the curriculum adviser and the adviser under whom the student will perform individual study or research. Such individual work may include special study in a subject matter for which no course is available or an individual research project, including on-the-job research in industry, which is not being undertaken for a thesis. 0 to 2 units.
- 491. Industrial Relations Systems.** A general framework for the analysis of labor-management relations; topics include the theory of industrial relations systems, the American system of industrial relations, intercountry system differences, and the application of systems theory to selected labor-management problem areas, such as income policies, multi-national organizations, and industrial democracy. Prerequisite: Graduate standing. 1 unit.
- 492. Research Seminar in Labor and Industrial Relations.** Systematic analysis of theories and procedures of the various social and physical sciences bearing on research in labor and industrial relations; primary emphasis on the process of integrating the approaches and techniques of the various social sciences with respect to the study of problems in labor and industrial relations as met in practice in management, the union, and government service, as well as in teaching and research in the field. Prerequisite: Major in social sciences or consent of instructor. 1 unit.
- 493. Quantitative Methods in Labor and Industrial Relations.** Introduction to statistical concepts and methods in the social sciences and their application to industrial relations problems; familiarizes the student with modern methods of probability sampling, statistical inference, and multivariate analysis, and their application to current research problems in labor and industrial relations. Prerequisite: Any elementary statistics course. 1 unit.
- 494. Tutorial Seminar.** Training and experience for Master's students in carrying out a problem solving project from formulation to written report in a chosen area of labor and industrial relations. Each student selects an individual topic with the approval and guidance of a faculty member. Prerequisite: Completion of no fewer than 6 units of Labor and Industrial Relations course work. 0 or 1 unit.
- 496. The Evolution of Labor-Management Relations in America.** Historical analysis and interpretation of the development of the labor movement and labor-management relations at the plant, industry, and national levels. Prerequisite: Graduate standing in labor and industrial relations or consent of instructor. 1 unit.
- 497. Collective Bargaining in Public Employment.** Same as Social Work 497, Administration, Higher, and Continuing Education 497, and Political Science 469. Development of employee organization, collective bargaining, and public policies in the public sector: federal, state, and local; analysis of contemporary bargaining relations, procedures, problems, and consequences. 1 unit.
- 498. Analysis of Organizations in Industrial Relations.** Intensive analysis of organizational behavior, with the main focus upon the theory of organizations as social institutions; concepts drawn from the various social sciences and applied to the principal organizations

concerned with industrial relations; and examination of the internal dynamics of unions, managements, and government agencies, with special reference to decision-making processes, and their individual relations to the interactions among them. Prerequisite: Consent of instructor. 1 unit.

- 499. Thesis Seminar.** For all students writing theses in labor and industrial relations at the A.M. and Ph.D. levels. 0 to 4 units.

LANDSCAPE ARCHITECTURE

Head of Department: Professor Vincent J. Bellafiore

Department Office: 214 Mumford Hall, 1301 W. Gregory, Urbana

- 101. Introduction to Landscape Architecture.** A survey of the practice, profession, and philosophy of landscape architecture. 2 hours.
- 133. Basic Landscape Design.** Introduction to the fundamentals of design, including studies in two- and three-dimensional abstract and applied problems, basic elements and procedures of design, and principles of landscape composition. Prerequisite: Credit or concurrent registration in Landscape Architecture 180, or consent of instructor. 5 hours.
- 134. Site Design.** Principles and practices of site planning; orientation, circulation, and land use definitions and relationships applied to site scale problems; and application of site design process. Field trip required; see Timetable for current fees. Prerequisite: Landscape Architecture 133 or consent of instructor. 5 hours.
- 142. Landform Design and Construction.** Introduction to the fundamentals of the earth's surface as a design element; limitations and uses of landforms; and methods of grading, surface drainage, and land surveying. Prerequisite: Mathematics 104 or 114. 3 hours.
- 150. Landscape Surveys.** Principles and practices of identifying, analyzing, and recording landscape resources. Field trip required; see Timetable for current fees. Prerequisite: Geography 103 or consent of instructor. 3 hours.
- 180. General Drafting and Graphics.** Basic techniques and standards of drafting; lettering, views and projections, dimensioning, and shades and shadows. Prerequisite: Open to landscape architecture majors only. 2 hours.
- 181. Visual Communications, I.** Principles of basic design and techniques in landscape architectural rendering. Prerequisite: Landscape Architecture 180 or consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Senior Honors Course.** Independent guided study and research in a selected area of landscape architecture; for candidates for honors in landscape architecture. Prerequisite: Senior standing in landscape architecture, a university grade-point average of 4.0, and consent of head of department. 1 to 6 hours. May be repeated to a maximum of 9 hours.
- 213. People, Land, and Environment.** Nontechnical study of the landscape and the environment as products of a natural base worked upon by people, their technologies, and their beliefs; approach is both historical (from prehistory to science fiction) and problem-oriented (the use of land, resources, and energy). 2 or 3 hours.
- 214. History of Landscape Architecture.** Analysis of the development of landscape architecture as a result of environmental and cultural influences. 3 hours.
- 226. Principles of Park Design.** Introduces theories, principles, and applications of park site and system master planning and design; examines relationships between aesthetic and functional considerations, site features, park users, and administrators. 2 hours.
- 235. Recreation and Community Design.** Development of design solutions at site and master plan scale relative to community urban and recreational problems; emphasizes development of analysis and design techniques. Field trip required; see Timetable for current fees. Prerequisite: Landscape Architecture 134 or consent of instructor. 5 hours.
- 236. Design Workshops, I.** Project design at various scales utilizing problems of a wide range

- of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. Students select from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours.
- 243. Site Engineering.** Principles of surveying and design of drainage, circulation, and utility systems. Prerequisite: Landscape Architecture 142 and Mathematics 104 or 114; or consent of instructor. 4 hours.
- 244. Landscape Construction.** Construction methods, materials, and procedures related to the design of landscape structures; development of design details and cost estimating. Prerequisite: Landscape Architecture 243 or consent of instructor. 4 hours.
- 246. Professional Practice.** The landscape architect as a professional practitioner; includes orientation to the concept of professionalism, forms of professional activity, and the skills needed to manage a practice. 1 hour.
- 251. Plant Materials and Design, I.** Ecological principles, study of plant communities, identification of native flora and perennials, and uses of plants in the landscape; introduction to planting design. Field trips required. Prerequisite: Landscape Architecture 150, Plant Biology 102, and Geography 103. 4 hours.
- 252. Plant Materials and Design, II.** Biogeography; identification of native species, evergreens, and exotics; uses of plants in the landscape; and planting design projects. Field trips required. Prerequisite: Landscape Architecture 251. 4 hours.
- 253. Planting Design.** Planting design philosophies; detailed and comprehensive design projects; management practices; technical documents; and plant identification. Field trips required. Prerequisite: Landscape Architecture 252. 4 hours.
- 290. Special Problems.** Supervised independent study, research, or special project in a selected area related to landscape architecture. Prerequisite: Junior or senior standing; consent of instructor and head of department prior to advance enrollment and registration. 1 to 6 hours. May be repeated to a maximum of 9 hours.
- 299. Off-Campus Study.** Provides campus credit for off-campus study. Prerequisite: Junior standing; prior review and approval of the student's written proposal by a faculty committee and the department head. 0 to 15 hours (summer session, 0 to 6 hours). Final determination of appropriate credit is made by a faculty review committee upon completion of the student's work. Maximum credit, 15 hours (summer session, 6 hours), all of which must be earned within one semester.
- 325. Historical Geography of American Landscapes to 1880.** Same as Geography 325. See Geography 325.
- 326. Historical Geography of American Landscapes Since 1880.** Same as Geography 326. See Geography 326.
- 327. American Vernacular: The Cultural Landscape.** Same as Geography 327. See Geography 327.
- 337. Regional Landscape Design.** Introduction to the process of physical planning, emphasizing land use policy and plan formulation; a regional case study is undertaken to develop analytical skills, to introduce the relationship between cultural and natural processes, and to explore the need for responsible political action. Prerequisite: Landscape Architecture 236 or consent of instructor. 5 hours or 1 ½ unit.
- 338. Design Workshops, II.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. The student selects from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours, or 1 to 1 ½ unit.
- 341. Land Resource Evaluation.** Same as Urban Planning 341. Examines concepts for the value of land, land resource problems and policy responses, methods for evaluating land resource development and policy alternatives, and case studies of land resource evaluation. Prerequisite: Graduate standing or consent of instructor. 4 hours or 1 unit.
- 350. Land Use Ecology.** Ecological implications of alternative land use patterns; equipment,

field techniques, and nomenclature in current use by environmental consultants; and elements of a baseline ecosystem study. Prerequisite: Consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.

- 370. Design-Behavior Interaction.** Critical discussion of notions and theories pertaining to the reciprocal effects of landscape architectural design and human behavior. 3 hours or $\frac{3}{4}$ unit.
- 382. Visual Communications, II.** Continuation of Landscape Architecture 181, emphasizing advanced techniques and further exploration of the media of visual communication. 3 hours or $\frac{3}{4}$ unit.
- 417. Land and Society: History, Theories, and Problems.** Historical and cross-cultural investigation of the use, shaping, and perception of the land-based environment; case studies, critical problems and issues, and theories of social-environmental interaction. Prerequisite: Consent of instructor. 1 unit.
- 437. Landscape Planning.** Small group design and planning studio emphasizing actual problems and clients; projects require fieldwork, analysis, problem-solving, design, and presentation to client. Prerequisite: Landscape Architecture 341 and 350, or consent of instructor. 1 $\frac{1}{2}$ units.
- 442. Spatial Design Methods.** Same as Urban Planning 442. Representations and solution procedures for problems involving the arrangement of land use activities in space; optimizing, approximate, and graphic methods, their applications, effectiveness, and efficiency; and experiments with computerized procedures. Prerequisite: Landscape Architecture 341 or consent of instructor. 1 unit.
- 450. Environmental Impact Statements.** Requirements of the National Environmental Policy Act and Guidelines from the Council on Environmental Quality for preparing and writing environmental impact statements; includes interdisciplinary team efforts and impact assessment techniques. Prerequisite: Graduate or law school standing, or consent of instructor. 1 unit.
- 463. Methods of Social and Behavioral Research in Designed Environments.** Same as Architecture 463. See Architecture 463.
- 464. Conducting Social and Behavioral Research in Designed Environments.** Same as Architecture 464. Each student prepares and conducts research to obtain information about specific relationships between people and the designed environment. Prerequisite: Landscape Architecture 370 or Architecture 323, and Architecture 463, or equivalent; and a course in introductory statistics. 1 unit.
- 465. Design/Behavior Studio.** Same as Architecture 465. Development of site or project scale design emphasizing the integration of user needs and behavioral factors. Prerequisite: Landscape Architecture 464, or consent of instructor. 1 $\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
- 481. Urban Design Studio, I.** Same as Architecture 481. See Architecture 481.
- 482. Urban Design Studio, II.** Same as Architecture 482. See Architecture 482.
- 483. Geology, Hydrology, and Land Use.** Same as Urban Planning 483. See Urban Planning 483.
- 487. Seminar.** Preparation, presentation, and discussion of research papers on current and future areas of landscape architectural application. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 490. Special Problems.** Nature and scope of projects to be determined by consultation between student and faculty adviser; open to landscape architecture majors as well as those from other disciplines who wish to engage in interdisciplinary work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
- 498. Master's Project.** Major independent or small-group project synthesizing knowledge from previous coursework. Prerequisite: Consent of instructor and program adviser. 0 to 2 units.
- 499. Thesis Research.** Prerequisite: Graduate standing in landscape architecture. 0 to 2 units.

LANGUAGES

(For a list of the languages regularly offered, together with the units responsible for offering them, see APPENDIX A.)

LATIN AMERICAN AND CARIBBEAN STUDIES

Director of Center: Professor Enrique Mayer

Center Office: Room 250, 1208 West California Avenue, Urbana

- 195. Freshman Seminar.** An intensive review of domestic and foreign factors influencing violence and social change in Latin America. Each semester a particular topic is selected. Prerequisite: Freshman James Scholar or other designation as a superior student. 3 hours.
- 295. Special Topics.** A topical survey of social, economic, and political factors in Latin American life. Each semester a particular topic is considered. Prerequisite: A basic course in a social science discipline. 2 to 4 hours.
- 345. Tutorials in Native Latin American Languages.** Upon the consent of the Director of the Center for Latin American Studies, tutorials are available in special native Latin American languages not regularly offered by the University. Tutorials at the elementary, intermediate, and advanced levels may be arranged. Students registering for unit credit for the first two semesters must first present satisfactory evidence of knowledge of the language at the elementary level, either in the form of credit earned at another institution or by passing a proficiency examination. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of instructor. 2 to 4 hours, or ½ to 1 unit. May be repeated up to six semesters successively to a maximum of 16 hours or 4 units.

LAW

Dean of College: Professor P. H. Hay

College Office: 209 Law Building, 504 E. Pennsylvania Ave. Champaign

- 301. Contracts-Sales, I.** Enforceability of promises including unjust enrichment and reliance, offer and acceptance, mistake, unfairness and overreaching, unconscionability, Statute of Frauds, interpretation of contract language, conditions, and third party beneficiaries. 4 hours or 1 unit.
- 302. Contracts-Sales, II.** Introduction to the Uniform Commercial Code, its interpretation and application; performance of contracts including warranty obligations, breach, remedies for breach, impossibility and frustration of purpose, assignment and delegation, and third party rights in sold goods. Prerequisite: Law 301. 3 hours or 1 unit.
- 303. Torts, I.** A basic course in civil wrongs, including intentional torts (such as assault and battery), negligence, and medical malpractice, and the impact of insurance. 2 hours or ½ unit.
- 304. Torts, II.** A basic course in civil wrongs, including liability of owners and occupiers of land, libel and slander, unfair commercial practices, and products liability. Prerequisite: Law 303. 3 hours or 1 unit.
- 305. Property, I.** With Law 306, the basic first-year course in property law, required of all students. Provides an overview of the law of land, with incidental coverage of personal property; includes the concept of property, acquisition of private property, recognized property interests, gratuitous transfer of property interests, commercial transfers (sale, lease), the use of property, and an introduction to environmental law. 3 hours or 1 unit.
- 306. Property, II.** Continuation of Law 305. 3 hours or 1 unit.
- 307. Criminal Law.** The sources and purposes of the criminal law; the meaning of criminal responsibility; and the characteristics of particular crimes. 3 hours or 1 unit.

- 308. Criminal Procedure.** Problems in the administration of criminal justice with emphasis on right to counsel, arrest, search, interrogation, lineups, and the scope and administration of exclusionary rules. Prerequisite: Law 307. 3 hours or 1 unit.
- 309. Civil Litigation, I.** First part of a study of the procedure in the civil courts; includes an overview of the structure of procedure and places particular emphasis on the bases for adjudicatory power, jurisdiction and the effect of a decision of one case on subsequent litigation between the same or different parties (*res judicata*). 3 hours or 1 unit.
- 310. Civil Litigation, II.** Continuation of Law 309. Modern civil litigation, with emphasis upon pleading and parties, pre-trial proceedings, trial practice (except evidence), relationship between judge and jury, verdicts and judgments, and appellate review. Prerequisite: Law 309. 3 hours or 1 unit.
- 311. Legal Writing and Research.** Emphasis on development and improvement of skills in legal writing, and training in legal bibliography. Assignments may include brief writing and preparation of legal memoranda and opinions. 2 hours or $\frac{1}{2}$ unit.
- 312. Moot Court.** Following Law 311, moot court is required in the second semester of the first year for further development of skills in legal research, analysis, and writing. Each student works in a team on the preparation of an appellate brief on a moot court case and then argues the case in appellate argument fashion before a panel of senior students and faculty. 1 hour. No graduate credit.
- 313. Constitutional Law, I.** Basic principles of American constitutionalism, including the judicial function in constitutional cases; the implementation of the doctrines of federalism and separation of powers; the development and exercise of the powers of Congress and the states in the federal union; and the protection of civil rights and liberties. 4 hours or 1 unit (summer session, 3 hours or 1 unit).
- 314. Administrative Law.** The functions of administrative tribunals in federal, state, and municipal government; the procedure before such administrative tribunals; and judicial relief from administrative decisions. 3 hours or 1 unit.
- 315. Constitutional Law, II.** A detailed study of the history and application of the First Amendment to the Constitution of the United States; focuses on the decisions of the Supreme Court concerning the freedoms of assembly, press, speech, and religion as well as the implied right of association. Prerequisite: Law 313. 3 hours or 1 unit.
- 316. Civil and Political Rights.** Basic problems in the relation of the individual to government and in the protection of the rights of minority groups. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 317. Advanced Criminal Procedure.** Problems in the administration of criminal justice, with emphasis upon the commencement of formal proceedings (bail, decision to prosecute, grand jury, preliminary hearing, location of prosecution, scope of prosecution, speedy trial, the adversary system (pleas, discovery, jury trials, prejudicial publicity, ethical problems, double jeopardy), and post-conviction review (post-trial motions, appeals, habeas corpus, related post-conviction remedies). Prerequisite: Law 307, 309 and 313. 3 hours or 1 unit.
- 318. Legislation.** The first division of the course deals with federal and state constitutional limitations upon the exercise of legislative power in a procedural sense, e.g., investigative powers, legislative structure, requirements relating to enactment of legislation, and role of courts in overseeing legislative action in these areas. The second division of the course deals with the formulation of legislative policy, the relationship of common law principles to legislative policy, and particularly the problems, rules, and methods employed by courts in the interpretation of legislation. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit (summer session, 3 hours or 1 unit).
- 319. Environmental Law.** The regulatory aspects of environmental law. Environmental impact assessments; control of air pollution, water pollution, noise, and toxic substances; the roles of federal and state governments; and citizen participation in and judicial review of public decision-making and enforcement procedures. 3 hours or 1 unit.
- 320. Natural Resources.** Legal problems associated with the use of certain land, water, and mineral resources, including energy sources; emphasizes public management and regulation. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit).

- 321. Urban Government.** The law governing the structure, powers, and operation of local governments in urban and suburban areas with analysis of political, economic, and social implications. 3 hours or 1 unit.
- 322. Land Use Planning.** The legal and administrative aspects of land development and regulation in an urban society; the techniques and problems of planning; the tools of plan effectuation, such as zoning, subdivision regulation, renewal and redevelopment, and housing programs; and the allocation of decision-making functions among various levels of government. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit).
- 323. Welfare Systems.** Examination of the legal structure and underlying economic and social policies of income maintenance programs and proposed reform; includes old age and survivor's insurance under the Social Security Act, governmental regulation of private pension systems supplementing public provision for old age, aid to families with dependent children under the Social Security Act, child welfare provisions, health maintenance provisions, and various other "welfare," "social entitlement," and related income redistribution programs. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit (summer session, 3 hours or 1 unit).
- 324. Law of Corrections and Prisoners' Rights.** An examination of the present system of corrections, including a study of procedural and substantive rights of incarcerated persons; the sentencing process; post-conviction remedies and programs, focusing on probation and parole; and alternatives to the present system. Prerequisite: Law 307 and 308. 3 hours or 1 unit.
- 327. Advanced Bankruptcy and Creditors' Rights.** Examines selected issues in bankruptcy and creditors' rights not covered in Law 339; includes reorganizations under Chapter 11 of the Bankruptcy Code in detail; additional coverage varies, depending on current significance, but typically includes jurisdictional problems, special problems in consumer bankruptcy, and the Bankruptcy Rules of Procedure. Prerequisite: Law 339. 3 hours or 1 unit.
- 328. Organizations, I.** Examines the basic state and federal legal consequences for individuals, organizations, and society of the formation, control, and financing of organizations; includes the agency and employment relationship, unincorporated associations, general partnerships, limited partnerships, close corporations, public corporations, and nonbusiness organizations. 3 hours or 1 unit.
- 329. Organizations, II.** Examines the impact of state and federal regulation and financial theory on the continuing financial policy decisions of business organizations, including distributions (by dividends and share purchases); going concern rights of debt and equity holders; insolvency and reorganization; tender offers; merger; and acquisitions. Prerequisite: Law 328. 2 hours or $\frac{1}{2}$ unit (summer session 3 hours or 1 unit).
- 330. Antitrust Law.** A study of the limitations imposed by the Sherman Act, Clayton Act, and Federal Trade Commission Act on anticompetitive practices by business firms; emphasizes price fixing, monopolization, mergers, exclusive dealing, tying arrangements, and public and private remedies for violations. 3 hours or 1 unit.
- 331. Business Planning.** Examination of planning situations wherein tax, corporations, corporate finance, securities regulation, and accounting materials are interrelated; organization of close corporations and public companies, corporate distributions and recapitalizations, sale of corporate businesses, corporate acquisitions and mergers, and corporate separations; and problems requiring written opinions and solutions. Prerequisite: Law 345 and 351. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit).
- 332. Securities Regulation.** Problems arising under federal securities laws administered by the Securities and Exchange Commission, as well as "blue sky" or state securities laws; emphasis upon statutory and regulatory requirements imposed in connection with corporate financing. Prerequisite: Law 328 and 329. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit).
- 333. Advanced Corporate and Securities Law.** A problem method analysis of advanced substantive and procedural aspects of corporate and securities litigation, including advanced aspects and recent developments of SEC Rule 10b-5; problems involving takeovers, litigation possibilities; procedural and other aspects of shareholders' derivative suits;

extra-territorial application of the federal securities laws. Prerequisite: Law 328 and 329. 2 hours or ½ unit (summer session, 3 hours or 1 unit).

- 334. Government Regulation.** A study of direct governmental intervention to control business activity in a wide range of industries through regulation of entry, prices, and services; emphasizes the control of price and service discrimination under the Robinson-Patman Act. 2 or 3 hours, or ½ or 1 unit (summer session, 3 hours or 1 unit).
- 335. International Business Transactions.** Doing business abroad: export-import regulations, use of foreign commission merchants, licensing of patents and know-how, investment and exchange problems, establishing a foreign operation (including forms of business organization available abroad), and application of United States and foreign antitrust law to the business operation. 3 hours or 1 unit.
- 336. Regulation of Money and Banking.** Examines the present and developing state and federal regulation of banks, banking, and financial institutions involved in capital financing transactions and markets, including the money market; the creation of money; monetary aspects of monetary regulation; state and federal branching rules and policy; bank holding companies, international banking; the investment and capital marketing and capital movement roles of banks; and the domestic and transnational relationships of banks and other investment intermediary institutions. Prerequisite: Law 328 and 329. 2 or 3 hours, or ½ or 1 unit (summer session, 3 hours or 1 unit).
- 337. Personal Property Security.** Advanced materials concerning secured transactions under the Uniform Commercial Code. Prerequisite: Law 339. 2 or 3 hours, or ½ or 1 unit (summer session, 3 hours or 1 unit).
- 338. Tax and Financing Aspects of Real Estate Transactions.** Methods of financing land acquisition and residential and commercial development, including publicly owned and subsidized housing. 3 hours or 1 unit.
- 339. Creditors' Rights.** Examines the legal regulation of the relationship among debtors and their creditors and among creditors of a particular debtor; includes: pre- and post-judgment remedies of unsecured creditors; introduction to rights of secured creditors under article 9 of the Uniform Commercial Code; debtors' attempts to defeat creditors, including fraudulent conveyances; study of Bankruptcy Code Chapters 7 (liquidation) and 13 (adjustment of debts of individuals), and introduction to Chapter 11 (reorganizations). 4 hours or 1 unit (summer session, 3 hours or 1 unit).
- 340. Commercial Paper.** A study of major problems involved in commercial paper with special emphasis on the history and interpretation of the Uniform Commercial Code. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 341. Consumer Credit.** Existing patterns and proposed changes in consumer credit law; finance charge regulations, special licensing for merchandisers of consumer credit, disclosure of finance charges, door to door selling, home improvement financing, cutting off defenses, creditor remedies problems including garnishment, wage assignments, and deficiency judgments, and administrative control of creditor practices. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 342. Copyright, Trademark, and Unfair Competition.** The regulation of competitive business behavior at common law and under federal and state statutes; trademarks, copyrights, design patents, trade secrets, protection of ideas, commercial disparagement, false advertising, and price discrimination. 2 to 3 hours, or ½ to 1 unit (summer session, 3 hours or 1 unit).
- 344. Government Contracts.** A study of the way the United States does business; differences in dealing with the government as compared to private parties; awarding of contracts and contractual clauses, especially those allocating risks; and adjudication of contract disputes. 3 hours or 1 unit.
- 345. Patent Law.** Historical development of protection of ideas, inventions, and discoveries; patentability; securing the patent; amendment and correction of patents; and infringement remedies, defenses, and procedures. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 346. Advanced Antitrust Law.** Issues in antitrust law of particular current significance. The

precise content varies, but typical areas of inquiry include federal regulatory antitrust exemptions, state action doctrine, patent licensing, extra-territorial application of domestic antitrust laws, and procedural issues in private enforcement. Prerequisite: Law 330. 3 hours or 1 unit.

- 347. International Trade Policy.** An analysis of the regulation of trade between nations by international agreement (e.g., the GATT), by multinational organizations (e.g., the European Communities), and by individual countries; emphasizes U. S. import restraints, export controls, and related laws. 3 hours or 1 unit.
- 348. Income Taxation.** The fundamental course in federal income taxation. Includes materials relating to income taxation of individuals and an introduction to taxation of corporations and shareholders. 3 hours or 1 unit.
- 349. Corporate Taxation.** An in-depth study of federal income tax law related to taxation of corporations, shareholders, partnerships, and partners. Prerequisite: Law 348. 3 hours or 1 unit.
- 350. Partnership Taxation.** Examines in detail the workings of subchapter K of the Internal Revenue Code of 1954, as amended, as well as other partnership tax provisions. Prerequisite: Law 348; Law 328, 329, and 349 are recommended. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 351. Estate and Gift Taxation.** A comprehensive treatment of federal transfer (estate and gift) taxes. Prerequisite: Law 348. 3 hours or 1 unit.
- 353. State and Local Taxation.** A survey which stresses the constitutional and statutory bases of state and local tax systems; considers the fiscal and economic policy aspects of the tax structure; and includes the power and purposes of taxation, the operation and administration of the general property tax, jurisdiction of the states to impose various types of taxes, and special problems relating to the operation of income, sales, and business excise taxes. 2 or 3 hours, or ½ or 1 unit (summer session, 3 hours or 1 unit).
- 354. Taxation of International Transactions.** Survey of the problems in U.S. taxation of foreign persons and foreign income, with special emphasis upon foreign business transactions of U.S. corporations. Prerequisite: Law 351. 2 or 3 hours, or ½ or 1 unit (summer session, 3 hours or 1 unit).
- 356. Comparative Industrial Relations Systems.** Same as Labor and Industrial Relations 454. See Labor and Industrial Relations 454.
- 357. Labor Law, I.** Same as Labor and Industrial Relations 347. A study of the National Labor Relations Act as amended, the preact history of the labor movement, and the judiciary's response thereto, with emphasis on understanding the problems, experiments, and forces leading to the enactment; includes the negotiation and administration of the collective bargaining agreement, especially the grievance arbitration procedure, its operation and place in national labor policy; and explores the relationship of the individual and the union. Prerequisite: Graduate standing or completion of first year of law curriculum. 3 or 4 hours, or 1 unit.
- 358. Employment Discrimination.** Problems arising under federal statutory prohibitions of discrimination in employment, with particular emphasis on evidentiary problems and the use of statistical proofs; defining relevant labor pools, using statistical analyses of data, and establishing proof of test validation. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 359. Collective Bargaining and Labor Arbitration.** Legal problems and practical aspects of the enforcement and administration of collective bargaining agreements; emphasizes judicial enforcement of labor contracts under Section 301 of the National Labor Relations Act and administration of the labor contract by the parties under the contract's own grievance and arbitration provisions. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 360. Labor Law and Public Policy.** Same as Labor and Industrial Relations 451. See Labor and Industrial Relations 451.
- 361. Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Labor and Industrial Relations 443. See Labor and Industrial Relations 443.
- 363. Family Law.** The creation and dissolution of the family, legal relationships within the

family, and related topics, such as the relationship between illegitimate child and natural parent and legal relationships created by adoption; considers family law aspects of the movement for women's equality; and emphasizes current developments in family law reform. 3 hours or 1 unit.

- 364. Decedent's Estates and Trusts.** Studies the means of transferring wealth, with primary emphasis on gratuitous transfers; the means available for making gratuitous transfers, including the validity and effect of testamentary instruments and trust deeds; and problems concerning the dispositive provisions of any type of instrument which transfers wealth. 3 hours or 1 unit.
- 365. Future Interests.** Studies the validity and effect of gratuitous dispositions of assets in which enjoyment is postponed, restrained, or long continued; classification of future interests; construction; powers of appointment; rule against perpetuities and related restrictions. Prerequisite: Law 364. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 366. Problems in Estate Planning.** Selected problems in the planning of estates which will serve to integrate the basic materials in property, trusts, wills, and income, estate, and gift taxation. Prerequisite: Law 348, 351, and 364. 2 to 3 hours, or ½ to 1 unit (summer session, 3 hours or 1 unit).
- 368. Law and Psychiatry.** Contemporary psychiatric theory and its relevance to various legal issues; psychiatric disorders, their etiology and treatment; and problems of prediction and prevention of deviant behavior in the context of the administration of the criminal and mental health laws. 3 hours or 1 unit.
- 369. American Legal History.** Studies selected topics in the development of law and legal institutions in the United States with particular emphasis on the history of the legal profession, legal education, and the role of lawyers and courts in U.S. society. Prerequisite: Some prior study of U.S. history, particularly social and intellectual, is helpful but not required. 3 hours or 1 unit.
- 370. International Human Rights Law.** Studies established and developing legal rules and procedures governing the protection of international human rights, including Marxist and Third World, as well as Western, conceptions of those rights. 3 hours or 1 unit.
- 371. Jurisprudence.** The place of law in society; the nature, goals, and methods of law; and the relation of law and social science. 3 hours or 1 unit.
- 372. Development of Western Legal Institutions.** Explores the development of both public and private law institutions in Western Europe and Great Britain from the period of late Antiquity (the Roman Codifications) to the high Middle Ages. 3 hours or 1 unit.
- 373. Current Legal Problems.** Intensive study of selected current legal problems; based upon recent court decisions, recent legislation, pending law reform proposals, or empirical studies; subject matter varies from semester to semester. 2 or 3 hours, or ½ or 1 unit (summer session, 3 hours or 1 unit).
- 374. International Law.** The nature, sources, and subjects of international law and its place in the control of international society; includes an examination of the law of jurisdiction, territory, recognition and succession of states, rights and immunities of states in foreign courts, diplomatic immunities, treaties, protection of citizens abroad, settlement of international disputes, war and neutrality, the United Nations, and the International Court of Justice. 3 hours or 1 unit.
- 375. Comparative Law.** Comparative law is a method, an approach to legal problem solving, rather than a subject matter in the traditional sense. The course attempts to sharpen the student's perceptions of the student's own law; it is not primarily concerned with specific rules of foreign law or with proficiency in a specific foreign legal system. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 376. International Organizations of the United Nations.** Examines the legal and political problems arising from the establishment and operations of international organizations, covering the nature and implications of their legal personality, membership, decision-making processes and powers; emphasizes primarily the United Nations, related specialized agencies, and affiliated regional organizations in regard to the peaceful settlement of international disputes. 3 hours or 1 unit.

- 377. Soviet Law.** Soviet conceptions of the role of law in theory and in practice; highlights of Soviet law; with comparison to the common law and civil law traditions; and study of Soviet court and legislative materials. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit (summer session, 3 hours or 1 unit).
- 378. Common Market Law.** An intensive study of the European Common Market, particularly of its laws relating to trade barriers, establishment of companies, and antitrust; and United States legislation in the field of international trade. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit).
- 379. Roman Law.** Basic public and private doctrines of Roman Law in the juristic period including contract, family law, succession, citizenship and status, delict, and criminal law. 3 hours or 1 unit.
- 381. Evidence.** The law governing the proof of disputed issues of fact; function of the court and jury; competence and examination of witness; standards of relevancy; privileged communications; illegal evidence; hearsay rule; best evidence rule; presumptions; and judicial notice. 3 or 4 hours, or 1 unit.
- 382. Trial Advocacy.** Examination of the problems of advocacy and tactics at the trial level. Students engage in actual trial work, including witness preparation, opening and closing statements, direct and cross examination, and jury instructions; demonstrations are conducted by staff and visiting judges and practitioners; and the course culminates with students conducting trials before a judge and a jury. 1 to 3 hours, or $\frac{1}{4}$ to 1 unit.
- 383. Fundamentals of Trial Practice.** Explores the theory and reality of trial practice, from developing a theory of the case through submission of jury instructions; topics include fact gathering, jury selection, opening statements, direct and cross-examination, exhibits, expert witnesses, and closing arguments. Prerequisite: Law 381 and concurrent registration in Law 382. 1 hour.
- 384. Advocacy Workshop.** Exposes students to the theory and reality of client interviewing and counseling, preparation of pleadings, and motion practice; devotes segments of the course to the preparation and conduct of a deposition; and discusses negotiation and settlement procedures and techniques. Prerequisite: Law 381 and concurrent registration in Law 382. 1 hour. No graduate credit.
- 385. Conflict of Laws.** The study of problems having relationship with two or more states or nations involving individual litigants or potential litigants; includes such matters as jurisdiction of courts, judgments, torts, workmen's compensation, contracts, property, family relationships, trusts and estates, business organizations, and governmental activities. 3 hours or 1 unit.
- 386. Federal Courts.** Examination of the relationship of federal courts to other organs of federal government and to the states, including an analysis of cases dealing with congressional control over jurisdiction, federal review of state court decisions (including the relationship between state and federal substantive and procedural law), and application of law to fact; the scope of the federal question of jurisdiction in federal courts; abstention; federal injunctions of state criminal proceedings; and problems of justiciability, advisory opinions, and mootness. 3 hours or 1 unit.
- 387. Advanced Torts.** Focuses on the traffic victim and his claim for compensation; compares the present common law method with various schemes of social insurance, such as workmen's compensation, accident and health insurance, and Social Security. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 388. Complex Litigation.** Legal and practical issues in "complex" cases: problems of joinder in multi-party cases, consolidation of cases brought independently (including the activities of the Judicial Panel of Multidistrict Litigation), class actions, discovery issues including the assertion and waiver of evidentiary privileges and use of computers, consequences of active judicial "management" of litigation at the pretrial stage, settlement of complex cases, and res judicata problems. 3 hours or 1 unit.
- 390. Law of Professional Responsibility.** A study of ethical issues arising in the practice of law with particular reference to the requirements of the American Bar Association Code of Professional Responsibility. 1 or 2 hours, or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).

- 391. Accounting Issues for Lawyers.** Introduction to the basic concepts of double-entry and accrual accounting, followed by a critical and comparative appraisal of generally accepted accounting principles in relation to legal concepts governing various business transactions. 2 or 3 hours, or ½ to 1 unit.
- 392. Lawyer as Negotiator.** Examines the negotiation process generally engaged in by legal practitioners; discusses specific negotiation situations of concern to lawyers, and considers the impact of social psychology upon the negotiation process. Reading materials include topics such as labor bargaining, personal injury settlements, nonverbal communication, visible manifestation of anxiety, and stress reaction; students engage in mock negotiations and write a paper on a related topic. 2 hours or ½ unit (summer session, 3 hours or 1 unit).
- 393. Legal Drafting and Law Office Practice.** A practical course on the drafting of legal documents; a study of the organization and management of a law office. 2 hours. No graduate credit.
- 394. Legal Problems.** Preparation of comments on recent decisions for publication in the University of Illinois Law Forum. Open to students selected for superior achievement in two or more semesters of law study. 1 hour. May be repeated. No graduate credit.
- 395. Moot Court Board.** Preparation of an appellate brief; presentation of an appellate oral argument; participation in intramural, state, national, or international moot court competition. 1 hour. No graduate credit. May be repeated to a maximum of 4 hours.
- 396. Remedies.** A survey of legal and equitable remedies for the protection of personal and property rights. Procedural and substantive aspects of injunctions; restitution of unjust enrichment in the context of the receipt of unsolicited benefits, benefits derived from the commission of tortious acts, and the mistaken acquisition of benefits; alternative remedies arising from bargain transactions; and remedies for violations of civil rights. 2 or 3 hours, or ½ or 1 unit.
- 397. Clinical Training.** Student field work in the offices of the Land of Lincoln Legal Assistance Foundation in Champaign and Daville, Champaign Human Relations Commission, local City Attorneys, State of Illinois Department of Mental Health, Champaign County State's Attorney, Champaign County Public Defender, Student Legal Service, and other public agencies. Students engage in legal and investigative work under the supervision of agency attorneys or other administrative personnel; this work may include conducting client interviews, doing legal research, preparing legal documents, and in some cases engaging in the trial of actual cases. 1 to 4 hours. May be repeated to a maximum of 4 hours. No graduate credit.
- 398. Seminars in Selected Legal Problems.** Introduction to the methods and materials of legal research; discussion of selected topics; each student investigates a topic approved by the instructor and presents the results of the investigation orally to the class and in writing to the instructor. 2 hours or ½ unit. May be repeated.
- 399. Research in Special Topics.** Individual research on a special problem selected in consultation with the instructor. 0 to 4 hours, or ½ to 1 unit.
- 402. Introduction to United States Law.** An intensive introduction to the American legal system for graduate law students with prior professional training in non-common law legal systems; stresses the functioning of basic U.S. legal institutions and the techniques of American legal research. 1 unit.
- 499. Thesis Research.** 0 to 3 units.

LEISURE STUDIES

Head of Department: Professor J. J. Bannon

Department Office: 104 Huff Hall, 1206 S. Fourth Street, Champaign

- 100. Introduction to Leisure Studies.** Central issues in defining leisure and providing for its realization; historical, philosophical, sociological, psychological, and economic approaches

to understanding leisure behavior, its meanings, social contexts, and personal and social resources. 3 hours.

110. **Foundations for Delivery of Leisure Services.** Introduces the leisure studies major to enabling legislation, fiscal concerns, standards for planning, problems of cities, and the relationship of professional organizations to recreation and park services. 2 hours.
130. **Introduction to Therapeutic Recreation.** A survey of the history, philosophy, concepts, and trends in therapeutic recreation; overviews types of populations served; describes settings and services; examines role of the therapeutic recreator in clinical and community settings. 2 hours.
140. **Principles of Outdoor Education and Camping.** Introduces various aspects of outdoor education and organized camping; theoretical perspectives, basic skills, and practice in developing program objectives and evaluations. 3 hours.
141. **Introduction to Outdoor Recreation.** Philosophy, policy, history, laws, regulations, and trends in the provision of all types of outdoor recreation opportunities; management and planning principles for the various organizational structures involved. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Leadership in Leisure Delivery Systems.** Introduces the student to the various theories of leadership applicable to situations that exist in the field of leisure studies; provides practice in various leadership settings and techniques for the evaluation of leadership performance. 3 hours.
210. **Theories and Methods of Supervision.** Concepts, principles, and objectives of supervision; the nature of the supervisory relationship; supervisory functions and processes; identification and application of methods and techniques; and organizational and operational patterns of supervision in recreation and park settings. Prerequisite: Leisure Studies 100 and 110, or consent of instructor. 3 hours.
215. **Recreation Program Development.** Theory and practice in recreation program development in the various recreation settings, including public, private, and commercial operations; core programming and programming dictated by the needs of the field, setting, or clientele; and program evaluation. Prerequisite: Leisure Studies 100 and 200, or consent of instructor. 3 hours.
230. **Clinical Aspects of Therapeutic Recreation.** A survey of basic concepts associated with the clinical application of therapeutic recreation services, including an investigation of illness and disabilities, basic medical and psychiatric terminology, adaptive devices and appliances, assistive techniques and record keeping and behavior, observation and recording. Prerequisite: Credit or concurrent registration in Leisure Studies 130. 4 hours.
231. **Leisure and the Aging.** In-depth study of concepts and theories of aging as related to recreation services; characteristics of the elderly, service delivery systems; activity adaptation; legislation; and issues and trends. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
232. **Principles of Therapeutic Recreation.** Practices and principles utilized in therapeutic recreation; includes professionalism, legislation, team approaches, activity analysis, client assessment and treatment plans. Prerequisite: Leisure Studies 230. 3 hours.
233. **Recreation for the Physically Disabled.** In-depth study of aspects of physical disability as related to therapeutic recreation services; includes characteristics and implications of disability, self-help skills, wheelchair activities, coaching techniques, services, accessibility, and legislation. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
234. **Recreation for the Mentally Ill and Emotionally Disturbed.** In-depth study of mental illness and emotional disturbance as related to therapeutic recreation services; characteristics and classification of mental illness, treatment standards, legislation, treatment approaches, and issues and trends. Prerequisite: Psychology 238 and Leisure Studies 230, or consent of instructor. 3 hours.
235. **Recreation for the Developmentally Disabled.** In-depth study of developmental disabilities as related to therapeutic recreation services; characteristics of various developmental disabilities, mainstreaming, normalization, activity selection and adaptation, instructional strategies, and behavioral management techniques. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.

- 239. Seminar in Therapeutic Recreation.** A seminar for senior therapeutic recreation majors to discuss and explore current issues, trends, and professional concerns in the field of therapeutic recreation. Prerequisite: Senior standing. 1 hour.
- 240. Operation and Maintenance of Parks.** Basic understanding of park operations, facility design, construction, and maintenance practices; staff allocations, job analysis, contract administration, and organizational structures. Prerequisite: Leisure Studies 100, 110, and 141. 3 hours.
- 241. Outdoor Recreation Consortium.** Intensive on-site study of programs and management of large multiple-use recreation areas; includes lectures, problem solving, and interaction with personnel from various responsible agencies. Prerequisite: Leisure Studies 141 and 240; Landscape Architecture 226, or consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
- 250. Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, or related areas selected by the student. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser, instructor, and head of department. 2 to 3 hours. May be repeated to a maximum of 4 or 6 hours.
- 260. Honors Seminar.** Same as Health and Safety Studies 290 and Physical Education 290. See Physical Education 290.
- 280. Orientation to Practicum.** Prepares and places students in the Leisure Studies Practicum. Students must document completion of 320 hours of field work. Topics include placement requirements and policies, vitas, interviewing, letters of application, and the role and issues of professional practice. Prerequisite: Junior standing; Leisure Studies 100, 110, 130, and either 200 or 230. 0 hours.
- 284. Leisure Studies Practicum.** Students are assigned to University-approved field training stations in an internship capacity for a minimum of forty hours per week for sixteen weeks. Both the agency and the University provide supervision. Prerequisite: Senior standing; Leisure Studies 280 and 310. 6 or 12 hours. Must be repeated to a maximum of 12 hours credit.
- 290. Research in Leisure Studies.** Examines elementary principles of research methods, design, processing and analysis; use of completed leisure research; development of an ability to conduct, evaluate, and utilize research on leisure behavior. Prerequisite: Junior standing; Leisure Studies 100, or consent of instructor. 3 hours.
- 299. Off-Campus Study.** Provides campus credit for foreign or domestic study completed off-campus. A student's proposal for study must have prior approval of the major department and the college office. Final determination of appropriate credit is made on the student's completion of the work. Prerequisite: Advanced standing and approval of major department and college. 0 to 16 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 32 hours.
- 301. Forest Recreation.** Same as Forestry 301. See Forestry 301.
- 310. Introduction to Administration.** Organization of public and private agency programs, leadership, facilities, and services; introduction to recreation administration. Prerequisite: Leisure Studies 210 and senior standing, or consent of instructor. 3 hours, or ½ or 1 unit.
- 315. Play Theories and Their Implications.** Classical and modern theories of play; critical analysis of definitions, concepts, and assumptions and of extant research and research strategies; implications for programming and planning for play. Prerequisite: Leisure Studies 100 and Psychology 100, 103, or 105; or consent of instructor. 2 to 4 hours, or ½ to 1 unit.
- 331. Facilitation Techniques and Leisure Education.** Examines knowledge, concepts, and models of leisure education in therapeutic recreation; applies specific instructional and counseling theories and techniques to the development and implementation of leisure education programs with different populations. Prerequisite: Leisure Studies 232 and junior standing, or consent of instructor. 3 hours or 1 unit.
- 332. Program Design and Evaluation in Recreation.** Examines theory and techniques of program design and evaluation utilizing system approaches; includes needs assessment,

agency accountability, and comprehensive programming strategies. Prerequisite: Leisure Studies 130 and senior standing, or consent of instructor. 3 hours or 1 unit.

- 340. Outdoor Recreation Management.** Principles, practices, and problems involved in managing outdoor recreation areas; emphasizes management of both natural and cultural resources and visitor use patterns. Prerequisite: Landscape Architecture 226 and Leisure Studies 141; or consent of instructor. Leisure Studies 290 or another research methods course recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 341. Outdoor Recreation Resource Planning.** Studies the outdoor recreational use of lands in the public domain and their planning, concepts, and processes related to planning resource based systems; multiple-use in planning; planning criteria for outdoor recreation facilities. Prerequisite: Leisure Studies 141, Landscape Architecture 226, and junior standing; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies and Rural Sociology 344. See Environmental Studies 344.
- 381. Management Internship.** Work-study experience in the management aspects of leisure service delivery systems. Students are assigned to agencies in their special fields of study and are closely supervised by University faculty. Prerequisite: Leisure Studies 284 or graduate standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Foundations of Leisure Studies.** Basic philosophical, historical, and scientific foundations and developments in leisure and recreation; analyzes of recreation values as related to other contemporary individual and community needs; and functions and settings of organized recreation, special problem areas, and current issues. Prerequisite: Leisure Studies 100 or equivalent. 1 unit.
- 402. Leisure Systems Administration.** Strengthens the graduate student's knowledge of the public administration of recreation programs and services provided by municipal, county, state, and national departments and agencies as related to the general well-being of individuals, families, and communities. Prerequisite: Basic course in the organization of recreation or equivalent. 1 unit.
- 403. Advanced Research Methods-Leisure.** Examines methods and techniques of conducting and evaluating leisure research; experimental and survey designs and procedures; data collection, reduction and analysis. Prerequisite: Leisure Studies 100 or equivalent; Leisure Studies 290 or equivalent; a course in introductory statistics. 1 unit.
- 404. Seminar in Outdoor Recreation.** Philosophy, principles, and methods employed in outdoor recreation research today; also emphasizes pure versus applied research, utilization, and dissemination of research results. Prerequisite: Leisure Studies 141, 340 and 341, or equivalent; or consent of instructor. 1 unit.
- 412. Personnel Administration for the Delivery of Leisure Services.** Examines principles, objectives, techniques, and problems in establishing a systematic approach to the recruitment, selection, and evaluation of personnel in public leisure service agencies with emphasis on innovative methods of personnel assessment and collective bargaining. Prerequisite: Leisure Studies 310 or consent of instructor. 1 unit.
- 430. Advanced Seminar in Therapeutic Recreation.** In-depth investigation of contemporary professional issues related to the practice of therapeutic recreation in treatment and community agencies serving special populations. Prerequisite: Leisure Studies 332 or consent of instructor. 1 unit.
- 445. Sociology of Leisure.** Same as Sociology 445. Sociological theory and research methods as applied to the study of leisure; includes institutional and community contexts of leisure, leisure roles and socialization, built and natural environments, and the relationships of leisure to family, work, subcultures, and resources. Prerequisite: Leisure Studies 401 or Sociology 386 or 415, or consent of instructor. 1 unit.
- 465. Psychology of Leisure.** Applies psychological theory and research methods to the study of leisure behavior and experience including a consideration of basic motivation, individual differences, and social interaction and implications for developmental intervention and human services. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 490. Seminar.** Student presentation of thesis studies, informal discussions, and critical analysis of problems; informal lectures by invited speakers. 0 credit.

- 493. Special Problems.** Independent research on special projects. Open only to students majoring in leisure studies. $\frac{1}{2}$ to 2 units.
- 494. Special Topics in Leisure Studies.** Lecture courses in topics of current interest; specific subject matter will be announced in the Timetable. Prerequisite: Will be determined for each course offered and will be indicated in the Timetable. $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** Preparation of thesis in leisure studies. 0 to 4 units.

LIBERAL ARTS AND SCIENCES

Program Administrator: Professor R. K. Applebee

Program Office: 294 Lincoln Hall, 702 S. Wright, Urbana

- 110. Workshop-Tutorial.** Independent study and experimental seminars open to Unit One students and to others; specific offerings vary each semester. Prerequisite: Allen Hall residency or consent of Unit One director. 1 to 4 hours. At the end of the semester, the instructor may increase or decrease credit up to 2 hours, i.e., to a maximum credit of 6 hours. Credit toward college or departmental requirements is contingent upon approval by the appropriate unit. In any given semester, a student may register only for Liberal Arts and Sciences 110 (4 hour limit) or 210. A combined total of 12 hours of Liberal Arts and Sciences 110 and/or 210 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. Experimental Seminar.** Seminars which are experimental in content or method of delivery, open to Unit One students and to others; special topics and independent research with individual faculty sponsors in areas not treated by regular course offerings, or in areas within the expertise of Unit One staff. A catalog of seminar offerings is available each semester from the Unit One office prior to registration. Prerequisite: Sophomore standing; Allen Hall residency or consent of Unit One director. 3 hours. Credit toward college or departmental requirements is contingent upon approval of the appropriate unit. In any given semester, a student may register only for Liberal Arts and Sciences 110 (4 hour limit) or 210. A combined total of 12 hours of Liberal Arts and Sciences 110 and/or 210 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
- 294. Senior Project.** For students seeking graduation with distinction in IPS. Prerequisite: Consent of instructor and IPS Advisory Committee; open only to students whose field of concentration is IPS and who have a cumulative grade point average of at least 4.25. 2 or 4 hours. May be repeated to a maximum of 4 hours.
- 299. LAS Study Abroad.** Provides credit toward the undergraduate degree for study at accredited foreign institutions or approved overseas programs. Final determination of credit is made on the student's completion of the work. Prerequisite: One year of residence at UIUC, good academic standing, and prior approval of the major department and the College of Liberal Arts and Sciences. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 30 semester hours per academic year or to a total of 36 semester hours, all of which must be earned within one calendar year.

LIBRARY AND INFORMATION SCIENCE

Dean of Graduate School of Library and Information Science: Professor Leigh Estabrook

School Office: 410 David Kinley Hall, 1407 W. Gregory, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 300. Foundations of Library and Information Science.** Examines the development of the

library and information centers in relation to the society they serve, the library and information science profession, the operation and organization of libraries and information centers, building collections, and the administration of libraries and information centers; serves as an orientation to library and information science. Prerequisite: Junior standing and consent of School. 4 hours or 1 unit.

- 301. Bibliography.** Covers enumerative bibliography, the practices of compiling lists; analytical bibliography, the design, production, and handling of books as physical objects; and historical bibliography, the history of books and other library materials, from the invention of printing to the present. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 303. Library Materials for Children.** Selection and use of library materials for children in public libraries and elementary school media centers, according to their needs in their physical, mental, social, and emotional development; deals with the standard selection aids for all types of print and nonprint materials and develops the ability to select and describe children's materials according to their developmental uses. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. Students may not receive credit for both Library and Information Science 303 and Elementary and Early Childhood Education 304.
- 304. Library Materials for Young Adults.** Evaluation, selection, and use of library materials for young adults in school and public libraries and community organizations, according to personal and curricular needs; studies selection sources for all formats of materials and explores techniques for utilization of materials. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 307. Introduction to Services Relating to Organization of Library Materials.** Emphasizes the role of library catalogs in bibliographic control; introduces the functions, forms, and arrangements of library catalogs in all types of libraries; identifies bibliographic data elements in manual and machine readable catalog records; and emphasizes the basic principles, concepts, practices, and tools of descriptive and subject cataloging and file structures. Prerequisite: Junior standing and consent of the School. 2 hours or $\frac{1}{2}$ unit.
- 308. Audiovisual Services in Libraries.** Designed to acquaint students with the nonprint media responsibilities of libraries; includes the evaluation, selection, and acquisition of software and hardware, the utilization of media in various types of libraries (by individuals and groups, in formal and informal programs), and the administration of integrated media collections (films, recorded sound, video, and exhibits). Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1 unit.
- 309. Storytelling.** Fundamental principles of the art of storytelling including techniques of adaptation and presentation; content and sources of materials; story cycles; methods of learning; practice in storytelling; and planning the story hour for the school and public libraries, for recreational centers, for the radio, and for television. Prerequisite: Junior standing and consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 320. Introduction to Information Sources and Services.** Introduces information referral techniques and readers' advisory and online information services; examines representative printed and online sources, and develops question negotiation skills and search strategies. Prerequisite: Junior standing and consent of the School. 2 hours or $\frac{1}{2}$ unit.
- 350. The Theory, Design, and Production of Audiovisual Materials.** Examines the theory and research related to the design and production of audiovisual materials and their application to the design and production of graphic materials, films, sound-slide programs, and television programs; also treats the management of audiovisual production services in libraries. Prerequisite: Junior standing or consent of instructor. 3 hours or 1 unit.
- 360. Practicum.** Supervised field experience of professional-level duties in an approved library or information center. Prerequisite: Completion of 4 units of library and information science courses, including Library and Information Science 300; junior standing or consent of instructor. 3 hours or $\frac{1}{2}$ unit. A maximum of $\frac{1}{2}$ unit may be applied toward a degree program.

- 405. Library Administration.** Designed to supply knowledge of the internal organization of libraries and of the principles of library administration; emphasis on comparison of the conditions found in the several kinds of libraries and on applications of the general theory of administration. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 406. Media Programs and Service for Children and Young Adults.** The role, problems, and needs of children's and young adults' library services in the school and public library. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 407. Cataloging and Classification, I.** Theory and application of basic principles and concepts of descriptive and subject cataloging; emphasis on interpreting catalog entries and making a catalog responsive to the needs of users; provides beginning-level experience with choice of entries, construction of headings, description of monographs (and, to a lesser extent, of serial publications and nonprint media), filing codes, Dewey and Library of Congress classification systems, and Library of Congress subject headings. Prerequisite: Library and Information Science 307 or consent of instructor. 1 unit.
- 408. Cataloging and Classification, II.** More complex problems in making and evaluating the changing, modern library catalog; practical and administrative problems in cataloging serial publications, analytics, ephemeral materials, and microforms; deals with various nonprint media, rare books and manuscripts, foreign language materials, and materials in special subject areas. Prerequisite: Library and Information Science 407. 1 unit.
- 409. Communication Roles and Responsibilities of Libraries.** Considers mass media of communication in terms of their relations with modern library services; reviews media organization, content, and research; considers problems of intellectual freedom as an aspect of communications behavior; and discusses the potential role of electronic devices in library activities now and for the future. $\frac{1}{2}$ or 1 unit.
- 410. Adult Public Services.** The literature, history, and problems of providing library service to the general adult user; investigation of user characteristics and needs, and the effectiveness of various types of adult services. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 411. Reference Service in the Humanities and Social Sciences.** Detailed consideration of the bibliographical and reference materials in various subject fields; training and practice in their use for solving questions arising in reference service. Prerequisite: Library and Information Science 320 or consent of instructor. 1 unit.
- 412. Scientific and Technical Literature and Reference Work.** Aims (a) to acquaint students with typical library materials in science and technology, and (b) to develop proficiency in their selection, evaluation, and use for reference work. Prerequisite: Library and Information Science 320, or consent of instructor. 1 unit.
- 415. Library Automation.** Introduction to various types of equipment for handling information and providing services in libraries; study of applications to library operations; and introduction to systems planning, to automation concepts, and to computer use. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 416. Advanced Library Automation.** The development of computer programs for library processes such as circulation, acquisitions, cataloging, and document retrieval. Includes seminar presentations based on individual research in automation topics. Prerequisite: Library and Information Science 415, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 417. Techniques for Managerial Decision Making in Library and Information Science.** Systematic techniques for achieving rational management decisions; includes problem definition, sampling, decision tables, and critical path analysis. Examples and current issues from the operation of libraries and information centers. Prerequisite: Library and Information Science 300, or consent of instructor. 1 unit.
- 424. Government Publications.** Aims to acquaint students with government publications, their variety, interest, value, acquisition, and bibliographic control, and to develop proficiency in their reference and research use; considers publications of all types and all governments (local, national, international) with special emphasis on U.S. state and federal governments and on the United Nations and its related specialized agencies. Prerequisite: Library and Information Science 411, 412, or consent of instructor. 1 unit.

- 427. Resources of American Research Libraries.** Acquaints students with the distribution and extent of American library resources for advanced study and research; spatial and financial aspects of library resources; methods of surveying library facilities; growth and use of union catalogs and bibliographical centers; interinstitutional agreements for specialization of collections and other forms of library cooperation; and the use of the research collection by the scientist and scholar. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 428. Library Buildings.** Studies the library's physical plant in the light of changing concepts and patterns of library service; analyzes present-day library buildings, (both new and remodeled) and their comparison with each other as well as with buildings of the past; examines the interrelationship of staff collections, users, and physical plant; discussion supplemented by visits to new libraries and conference with their staffs. A two-day field trip is required; see Timetable for estimated cost. Prerequisite: Library and Information Science 405 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 429. Information Storage and Retrieval.** Types of systems for storage and retrieval of documents and references; history of retrieval systems, their characteristics, evaluation, and factors affecting their performance, with special reference to modern computer-based systems; procedures in the dissemination of scientific and other information; major information centers and services in the U.S. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 430. Advanced Reference.** Enables the student to utilize the varied resources of a large research library; deals with the methods of analyzing and solving bibliographic problems such as arise in scholarly libraries and in connection with research projects. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ or 1 unit.
- 431. Online Information Systems.** Explores the state-of-the-art in online information systems, with particular emphasis on their use as part of reference service in libraries; acquaints students with the characteristics of both bibliographic and nonbibliographic data bases; and trains students in the use of at least one currently available online retrieval system. Prerequisite: Library and Information Science 429. $\frac{1}{2}$ unit.
- 432. History of Libraries.** Same as Communications 432. The origins, development, and evolution of libraries and related institutions, from antiquity to the twentieth century, as a reflection of literacy, recognition of archival responsibility, humanistic achievement, scientific information needs, and service to society. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 433. Information Needs of Particular Communities.** In-depth study of the characteristics and information needs of specialist users of libraries; goals and objectives, policies, and services; reference and bibliographical aids; and effective services that satisfy these special needs. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for a total of 1 unit.
- 434. Library Systems.** Development of library systems, with special reference to public libraries as a norm for the development of library services; detailed treatment of library standards, the growth and development of county and regional libraries, and the role of the state library and of federal legislation. Prerequisite: Library and Information Science 405 or consent of instructor. 1 unit.
- 437. Technical Services Functions.** Seminar on the principles, problems, trends, and issues of acquiring, identifying, recording, and conserving/preserving materials in all types of libraries and information centers; includes the special problems of serials management; emphasizes service aspects. Prerequisite: Library and Information Science 300 and 407, or consent of instructor; concurrent registration in Library and Information Science 407 is acceptable with consent of instructor. 1 unit.
- 438. Administration and Use of Archival Materials.** Administration of archives and historical manuscripts; emphasizes the processing and research use of archival materials. Prerequisite: Consent of instructor. 1 unit.
- 440. Advanced Bibliography.** Discusses the major reference bibliographies, including general works, subject lists in various fields, regional historical and current national bibliogra-

phies, and published library catalogs; surveys the nature of bibliographical access to the output of the world's press, descriptive bibliography, and rare-book librarianship. Prerequisite: Library and Information Science 301 or consent of instructor. ½ or 1 unit.

- 441. History of Children's Literature.** Interpretation of children's literature from the earliest times, including the impact of changing social and cultural patterns on books for children; attention to early printers and publishers of children's books and to magazines for children. 1 unit.
- 442. Seminar in Library Materials for Children and Young Adults.** Advanced study of criteria for the evaluation of books and other media, including an individual project on a given theme or subject involving extensive critical reading, viewing, and listening. Prerequisite: Library and Information Science 303, 304, or consent of instructor. 1 unit.
- 443. Contemporary Book Publishing.** Surveys twentieth-century book publishing, placing it in an economic, social, and literary context; emphasizes economic structure, the relationship of author and publisher, promotion, distribution, and the influence of the industry on librarianship. Prerequisite: Library and Information Science 300 or consent of instructor. ½ or 1 unit.
- 444. Measurement and Evaluation of Library Services.** Methods and criteria for evaluating various facets of library service, including the collection, the catalog, document delivery capabilities, reference service, technical processes, and information retrieval operations; deals with cost-effectiveness considerations. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 450. Advanced Problems in Librarianship.** Directed and supervised investigation of selected problems in library resources, reference service, research libraries, reading, public libraries, or school libraries. Prerequisite: Library and Information Science 300, or consent of instructor. ¼ to 2 units.
- 451. Independent Study.** Permits the intermediate or advanced student opportunity to undertake the study of a topic not otherwise offered in the curriculum or to pursue a topic beyond or in greater depth than is possible within the context of a regular course. Prerequisite: Consent of dean. ½ to 1 unit. May be repeated by M.S. students to a maximum of 1 unit; C.A.S. students, 2 units; or Ph.D. students, 4 units.
- 459. CAS Project.** Individual study of a problem in library or information science; forms the culmination of the Certificate of Advanced Study program. Prerequisite: Admission to CAS program in library and information science. 0 to 2 units. May be taken for additional units, but only two will apply to the Certificate of Advanced Study.
- 469. Principles of Research Methods.** Studies the design of research using historical, descriptive, and experimental methodologies; emphasizes applications in the library and information science fields. For doctoral students only. Prerequisite: A course in the principles of statistics, a library and information science course in quantitative methods; and consent of instructor. 1 unit.
- 471. The History of Communications Media and Libraries.** Seminar in the different means of transmitting content through time and space; includes the history and comparison of libraries, books, and other communications media. Prerequisite: Open to doctoral students only. 1 unit.
- 472. The Bibliographic Organization of Information and Library Materials.** Seminar in the relationship between knowledge and its bibliographic control; includes the structure of knowledge and classification, the descriptive and subject aspects of bibliography and indexing, and information theory. Prerequisite: Open to doctoral students only. 1 unit.
- 473. The Social Basis of Library and Information Science.** Seminar in the interrelationships between librarians and information scientists and their communities of users; includes modern institutions of librarianship and information service, the education of librarians and information scientists, and the sociology of libraries and information centers. Prerequisite: Open to doctoral students only. 1 unit.
- 474. The Management of Libraries and Information.** Seminar in the organizations and structures which facilitate both the achievement of library and information center goals and the flow of information; includes management and decision-making tools. Prerequisite: Open to doctoral students only. 1 unit.

- 475. Seminar in Library and Information Science.** Preparation, presentation, and criticism of a scholarly paper of moderate length and publishable quality based on individual study. Prerequisite: Library and Information Science 471, 472, 473, or 474; open to doctoral students only. 1 unit. Required: To be repeated for a total of 4 units.
- 499. Thesis Research.** Individual study and research. Section A: M.S. candidates, 0 to 2 units. Section B: doctoral candidates, 0 to 4 units.

LIFE SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Anatomical Sciences, Biology, Ecology, Ethology, and Evolution, Entomology, Genetics and Development, Microbiology, Physiology and Biophysics, and Plant Biology.)

Director of School: Professor Samuel Kaplan

School Office: 387 Morrill Hall, 505 South Goodwin, Urbana

LINGUISTICS

(Including African Languages, Arabic, Hebrew, Hindi, Persian, and Sanskrit)

Chairperson of Department: Professor C-W. Kim

Department Office: 4088 Foreign Languages Building, 707 South Mathews, Urbana

Linguistics

- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Introduction to Language Science.** An introduction to the theory and methodology of general linguistics; includes the various branches and applications of linguistics. 3 hours.
- 201. Elements of Phonology.** Introduction to the formal description of phonological structure, including study of articulatory phonetics, the phonological feature framework, and fundamental concepts of generative phonological theory. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
- 202. Elements of Syntax.** Introduction to the types of syntactic and semantic phenomena found in natural language, with material drawn from a variety of languages; emphasis on the implications of such phenomena for linguistic theory; formalism and application of generative grammar. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
- 225. Elements of Psycholinguistics.** Introduction to the theory and methodology of psycholinguistics with emphasis on language acquisition and linguistic behavior. 3 hours.
- 260. American Sign Language.** Same as Psychology and Speech and Hearing Science 260. See Psychology 260.
- 290. Individual Study.** Individual readings and research reports on special topics dealing with the theoretical or applied aspects of the linguistic sciences. Prerequisite: Written consent of instructor on form available in linguistics departmental office. 2 to 4 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Study and research for honors thesis; open only to seniors in the linguistics field of concentration who are eligible for departmental distinction. Prerequisite: Written consent of instructor on form available in linguistics departmental

office; linguistics course average of 4.4. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)

- 300. Introduction to Linguistic Structure.** Same as Anthropology 300. Introduction to the theory and methodology of the science of linguistics with special reference to phonology and syntax. 3 hours or ½ unit.
- 301. Introduction to General Phonetics.** Introduction to the main branches of general phonetics and phonological theory; emphasis on analysis of non-Western languages and research techniques. 3 hours or ½ unit.
- 302. Introduction to Language History.** Introduction to the nature of language change; includes sound change, change through language contact (such as Pidgins and Creoles), semantic change (etymology), language relationship and reconstruction, and language history as an aid to understanding cultural history (philology). This course cannot be used to fulfill departmental graduate requirements. Prerequisite: Four years of high school foreign language study or fulfillment of the College of Liberal Arts and Sciences foreign language requirement. 3 hours or ½ unit.
- 303. Non-Western Linguistic Structures.** Intensive study of linguistic structure of a selected non-Western language. 3 hours or 1 unit. May be repeated for credit with consent of instructor.
- 304. Tutorials in Nonwestern Languages.** Advanced or intensive language instruction in a selected nonwestern language; does not cover instruction in East or Southeast Asian languages. Prerequisite: Consent of instructor. 1 to 5 hours, or ½ to 1 unit. May be repeated with consent of instructor.
- 305. Introduction to Applied Linguistics.** Same as English as a Second Language 305. Introduction to the applications of general linguistic theory to the specific fields of stylistics, theory of translation, contrastive analyses, and the teaching and learning of foreign and second languages; practical assignment work. Prerequisite: Consent of instructor. 3 hours, or ½ or 1 unit.
- 306. Introduction to Computational Linguistics.** Introduces the use of computers in linguistics and application of linguistics in high technology. Topics include spelling and grammar-checking in word processing, natural language and man-machine communication, data organization, language understanding systems, and computer-assisted language instruction. Students write several computer programs. Prerequisite: Linguistics 300 or equivalent; and a Computer Science 100-level programming course (not Computer Science 106), or Computer Science 400, or consent of instructor. 3 hours or 1 unit.
- 307. Introduction to Mathematical Linguistics.** Same as Anthropology 307. Principles of set theory, logic and formal systems, group theory, and automata theory; introduction to the formal theory of grammars. Prerequisite: Linguistics 300. 3 hours or 1 unit.
- 309. Introduction to Indo-European Linguistics.** Same as Greek 310 and Latin 310. Introductory survey of Indo-European languages and their mutual relations; exemplification of methods of reconstruction; principles of comparative phonology and introductory survey of morphology; and discussion of theories about the original home, culture, and society of the Indo-Europeans. Prerequisite: Fulfillment of the language requirement of the College of Liberal Arts and Sciences. 3 hours or 1 unit.
- 311. Introduction to Syntax: A Typological Approach.** Introduces the study of syntax through typological survey of syntactic systems of natural languages; examines material from diverse language families; implications of typological studies for syntactic theory. Prerequisite: Linguistics 300. 3 hours, or ½ or 1 unit.
- 312. Stylistics and Literary Criticism.** Same as English 304. See English 304.
- 314. Introductory Coptic, I.** Same as Coptic and Religious Studies 301. See Coptic 301.
- 315. Introductory Coptic, II.** Same as Coptic and Religious Studies 302. See Coptic 302.
- 316. Structure of the French Language.** Same as French 316. See French 316.
- 320. Introduction to African Linguistics.** Introduction to genetic and typological classification of the main language families of Africa; concentration on grammatical and phonological characteristics. Prerequisite: Linguistics 200 or 300; consent of instructor. 3 hours or 1 unit.

- 323. Language Acquisition.** Same as Communications 323 and Psychology 323. See Psychology 323.
- 325. Introduction to Psycholinguistics.** Same as Communications 325. Introductory survey of psychological and linguistic approaches to the study of communication. Prerequisite: Credit or concurrent registration in Linguistics 300. 3 hours or 1 unit. Credit is not given for both Linguistics 325 and Psychology 325.
- 330. Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Korean 330. Introduction to genetic relation of the Far Eastern languages with other languages; concentration on synchronic analysis of phonology and syntax. Prerequisite: Linguistics 300; consent of instructor. 3 hours or 1 unit.
- 332. Sex-Related Differences in Language.** Same as Speech Communication and Women's Studies 332. See Speech Communication 332.
- 338. Philosophy of Language.** Same as Philosophy 338. See Philosophy 338.
- 340. History of Linguistics.** Survey of linguistic theories from ancient to modern times; special emphasis on comparative grammar and the development of structural linguistics; and extended discussion of at least one other period. 3 hours or 1 unit.
- 350. Introduction to Sociolinguistics.** Same as English as a Second Language 350. Critical study of the sociologically oriented general linguistic theories; special reference to language varieties, language attitudes, language diversity, language standardization, linguistic geography, and language and political roles (language loyalty); emphasis on research methodology and techniques. Prerequisite: Introductory course in linguistics or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 353. Spanish Structure.** Same as Spanish 353. See Spanish 353.
- 362. Introduction to Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 367. Introduction to Germanic Linguistics.** Same as Germanic 367. See Germanic 367.
- 370. Language, Culture, and Society.** Same as Anthropology 370 and Communications 370. See Anthropology 370.
- 375. Speech Science, I.** Same as Speech and Hearing Science and Speech Communication 375. See Speech and Hearing Science 375.
- 376. Speech Science, II.** Same as Speech and Hearing Science and Speech Communication 376. See Speech and Hearing Science 376.
- 380. Introduction to Slavic Linguistics.** Same as Slavic 380. See Slavic 380.
- 382. Introduction to Sanskrit Linguistics.** A linguistic introduction to the structure of Sanskrit (phonetics, phonology, and morphology) and its historical antecedents and development, with reading of sample texts. Prerequisite: Linguistics 300 and consent of instructor. 3 hours or 1 unit.
- 385. Reading in a Second Language.** Same as English as a Second Language 386. See English as a Second Language 386.
- 386. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, Slavic, and Spanish 382. See Humanities 382.
- 387. The Structure of English.** Critical evaluation of traditional and structuralist grammatical descriptions; introduction to transformational grammatical studies; detailed survey of a transformational syntax of English; and brief introduction to generative phonology and morphophonemic analysis of English, especially stress. 3 hours or $\frac{3}{4}$ unit.
- 388. English Phonology and Morphology for ESL Teachers.** Same as English as a Second Language 388. See English as a Second Language 388.
- 389. Theoretical Foundations of TESL Methodology.** Same as English as a Second Language 389. See English as a Second Language 389.
- 400. Introduction to General Linguistics.** Same as Anthropology 400 and English as a Second Language 402. Introduction to the linguistic sciences; linguistic theory and methodology; and branches of linguistics and their application. 1 unit. Credit may not be applied toward a graduate degree in linguistics.
- 401. Syntax.** Critique of traditional and contemporary theories of syntactic structure; systemat-

- ic introduction to transformational grammar. Prerequisite: Linguistics 300 or equivalent. 1 unit.
- 402. Phonology.** Examination of language-specific phonological problems with a view toward formulating a language-independent theory of phonology. Prerequisite: Linguistics 301 or consent of instructor. 1 unit.
- 403. Seminar in Linguistic Analysis.** Discussion of advanced topics of current interest. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit with consent of instructor.
- 404. Practicum.** Classroom- and homework-solving of assorted problems in syntactic and phonological analysis of many languages. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit as topic varies with consent of instructor.
- 405. Seminar in Stylistics.** Same as Comparative Literature 405. Seminar designed to evaluate and discuss earlier and current linguistically motivated stylistic theories; emphasis on the theoretical and methodological problems in application of linguistics to stylistic analysis of literary texts. Prerequisite: Linguistics 300 or 305; consent of instructor. 1 unit.
- 406. Topics in Computational Linguistics.** Speech sampling and linguistic redundancy; phonology in speech recognition; syntactic parsing of natural language; domains of linguistic knowledge including lexical, syntactic, semantic, discourse, and pragmatic representations; quantitative reasoning; linguistic expert system; speech synthesis. Prerequisite: Linguistics 306 and 401; Linguistics 402 or consent of instructor. 1 unit.
- 408. Russian Phonology.** Same as Russian 408. See Russian 408.
- 411. Historical Linguistics.** Introduction to historical and comparative linguistics with particular attention to theoretical issues. Prerequisite: Credit or concurrent registration in Linguistics 300 and 301. 1 unit.
- 412. Research Seminar in Historical Linguistics.** Research work in etymology, linguistic geography, and historical syntax. Prerequisite: Linguistics 411 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units, as topics vary, with consent of instructor.
- 413. Pedagogical Grammar.** Same as English as a Second Language 412. See English as a Second Language 412.
- 419. Contrastive Linguistics.** Same as English as a Second Language 419. Critical survey of contemporary linguistic models; special reference to their relevance in preparing contrastive analyses of languages; and detailed discussion on contrastive analysis of English and selected non-Western languages at different linguistic levels. Prerequisite: Linguistics 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 420. Linguistic Phonetics.** Principles of scientific description of the phonic aspect of language; distinctive features and phonetic alphabets; relations between phonetics and other linguistic levels; and inventory of speech sounds. Prerequisite: Linguistics 301 or equivalent. 1 unit.
- 424. Developmental Psycholinguistics.** Same as Communications and Psychology 424. See Psychology 424.
- 425. Psycholinguistics.** Same as Communications 425 and Psychology 425. See Psychology 425.
- 429. Second Language Acquisition and Bilingualism.** Same as Psychology 429. Examination of the field from a psycholinguistic perspective; topics discussed include first versus second language acquisition; the nature of language aptitude and competence; methods of second language teaching; the nature of bilingualism; and comparative psycholinguistics. Prerequisite: Consent of instructor. 1 unit.
- 440. Seminar in History of Linguistics.** Analysis of recent theoretical approaches. Prerequisite: Linguistics 340. 1 unit.
- 441. Syntax, II.** Advanced analysis and critique of syntactic descriptions, with special attention to implications for universal grammar. Prerequisite: Linguistics 401 or consent of instructor. 1 unit.
- 442. Phonology, II.** Continuation of Linguistics 402. Prerequisite: Linguistics 402. 1 unit.
- 450. Linguistics and the Study of Meaning.** Consideration of those aspects of meaning which are the concern of linguistic theory. Prerequisite: Linguistics 300. 1 unit.

- 460. Seminar in Bilingualism.** A research-oriented seminar on theoretical and applied aspects of bilingualism; critical evaluation of linguistic, neurolinguistic, sociolinguistic, and psycholinguistic approaches to bilingualism; and concentration on selected case studies from western and nonwestern societies, especially Asia and Africa. Prerequisite: Linguistics 350 or an introductory course in linguistics. 1 unit.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
- 475. Experimental Phonetics, I.** Same as Speech and Hearing Science 475. See Speech and Hearing Science 475.
- 476. Experimental Phonetics, II.** Same as Speech and Hearing Science 476. See Speech and Hearing Science 476.
- 481. Topics in Syntactic Theory.** Investigation of syntactic universals; recent developments in the theory of syntax. Prerequisite: Linguistics 441 or consent of instructor. 1 unit. May be repeated as topics vary with consent of instructor.
- 482. Topics in Phonological Theory.** Recent developments in the theory of phonology. Prerequisite: Linguistics 442 or consent of instructor. 1 unit. May be repeated for credit as topic varies with consent of instructor.
- 490. Special Topics in Linguistics.** Individual studies in the areas of linguistics not covered by regular course offerings. ½ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

LANGUAGES OFFERED BY THE DEPARTMENT OF LINGUISTICS.

Other languages may be offered by tutorial (see Linguistics 304). See also APPENDIX A for a list of all languages currently offered on this campus.

African Languages

- 201. Elementary Hausa, I.** Same as African Studies 201. Introduction to Hausa; emphasizes grammar, pronunciation, reading, and conversation in standard Hausa. Language lab participation required. 5 hours.
- 202. Elementary Hausa, II.** Same as African Studies 202. Continuation of elementary Hausa, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Hausa. Participation in language laboratory required. Prerequisite: African Languages 201. 5 hours.
- 211. Elementary Lingala, I.** Same as African Studies 211. Introduction to Lingala; emphasizes grammar, pronunciation, reading and conversation in standard Lingala. Participation in language laboratory required. 5 hours.
- 212. Elementary Lingala, II.** Same as African Studies 212. Continuation of elementary Lingala, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Lingala. Participation in language laboratory required. Prerequisite: African Languages 211. 5 hours.
- 231. Elementary Swahili, I.** Same as African Studies 231. Beginning spoken Swahili with minimum of formal grammar; conversation with a native Swahili tutor under the supervision of a linguist-instructor. 5 hours.
- 232. Elementary Swahili, II.** Same as African Studies 232. Second semester of spoken Swahili; more conversation with a native tutor; and further grammar. Prerequisite: African Languages 231. 5 hours.
- 241. Elementary Wolof, I.** Same as African Studies 241. Introduction to Wolof; emphasizes grammar, pronunciation, reading, and conversation in standard Wolof. Participation in language laboratory required. 5 hours.
- 242. Elementary Wolof, II.** Same as African Studies 242. Continuation of elementary Wolof, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Wolof. Participation in language laboratory required. Prerequisite: African Languages 241. 5 hours.

- 303. Intermediate Hausa, I.** Same as African Studies 303. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and spoken Hausa, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 202. 5 hours or 1 unit.
- 304. Intermediate Hausa, II.** Same as African Studies 304. Continuation of African Languages 303. Emphasizes ability to engage in reasonably fluent discourse in Hausa, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Hausa dialects. Participation in language laboratory required. Prerequisite: African Languages 303. 5 hours or 1 unit.
- 313. Intermediate Lingala, I.** Same as African Studies 313. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in the standard and spoken Lingala dialects, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 212. 5 hours or 1 unit.
- 314. Intermediate Lingala, II.** Same as African Studies 314. Continuation of African Languages 313. Emphasizes ability to engage in reasonably fluent discourse in Lingala, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Lingala dialects. Participation in language laboratory required. Prerequisite: African Languages 313. 5 hours or 1 unit.
- 333. Intermediate Swahili, I.** Same as African Studies 333. Second-year Swahili with emphasis on developing conversational fluency; some readings on Swahili culture and customs. Prerequisite: One year of Swahili. 5 hours or 1 unit.
- 334. Intermediate Swahili, II.** Same as African Studies 334. More of second-year Swahili with emphasis on conversational fluency; some reading in Swahili literature. Prerequisite: One year of Swahili. 5 hours or 1 unit.
- 335. Advanced Swahili, I.** Same as African Studies 335. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: African Languages 334 or equivalent. 5 hours or 1 unit.
- 336. Advanced Swahili, II.** Same as African Studies 336. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: African Languages 335 or equivalent. 5 hours or 1 unit.
- 343. Intermediate Wolof, I.** Same as African Studies 343. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and Dakar Wolof, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 242. 5 hours or 1 unit.
- 344. Intermediate Wolof, II.** Same as African Studies 344. Continuation of African Languages 343. Emphasizes ability to engage in reasonably fluent discourse in Wolof, comprehensive knowledge of formal grammar, and ability to read ordinary texts in standard and Dakar Wolof. Participation in language laboratory required. Prerequisite: African Languages 343. 5 hours or 1 unit.

Arabic

- 201. Elementary Standard Arabic, I.** Mastery of the Arabic alphabet and phonetics; elementary formal grammar and the development of reading and writing skills; and conversation in the formal noncolloquial style. All students are required to register for one hour per week in the language laboratory. 5 hours.
- 202. Elementary Standard Arabic, II.** Continuation of Arabic 201. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 201. 5 hours.
- 210. Colloquial Arabic, I.** Development of conversational fluency in one of the major colloquial dialects; see Timetable for dialect to be taught each semester. 4 hours.

211. **Colloquial Arabic, II.** Continuation of Arabic 210. Prerequisite: Arabic 210. 4 hours.
303. **Intermediate Standard Arabic, I.** Survey of more advanced grammar; emphasis on increasing conversational fluency in the formal noncolloquial style; and reading of prose texts reflecting aspects of Arabic culture. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 202. 5 hours or 1 unit.
304. **Intermediate Standard Arabic, II.** Continuation of Arabic 303. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 303. 5 hours or 1 unit.
305. **Advanced Standard Arabic, I.** Practice to attain conversational fluency in the formal noncolloquial style; introduction to Arabic literature; and readings in social, political, and historic writings. Prerequisite: Arabic 304. 5 hours or 1 unit.
306. **Advanced Standard Arabic, II.** Continuation of Arabic 305. Prerequisite: Arabic 305. 5 hours or 1 unit.

Hebrew

201. **Elementary Modern Hebrew, I.** Introduction to Hebrew; includes conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. Students are required to register for one hour weekly in the language laboratory. 5 hours.
202. **Elementary Modern Hebrew, II.** Continuation of Modern Hebrew 201, with introduction of more advanced grammar, and with emphasis on more fluency in speaking and reading. Prerequisite: Hebrew 201. 5 hours.
205. **Introduction to Classical Hebrew, I.** Same as Religious Studies 205. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills. 4 hours.
206. **Introduction to Classical Hebrew, II.** Same as Religious Studies 206. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills; translation of simple biblical prose. Prerequisite: Hebrew 205 or equivalent. 4 hours.
210. **Biblical Prose.** Same as Religious Studies 210. Reading and discussion of selections from the Books of Samuel with emphasis on grammar and exegesis; exercises in prose composition. Prerequisite: Hebrew 205 and 206. 4 hours.
303. **Intermediate Modern Hebrew, I.** First term of the second year of the Hebrew language, including drill for more advanced conversational fluency, increased study of the written language, and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Modern Hebrew, II.** Concentration on ability to engage in reasonable fluent discourse in Hebrew, comprehensive knowledge of formal grammar, and an ability to read ordinary written Hebrew. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Modern Hebrew, I.** Advanced spoken and written standard modern Hebrew; introduction to modern Hebrew literature. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours or $\frac{3}{4}$ to 1 unit.
306. **Advanced Modern Hebrew, II.** A course for advanced knowledge of spoken and written standard Modern Hebrew with emphasis on Modern Hebrew literature and language. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.
307. **Topics in Modern Hebrew Language and Literature, I.** Selected readings from modern Hebrew authors, with emphasis on the novel and short story; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 306 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
308. **Topics in Modern Hebrew Language and Literature, II.** Selected readings from modern Hebrew authors, with special emphasis on Eastern European "Revival" literature;

lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 307 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.

- 311. Hebrew Poetry.** Same as Religious Studies 311. Translation and analysis of ancient Hebrew poetry, with emphasis on the development of Hebrew prosodic style and on textual criticism; research paper required for graduate credit. Prerequisite: Hebrew 210 or equivalent. 4 hours or 1 unit.

Hindi

- 201. Elementary Hindi/Urdu, I.** An introduction to the Hindi/Urdu language; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, and a minimum of formal grammar and Devanagari writing; introduction to Arabic-Persian script by arrangement. All students are required to register for one hour per week in the language laboratory. 5 hours.
- 202. Elementary Hindi/Urdu, II.** Second term of spoken Hindi/Urdu; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, formal grammar based on conversational materials, and work on written Hindi; concentration on written Urdu by arrangement. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 201. 5 hours.
- 301. Intensive Hindi, I.** An intensive course on the Hindi language including conversation with a native Hindi-speaking tutor under the direction of a linguist-instructor; study of the formal grammar and the Devanagari script. 10 hours or 2 units.
- 302. Intensive Hindi, II.** Includes drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; increasing study of the written language and more formal grammar; and concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 301 or equivalent, or consent of instructor. 10 hours or 2 units.
- 303. Intermediate Hindi, I.** First term of second year of the Hindi language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 202 or equivalent. 5 hours or 1 unit.
- 304. Intermediate Hindi, II.** Concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 303 or equivalent. 5 hours or 1 unit.
- 305. Advanced Hindi, I.** A course for advanced knowledge of spoken and written Hindi. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 304 or consent of instructor. 5 hours or 1 unit.
- 306. Advanced Hindi, II.** A course for advanced knowledge of spoken and written Hindi with emphasis on modern Hindi literature and language. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 305 or consent of instructor. 5 hours or 1 unit.
- 308. Introduction to South Asian Literature.** Introduces selected literatures of South Asia in a cross-cultural and comparative perspective; emphasizes relating literary texts and trends to the historical, sociocultural, political, and literary contexts of the subcontinent. Texts for South Asian languages are offered in English translation; in addition, there will be texts by South Asian authors written in English. Knowledge of a South Asian language not required. Prerequisite: Consent of course coordinator. 3 hours, or $\frac{1}{2}$ or 1 unit.

Persian

201. **Elementary Persian, I.** Introduction to Persian, including conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
202. **Elementary Persian, II.** Continuation of Persian 201, with introduction of more advanced grammar and with emphasis on more fluency in speaking and reading. Prerequisite: Persian 201 or equivalent. 5 hours.
205. **Introduction to Persian Culture and Literature, I.** Same as Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
206. **Introduction to Persian Culture and Literature, II.** Same as Comparative Literature 204. Continuation of Persian 205/ Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
303. **Intermediate Persian, I.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 202. 5 hours or 1 unit.
304. **Intermediate Persian, II.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 303. 5 hours or 1 unit.
305. **Advanced Persian, I.** Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 304. 3 hours or 1 unit.
306. **Advanced Persian, II.** Continuation of Persian 305. Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 305. 3 hours or 1 unit.

Sanskrit

201. **Elementary Sanskrit, I.** Introduction to Sanskrit, treating in full the grammar of the language as preparation for reading, and including the reading of sections of the Mahabharata. 5 hours.
202. **Elementary Sanskrit, II.** Continuation of Sanskrit 201. Prerequisite: Sanskrit 201. 5 hours.

MATHEMATICS

Head of Department: Professor Heini Halberstam

Department Office: 273 Altgeld Hall, 1409 W. Green, Urbana

101. **Basic Mathematics.** Review of arithmetic and the following topics in basic algebra: signed numbers, absolute value and the number line, first degree equations and inequalities, algebraic expressions and rules of exponents, factoring, and graphing. Enrollment is restricted. Prerequisite: Placement is determined by score on appropriate placement test, or consent of the Mathematics Department. 3 hours. Credit may not be used towards graduation in the College of LAS.
102. **Introductory Algebra.** Methods of elementary algebra, including simplification of algebraic expressions, solving linear and quadratic equations, equations of lines, systems of linear equations, and radicals. Enrollment is restricted. Prerequisite: Mathematics 101, or score on appropriate placement test, or consent of Mathematics Department. 3 hours. Credit may not be used towards graduation for students in the College of LAS.

- 104. Elements of Algebra and Trigonometry.** For premedical students and students in the curriculum preparatory to the teaching of biology who have entered with only one unit of high school algebra and who need credit in trigonometry as a prerequisite to physics. Students who enter with one and one-half units of algebra must take Mathematics 114. Credit in Mathematics 104 involves duplication of credit with Mathematics 111, 114, and 116, and does not serve as a prerequisite for Mathematics 120. Prerequisite: 1 unit of high school algebra; 1 unit high school plane geometry. 3 hours. Credit is not given for both Mathematics 104 and 116.
- 111. Algebra.** Examines the real number system: factoring, powers and roots, rational expressions, equations and inequalities, the quadratic formula; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; the binomial theorem. An accelerated treatment of college algebra is given in Mathematics 112. Prerequisite: 1 unit of high school algebra, and 1 unit of high school geometry. 5 hours. Credit is not given for both Mathematics 111 and either 112 or 116.
- 112. College Algebra.** Rapid review of basic techniques of factoring, rational expressions, equations and inequalities; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; and the binomial theorem. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 ½ units of high school algebra, and 1 unit of high school geometry. 3 hours. Credit is not given for both Mathematics 112 and either 111 or 116.
- 114. Plane Trigonometry.** Studies degrees and radians, the trigonometric functions, identities and equations, inverse functions, oblique triangles and applications. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 ½ units of high school algebra, or concurrent registration in Mathematics 111 or 112; 1 unit of high school geometry. 2 hours. Credit is not given for both Mathematics 114 and 116.
- 116. College Algebra and Trigonometry.** A unified treatment of algebra and trigonometry that combines Mathematics 112 and 114. Students who need Mathematics 112 and 114 should enroll in Mathematics 116. Prerequisite: 1 ½ units of high school algebra; 1 unit of high school geometry. 5 hours. Credit is not given for both Mathematics 116 and either 111 or 112. Students with credit in Mathematics 114 may receive 3 hours credit for Mathematics 116.
- 118. Introduction to Mathematics, I.** An elementary course for students whose major interests are not in engineering or the physical sciences; provides an overall view of mathematics; emphasizes ideas and concepts rather than routine drill; and includes concepts from the following areas: combinatorics, number theory, the real and rational number systems, topology, representation of numbers, and map coloring. Prerequisite: 1 unit of high school algebra; 1 unit of high school plane geometry; or equivalent. 3 hours.
- 119. Introduction to Mathematics, II.** Continuation of Mathematics 118; includes concepts from the following areas: combinatorics, algebraic number theory, constructions, cardinal numbers, probability and statistics, analytic geometry, and calculus. Prerequisite: Mathematics 118. 3 hours.
- 120. Calculus and Analytic Geometry, I.** First course in calculus and analytic geometry; basic techniques of differentiation and integration with applications, including curve tracing in the plane. Students with strong backgrounds in analytic geometry should normally enroll in Mathematics 135. Prerequisite: Mathematics 116; or Mathematics 111 or 112, and Mathematics 114, or an adequate mathematics placement test score. 5 hours. Credit is not given for Mathematics 120 and Mathematics 134 or 135.
- 124. Finite Mathematics.** An introduction to finite mathematics for students in the social sciences; introduces the student to the basic ideas of logic, set theory, probability, vectors and matrices, and Markov chains. Problems are selected from social sciences and business. Prerequisite: Mathematics 111 or 112, or an adequate mathematics placement test score. 3 hours.
- 125. Elementary Linear Algebra with Applications.** Basic concepts and techniques of linear algebra; includes systems of linear equations, matrices, determinants, vectors in n -space, and eigenvectors, together with selected applications, such as Markov processes, linear

- programming, economic models, least squares, and population growth. Prerequisite: Mathematics 111 or 112, or an adequate placement test score. 3 hours. Credit is not given for both Mathematics 125 and 225.
132. **Calculus and Analytic Geometry, II.** Second course in calculus and analytic geometry: techniques of integration, conic sections, polar coordinates, vectors, and infinite series. Prerequisite: Mathematics 120. 3 hours.
134. **Calculus for Social Scientists, I.** Introduction to the concept of functions and the basic ideas of the calculus. Prerequisite: Mathematics 111 or 112. 4 hours. Credit is not given for Mathematics 134 and Mathematics 120 or 135.
135. **Calculus.** First course in calculus. Differentiation and integration; applications to curve-tracing, maxima and minima, area, and volume. Prerequisite: Completion of a thorough course in plane and solid analytic geometry, or equivalent. 5 hours. Credit is not given for both Mathematics 135 and 120.
149. **Honors Course in Mathematics.** Prerequisite: Concurrent registration in an honors section of Mathematics 120, 132 or 242; consent of the department. Enrollment is strictly limited to students with superior mathematical talents. 1 hour.
161. **Statistics.** Same as Statistics 100. See Statistics 100.
198. **Freshman Seminar.** Guides the student in the study of selected topics not considered in standard courses. Prerequisite: Enrollment in the mathematics honors program; consent of department. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Mathematics for Elementary Teachers.** A systematic presentation of elementary mathematics for juniors and seniors who are preparing to teach in elementary schools. Topics include decimal numerals, number systems, sets, and introductory algebra. A simultaneous development of teaching methods and materials may be included. Not acceptable for credit in the College of Liberal Arts and Sciences. Prerequisite: Junior standing in elementary education. 5 hours.
203. **Mathematics for Elementary Teachers.** Continuation of Mathematics 202. Topics include measurement, metric and nonmetric geometry, algebra, sets, and introduction to trigonometry, statistics, and probability. A simultaneous development of teaching methods and materials is also included. Not acceptable for credit in the College of Liberal Arts and Sciences. Prerequisite: Mathematics 202 or consent of instructor. 3 hours.
225. **Introductory Matrix Theory.** Systems of linear equations, matrices and inverses, determinants, and a glimpse at vector spaces, eigenvalues and eigenvectors. Prerequisite: Mathematics 120. 2 hours. Credit is not given for both Mathematics 225 and 125. Also, students with earned credit in Mathematics 315 may not receive additional credit for Mathematics 225, when 225 is taken after 315.
242. **Calculus of Several Variables.** Third course in calculus and analytic geometry: three dimensional space, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 132. 3 hours. Credit is not given for both Mathematics 242 and either Mathematics 244 or 245.
244. **Calculus for Social Scientists, II.** Continuation of Mathematics 134. The calculus of the trigonometric functions, Taylor polynomials, and infinite series; analytic geometry in n dimensions, vector calculus, classical extremum problems in n variables, and Lagrange multipliers; and multiple integrals. Prerequisite: Mathematics 134 or consent of instructor. 5 hours. Students may not receive credit for both Mathematics 244 and either Mathematics 242 or 245.
245. **Calculus, II.** Continuation of Mathematics 135. Polar coordinates, vectors and parametric equations, infinite series, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 135. 5 hours. Students may not receive credit for both Mathematics 245 and either Mathematics 242 or 244.
247. **Intermediate Analysis.** Advanced calculus for students in mathematics: topics include continuity, gradients, Jacobians, optimization, vector integration, Stokes' theorem, partial differential equations and applications. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 247 and 343. (Counts for advanced hours in LAS.)

- 250. Advanced Problem Solving.** The art and technique of solving mathematical problems. Prerequisite: The calculus. 1 hour. May be repeated to a maximum of 6 hours.
- 257. Numerical Methods.** Same as Computer Science 257. See Computer Science 257.
- 263. Statistics for Scientists.** Same as Statistics 210. See Statistics 210.
- 270. Actuarial Problem Solving.** Methods and techniques of solving problems in actuarial mathematics for advanced students intending to enter the actuarial profession. Prerequisite: Consent of instructor. 1 to 2 hours. May be repeated to a maximum of 4 hours.
- 290. Individual Study.** Guided individual study of advanced topics not covered in other courses. Prerequisite: Mathematics 347 with grade of B or better, or consent of department. 2 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Guided individual study of advanced topics not covered in other courses; for students seeking honors credit. Prerequisite: Mathematics 347 with grade of B or better, or consent of Mathematics Honors Committee. 2 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 296. Honors Seminar.** Careful study of a selected area of mathematics, carried out either deductively from axioms or inductively through problems; subject matter varies with instructor. Prerequisite: Consent of Mathematics Honors Committee. 3 hours. May be repeated to a maximum of 6 hours.
- 302. Topics on Geometry.** Historical development of geometry; includes tacit assumptions made by Euclid, Euclid's Fifth Postulate and its equivalents; the discovery of non-Euclidean geometries; geometry as a mathematical structure; and geometry as a study of invariants of set transformations. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
- 303. Advanced Aspects of Euclidean Geometry.** Selected topics from geometry, for example circumcircle, the nine-point circle, theorems on centroid and ortho-center, the construction of regular figures, isometries in the plane and space, rotations and translations, fixed points, ordered and affine geometries, and geometry of inversive plane. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
- 305. Teacher's Course.** Presents selected topics in mathematics that are related to the content of secondary school mathematics programs; provides background for enrichment topics for secondary school students. Subject matter varies with the instructor. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 306. History of Calculus.** An examination of the historical origins and genesis of the concepts of the calculus; includes mathematical developments from the ancient Greeks to the eighteenth century. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 308. Actuarial Statistics, I.** Same as Statistics 308. Examines elementary theory of probability, including independence, conditional probability, and Bayes' theorem; combinations and permutations; random variables, expectations, and probability distributions; joint and conditional distributions; functions of random variables; sampling; central limit theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit. Credit is not given for both Mathematics 308 and either Mathematics 361 or Statistics 310.
- 309. Actuarial Statistics, II.** Same as Statistics 309. Continuation of Mathematics 308. Examines parametric point and interval estimation, including maximum likelihood estimation, sufficiency, completeness, and Bayesian estimation; hypothesis testing; linear models; regression and correlation. Prerequisite: Mathematics 308. 4 hours or 1 unit. Credit is not given for both Mathematics 309 and Statistics 311.
- 310. Theory of Interest.** A study of compound interest and annuities; applications to problems in finance. Prerequisite: Mathematics 242 or 245. 3 hours or 1 unit.
- 311. Actuarial Linear Techniques.** Introduces techniques of linear algebra and linear programming; topics include matrix operations, determinants, linear equations, vector spaces, linear programs, the simplex method, and duality for linear programs. Prerequisite: Credit or concurrent registration in Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 311 and either 315 or 383.
- 312. Graph Theory and Its Applications.** Examines basic concepts and applications of graph theory, where graph refers to a set of vertices and edges that join some pairs of vertices;

topics include subgraphs, connectivity, trees, cycles, vertex and edge coloring, planar graphs and their colorings. Draws applications from computer science, operations research, chemistry, the social sciences, and other branches of mathematics, but emphasis is placed on theoretical aspects of graphs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.

- 313. Combinatorial Mathematics.** Same as Computer Science 313. Permutations and combinations, generating functions, recurrence relations, inclusion and exclusion, Polya's theory of counting, and block designs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 314. Introduction to Mathematical Logic.** Introduction to the formalization of mathematics and the study of axiomatic systems; detailed treatment of the propositional calculus and the first-order predicate calculus; and Godel's completeness and compactness theorems with applications to specific mathematical theories. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
- 315. Linear Transformations and Matrices.** An introductory course emphasizing techniques of linear algebra; topics include matrix operations, determinants, linear equations, vector spaces, linear transformations, eigenvalues, and eigenvectors. Prerequisite: Mathematics 242 or 245; elementary knowledge of matrix multiplication, Gaussian elimination, matrix inverses, and calculation of determinants (e.g., Mathematics 125 or 225). 3 hours or 1 unit.
- 317. Introduction to Abstract Algebra.** An introductory course in abstract algebra; includes modular arithmetic, permutations, group theory through the isomorphism theorems, ring theory through the notions of prime and maximal ideals, and additional topics such as unique factorization domains and classification of groups of small order. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 318. Introduction to Linear Algebra.** Abstract approach emphasizing concept of linear transformation; topics include linear equations, vector spaces, linear transformation, matrices, determinants, invariant subspaces, direct sum decompositions, canonical forms, inner product spaces, and bilinear forms. Emphasizes proofs. Prerequisite: Junior standing and two courses beyond calculus, or consent of instructor. 3 hours or 1 unit.
- 319. Applied Modern Algebra.** Same as Electrical Engineering 319. Sets and functions, finite-state machines, partially ordered sets, Boolean algebras, normal form of switching functions, the semigroup of a machine, and group codes. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 323. The Calculus of Curves and Surfaces.** Applications of the calculus to the study of shape and curvature of curves and surfaces; introduction to vector fields, differential forms on Euclidean spaces, and the method of moving frames for low-dimensional differential geometry. Prerequisite: Mathematics 242 or 245; or equivalent. 3 hours or 1 unit.
- 332. Introduction to Set Theory and Topology.** Informal set theory, cardinal and ordinal numbers, and axiom of choice; topology of metric spaces and introduction to general topological spaces. Prerequisite: Credit or concurrent registration in Mathematics 347. 3 hours or 1 unit.
- 339. Philosophy of Mathematics.** Same as Philosophy 339. See Philosophy 339.
- 340. Differential Equations with Linear Algebra.** An introduction to elementary linear algebra and ordinary linear differential equations; considers both single differential equations and systems of differential equations, with applications. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 340 and either Mathematics 341 or 345.
- 341. Differential Equations.** A basic course in ordinary differential equations; topics include existence and uniqueness of solutions and the general theory of linear differential equations; treatment is more rigorous than that given in Mathematics 345. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 341 and either 340 or 345.
- 342. Fourier Series and Boundary Value Problems.** Deals with the theory of Fourier series and applications to solving partial differential equations. Prerequisite: Mathematics 340, 341 or 345. 3 hours or 1 unit.

- 343. Advanced Calculus.** Introductory study of vector calculus and functions of several variables; topics include directional derivatives; Jacobians; change of variables in multiple integrals; maxima and minima; line and surface integrals; theorems of Gauss, Green, and Stokes; infinite series; and uniform convergence. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Students may not receive credit for both Mathematics 343 and 247.
- 344. Elementary Real Analysis.** Careful treatment of the theoretical aspects of the calculus of functions of a real variable; topics include the real number system, limits, continuity, derivatives, and the Riemann integral. Prerequisite: Mathematics 242 or 245. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
- 345. Differential Equations and Orthogonal Functions.** Intended for engineering students and others who require a working knowledge of differential equations; included are techniques and applications of ordinary differential equations and an introduction to partial differential equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for Mathematics 345 and either 340 or 341.
- 346. Complex Variables and Applications.** For students who desire a working knowledge of complex variables; covers the standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, Laplace transforms, and potential fields. Students desiring a systematic development of the foundations of the subject should take Mathematics 348. Prerequisite: Mathematics 343 or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
- 347. Introduction to Higher Analysis: Real Variables.** Careful development of elementary real analysis including such topics as completeness property of the real number system; basic topological properties of n -dimensional space; convergence of numerical sequences and series of functions; properties of continuous functions; and basic theorems concerning differentiation and Riemann integration. Prerequisite: Mathematics 242 or 245 (or equivalent) and junior standing; or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
- 348. Introduction to Higher Analysis: Complex Variables.** For students who desire a rigorous introduction to the theory of functions of a complex variable; topics include Cauchy's theorem, the residue theorem, the maximum modulus theorem, Laurent series, the fundamental theorem of algebra, and the argument principle. Prerequisite: Mathematics 347. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
- 351. Topics in Applied Mathematics.** Deals with topics in the application of mathematics to the physical, biological, and social sciences; see Timetable or department office for current topics. Prerequisite: Consent of instructor. 3 hours or 1 unit. May be repeated with consent of instructor.
- 352. Multivariate Real Analysis.** Rigorous treatment of the calculus of functions of several real variables; topics covered include differentials, maxima and minima, Lagrange multipliers, transformation of multiple integrals, Jacobian's, implicit function theorems, line and surface integrals, Stokes' theorem, and vector analysis. Prerequisite: Mathematics 347. 3 hours or 1 unit.
- 353. Elementary Theory of Numbers.** Topics covered include divisibility, primes, congruences, quadratic reciprocity, and Farey sequences. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 355. Numerical Methods for Partial Differential Equations.** Same as Computer Science 355. See Computer Science 355.
- 357. Mathematical Models in the Social Sciences.** Use of many models drawn from the social sciences to motivate, illustrate, and give a unified development of topics in one or more of the following areas: linear algebra, graph theory, Markov chains, linear and nonlinear systems of difference equations, and optimization. Prerequisite: Mathematics 134 or equivalent. 3 hours or 1 unit.
- 358. Numerical Analysis: Linear Problems.** Same as Computer Science 358. See Computer Science 358.
- 359. Numerical Analysis: Nonlinear Problems.** Same as Computer Science 359. See Computer Science 359.

- 361. Introduction to Probability Theory, I.** Same as Statistics 351. Introduction to mathematical probability; includes the calculus of probability, combinatorial analysis, random variables, expectation, distribution functions, moment-generating functions, and central limit theorem. Prepares students for Mathematics 366. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 363. Introduction to Mathematical Statistics and Probability, I.** Same as Statistics 310. See Statistics 310.
- 364. Introduction to Mathematical Statistics and Probability, II.** Same as Statistics 311. See Statistics 311.
- 365. Analysis of Variance.** Same as Statistics 324. See Statistics 324.
- 366. Introduction to Probability Theory, II.** Same as Statistics 356. Continuation of Mathematics 361. Includes random walks, discrete and continuous time Markov chains, and special topics selected from weak stationarity, multivariate central limit theorem, probability model building, stochastic equations, martingale theory, and renewal theory. Prerequisite: Mathematics 361 or Statistics 311. 3 hours or 1 unit.
- 368. Topics in Applied Statistics.** Same as Statistics 330. See Statistics 330.
- 369. Methods of Applied Statistics.** Same as Statistics 320. See Statistics 320.
- 370. Finite Differences.** Finite differences, finite integration, interpolation, difference equations, numerical integration, and iterative methods of solving equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 371. Actuarial Theory, I.** Single-life mortality functions, annuities, life insurance, premiums, and reserve. Prerequisite: Mathematics 310 or consent of instructor. 3 hours or 1 unit.
- 372. Actuarial Theory, II.** Continuation of Mathematics 371. Emphasis is on multiple-life functions. Prerequisite: Mathematics 371. 3 hours or 1 unit.
- 373. Combinatorial Algorithms.** Same as Computer Science 373. See Computer Science 373.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Computer Science 375. See Computer Science 375.
- 376. Actuarial Risk Theory.** Mathematical analysis of the risk to an insurer due to variations in expected claim numbers and amounts; optimal insurance systems; the probability of ruin in the long run; reinsurance; dividend formulas. Prerequisite: Credit or concurrent registration in Statistics 309 or 311. 3 hours or 1 unit.
- 377. Theory of Computable Functions.** An introductory course in which the concept of effective computability is made precise and studied; presents various types of algorithms, such as Turing machines and abstract register machines; studies the class of functions computable by such algorithms, with applications to the existence of algorithmically unsolvable problems in mathematics. Topics treated include sets which can be listed by algorithms, universal algorithms, unsolvability of the halting problem and generalizations, and self-referential algorithms and their applications. Prerequisite: Mathematics 375 or 314 or 317. 3 hours or 1 unit.
- 381. Vector and Tensor Analysis.** Vector spaces, transformation properties, covariant and contravariant tensors, and differential geometry of surfaces; with applications to relativity theory. Prerequisite: Mathematics 343 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 383. Linear Programming.** Same as Computer Science 383. Systems of linear inequalities, the standard canonical and general linear problems, and simplex methods of solution. Prerequisite: Mathematics 125, 225, or 315; or equivalent. 3 hours or 1 unit.
- 384. Nonlinear Programming.** Iterative and analytical solutions of constrained and unconstrained problems of optimization: gradient and conjugate gradient solution methods; Newton's method, LaGrange multipliers, and duality and the Kuhn-Tucker theorem; and quadratic, convex, and geometric programming. Prerequisite: Mathematics 242 or 245, and a knowledge of linear algebra equivalent to Mathematics 315, or consent of instructor. 3 hours or 1 unit.
- 385. Differential Equations, II.** Continuation of Mathematics 345. Linear systems of differential equations, including a self-contained development of the necessary matrix theory; the Laplace transform; and nonlinear differential equations. Prerequisite: Mathematics 341 or 345. 3 hours or 1 unit.

- 388. Mathematical Methods in Engineering and Science.** Matrices, determinants, bounds and approximations to eigenvalues, introduction to linear operator theory and inner product spaces, orthogonal expansions, and Fourier transforms. Prerequisite: Mathematics 343 or equivalent. 3 hours or 1 unit.
- 391. Switching Theory.** Same as Computer Science 391 and Electrical Engineering 391. Combinational electronic and relay switching networks; two-level design methods; and pulse-mode and fundamental mode sequential networks. Prerequisite: Computer Science 264, Electrical Engineering 290, or Mathematics 319, or consent of instructor. 3 hours or 1 unit.
- 392. Finite State Machines.** Same as Electrical Engineering 392 and Computer Science 392. Synchronous machines: state reduction of incompletely specified machines, series parallel decomposition, state assignment, and machine behavior; asynchronous machines: state assignment, hazards, and interacting machines. Prerequisite: Mathematics 319 and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
- 393. Statistical Computing.** Same as Statistics 328. See Statistics 328.
- 394. Time Series Analysis.** Same as Statistics 329. See Statistics 329.
- 400. General Seminar.** General seminar required of all graduate students who have passed the departmental written qualifying examination for the Ph.D. 0 units.
- 401. Second Course in Abstract Algebra, I.** Isomorphism theorems for groups; solvability of p -groups; simplicity of the alternating group on 5 letters; Sylow theorems and Jordan-Hölder theorem; principal ideal domains; Gauss' lemma; Eisenstein's criterion; fundamental theorem of Galois theory; finite fields; cyclotomic fields; and solvability of equations by radicals. Prerequisite: Mathematics 317 and 318. 1 unit.
- 402. Second Course in Abstract Algebra, II.** Modules; Hilbert basis theorem; Krull-Schmidt theorem; Wedderburn theorem on semisimple rings; finitely generated modules over principal ideal domains, with applications to abelian groups and canonical forms for matrices; categories and functors; tensor products; and bilinear and quadratic forms. Prerequisite: Mathematics 401. 1 unit.
- 403. Theory of Rings.** Ideal theory in commutative rings; structure of noncommutative rings. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 404. Group Theory.** Structure of groups, derived groups, nilpotence and solvability, and extensions and products. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 405. Algebraic Number Theory.** Further development of the theory of fields covering topics from valuation theory, ideal theory, units in algebraic number fields, ramification, function fields, and local class field theory. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 406. Homological Algebra.** Definition and properties of the functors Ext and Tor ; projective, injective, and flat modules; group extensions; dimensions of rings, and Hilbert theorem on syzygies. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 407. Group Representation Theory.** Representation of groups by linear transformations, group algebras, character theory, and modular representations. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 408. Lie Algebras.** Examples of Lie algebras (low dimensions, Lie algebras of Lie groups, free algebras, and universal enveloping algebra); Poincaré-Birkhoff-Witt theorem; nilpotent and solvable algebras; Cartan subalgebras; structure of semisimple algebras; real forms; and representations. Prerequisite: Mathematics 401; credit or concurrent registration in Mathematics 402. 1 unit.
- 410. Logical Foundations of Mathematics.** Development of the predicate calculus of first order as a framework for metamathematical investigations; consideration of the completeness and incompleteness theorems of Gödel. Prerequisite: Mathematics 314 or 317, or consent of instructor. 1 unit.
- 411. Model Theory.** Elements of model theory, including Löwenheim-Skolem theorems, categoricity, ultraproducts, and applications to algebra; decidability theory using both model theoretic methods and elimination of quantifiers. Prerequisite: Mathematics 410. 1 unit.
- 412. Recursive Function Theory.** Introductions to recursive functions; study of properties of recursive and recursively enumerable sets; degrees of unsolvability; and the implications of the Church-Turing thesis. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.

- 413. Set Theory.** Zermelo-Fraenkel axiomatic set theory; consideration of basic concepts in set theory such as ordinal, cardinal, and rank. Prerequisite: Mathematics 410. 1 unit.
- 414. Advanced Topics in Logic.** Prerequisite: Mathematics 410; consent of instructor. 1 unit.
- 415. Advanced Topics in the Theory of Groups.** Prerequisite: Consent of instructor. 1 unit.
- 416. Advanced Topics in Abstract Algebra.** Prerequisite: Consent of instructor. 1 unit.
- 418. Graph Theory.** Same as Computer Science 472. Structure of graphs; planarity and colorability of graphs; matrices associated with a graph; and automorphism group of a graph. Prerequisite: Mathematics 313, 317, or 319, or equivalent. 1 unit.
- 422. Algebraic Geometry.** Properties of affine and projective varieties defined over algebraically closed fields; rational mappings, birational geometry and divisors, especially on curves and surfaces; introduction to the language of schemes; and Riemann-Roch theorem for curves. Prerequisite: Mathematics 402. 1 unit.
- 423. Differentiable Manifolds.** Definition and properties of differentiable manifolds and maps, introducing vector fields, tangent bundles, differential forms, exterior derivatives, and foliations. Prerequisite: Mathematics 323 or 381, or consent of instructor. 1 unit.
- 424. Riemannian Geometry.** Local and global properties of Riemannian manifolds. Prerequisite: Mathematics 423. 1 unit.
- 425. Linear Analysis on Manifolds, I.** Study of topological invariants of differentiable and complex manifolds. Prerequisite: Mathematics 423 and 431, or consent of instructor. 1 unit.
- 427. Lie Groups.** Study of groups which are also differentiable manifolds. Prerequisite: Mathematics 423. 1 unit.
- 428. Topics in Geometry.** Prerequisite: Consent of instructor. 1 unit.
- 430. Elementary Geometry from a Modern Viewpoint.** Designed for secondary school teachers of mathematics; primary purpose is to discuss critically the logical structure and content of Euclidean geometry from the modern point of view; and consideration is given to the historical development of the modern approach. Prerequisite: Consent of instructor. 1 unit.
- 431. Algebraic Topology, I.** Homological algebra techniques, simplicial and singular homology, fundamental group and covering spaces, and applications. Prerequisite: Mathematics 318 and 332; concurrent registration in Mathematics 401 or consent of instructor. 1 unit.
- 432. Algebraic Topology, II.** Continuation of Mathematics 431. Axiomatic homology theory, fibrations and cofibrations, CW-complexes, cohomology products, and other topics. Prerequisite: Mathematics 431; concurrent registration in Mathematics 402. 1 unit.
- 433. Fiber Spaces and Characteristic Classes.** Continuation of Mathematics 432. Study of fiber bundles and their associated characteristic classes; applications to geometric problems. Prerequisite: Mathematics 432. 1 unit.
- 435. General Topology, I.** Study of topological spaces and maps, including Cartesian products, identifications, connectedness, compactness, uniform spaces, and function spaces. Prerequisite: Mathematics 332 or consent of instructor. 1 unit.
- 436. General Topology, II.** Continuation of Mathematics 435. Prerequisite: Mathematics 435. 1 unit.
- 438. Topics in Topology.** Prerequisite: Consent of instructor. 1 unit.
- 440. Theory of Functions of a Complex Variable, I.** Topics include the Cauchy theory, harmonic functions, entire and meromorphic functions, and the Riemann mapping theorem. Prerequisite: Mathematics 346 and 347, or Mathematics 348. 1 unit.
- 441. Real Analysis, I.** Lebesgue measure on the real line; integration and differentiation of real valued functions of a real variable; and additional topics at discretion of instructor. Prerequisite: Mathematics 347 or equivalent. 1 unit. Credit is not given for both Mathematics 441 and 481.
- 442. Real Analysis, II.** Abstract measure theory; integration on general measure spaces; and introduction to functional analysis. Prerequisite: Mathematics 441. 1 unit.
- 443. Ordinary Differential Equations.** Existence, uniqueness, and continuation of solutions; topics selected from the following: the theory of linear differential operators, Sturm-Liouville theory, stability theory, and qualitative theory of differential equations. Prerequisite: Mathematics 347; a first course in ordinary differential equations. 1 unit.

- 444. Partial Differential Equations.** A basic introduction to the study of partial differential equations; topics include: the Cauchy problem, power-series methods, characteristics, classification, canonical forms, well-posed problems, Riemann's method for hyperbolic equations, the Goursat problem, the wave equation, Sturm-Liouville problems and separation of variables, Fourier series, the heat equation, integral transforms, Laplace's equation, harmonic functions, potential theory, the Dirichlet and Neumann problems, and Green's functions. Prerequisite: Consent of instructor. 1 unit.
- 445. Theory of Functions of a Complex Variable, II.** Continuation of Mathematics 440. Topics include subharmonic functions, Nevanlinna theory, analytic continuation and Riemann surfaces, and univalent functions. Prerequisite: Mathematics 440. 1 unit.
- 446. Hilbert Spaces.** Geometrical properties of Hilbert spaces; linear operators; and the spectral theory for self adjoint and related operators. Prerequisite: Mathematics 442. 1 unit.
- 447. Banach Spaces.** Geometrical properties of Banach spaces; bounded linear operators; applications to analysis; and linear topological spaces. Prerequisite: Mathematics 442. 1 unit.
- 448. Harmonic Analysis.** Locally compact groups; Haar measure; Fourier analysis; and Tauberian theorems. Prerequisite: Mathematics 442. 1 unit.
- 451. Theory of Probability, I.** Same as Statistics 451. Mathematical foundations or probability and stochastic processes; probability measures, random variables, distribution functions, convergence theory, the Central Limit Theorem, conditional expectation, and martingale theory. Prerequisite: Mathematics 442. 1 unit. Credit is not given for both Mathematics 451 and either 481 or 482.
- 452. Theory of Probability, II.** Same as Statistics 452. Continuation of Mathematics 451. Prerequisite: Mathematics 451. 1 unit. Credit is not given for both Mathematics 452 and 482.
- 453. Analytic Theory of Numbers, I.** Problems in number theory treated by methods of analysis; topics chosen from prime number theory, Riemann zeta function, sieve methods, diophantine approximation, metric theory, partitions, lattice points, Waring's problem, and asymptotic properties of arithmetical functions. Prerequisite: Mathematics 317 or 348. 1 unit.
- 454. Analytic Theory of Numbers, II.** Continuation of Mathematics 453. Prerequisite: Mathematics 453. 1 unit.
- 455. Mathematical Methods of Physics.** Introduction to inner product spaces, linear operators, and Schwartz distribution theory; Green's functions for ordinary differential equations; and integral equations: Hilbert-Schmidt theory and Sturm-Liouville theory. Prerequisite: Mathematics 343 and 346. 1 unit.
- 456. Mathematical Methods of Physics.** Calculus of variations: Euler-Lagrange theory, Rayleigh-Ritz method, and Dirichlet principle; integral transform methods and separation of variables; and approximation methods: finite differences, Galerkin's method, and asymptotic expansions. Prerequisite: Mathematics 455 or consent of instructor. 1 unit.
- 457. Numerical Solution of Ordinary Differential Equations.** Same as Computer Science 457. See Computer Science 457.
- 458. Topics in Numerical Analysis.** Same as Computer Science 458. See Computer Science 458.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Nuclear Engineering, Physics and Theoretical and Applied Mechanics 459. An advanced methods course in asymptotic methods, with examples drawn from fluid mechanics, but designed to be mathematically instructive to all students of applied mathematics, engineering, and the physical sciences. Prerequisite: Mathematics 346 or Physics 413; or consent of instructor. 1 unit.
- 460. General Relativity and Cosmology.** Same as Astronomy and Physics 424. See Physics 424.
- 461. Applied Stochastic Processes.** Same as Statistics 455. Introduction to topics such as spectral analysis, filtering theory, and prediction theory of stationary processes; Markov chains and Markov processes. Prerequisite: Mathematics 346 and 347. 1 unit.

- 463. Information Theory.** Same as Computer Science 463 and Electrical Engineering 463. Mathematical models for information channels and sources; existence theorems for and construction of error-correcting codes. Prerequisite: Mathematics 361. 1 unit.
- 465. Topics in Automata Theory.** Same as Computer Science 465 and Electrical Engineering 465. Prerequisite: Mathematics 392 or consent of instructor. 1 unit.
- 466. Topics in Ordinary Differential Equations.** Introduction to current research in such areas as stability and asymptotic behavior of solutions; topological dynamics; numerical methods; and boundary value problems and spectral theory of differential operators. Prerequisite: Consent of instructor. 1 unit.
- 468. Topics in Analysis.** Prerequisite: Consent of instructor. 1 unit.
- 470. Statistical Decision Functions.** Same as Statistics 470. See Statistics 470.
- 471. Multivariate Analysis.** Same as Statistics 471. See Statistics 471.
- 472. Special Topics in Actuarial Theory.** Selected topics in advanced actuarial science. Prerequisite: Consent of instructor. 1 unit. May be repeated once for credit.
- 475. Topics in Combinatorics.** Same as Computer Science 475. See Computer Science 475.
- 476. Coding Theory.** Same as Electrical Engineering and Computer Science 456. See Electrical Engineering 456.
- 477. Graduation and Demography.** Construction and graduation of mortality and other tables; mathematical aspects of demography, especially measures of mortality and morbidity; and risk theory and reinsurance. Prerequisite: Mathematics 370 and 371. 1 unit.
- 478. Topics in Statistics.** Same as Statistics 478. See Statistics 478.
- 480. Optimization by Vector Space Methods.** Same as Electrical Engineering 480. Introduction to normed, Banach, and Hilbert spaces; applications of the projection theorem and the Hahn-Banach Theorem to problems of minimum norm, least squares estimation, mathematical programming, and optimal control; the Kuhn-Tucker Theorem and Pontryagin's maximum principle; and introduction to iterative methods. Prerequisite: Mathematics 315 or 383, and Mathematics 347 or consent of instructor. 1 unit.
- 481. Probability and Measure, I.** Same as Statistics 453. Measures and probabilities; integration and expectation; convergence theorems and inequalities for integrals and expectations; independence; convergence in probability, almost surely, and mean; Three Series Theorem; laws of large numbers. Prerequisite: Mathematics 347 or consent of instructor. 1 unit. Credit is not given for both Mathematics 481 and either Mathematics 441 or 451.
- 482. Probability and Measure, II.** Same as Statistics 454. Measure extensions, Lebesgue-Stieltjes measure, Kolmogorov consistency theorem; conditional expectation, conditional probability, martingales; distribution functions and characteristic functions; convergence in distribution; Central Limit Theorem. Prerequisite: Mathematics 481. 1 unit. Credit is not given for both Mathematics 482 and either 451 or 452.
- 483. Optimization in Networks.** Theory and methods for optimization over directed graphs; paths, cuts, flows, and potentials; matchings; PERT and CPM; max flow, min path, out-of-kilter, Hungarian, and other algorithms; nonlinear cost functionals; painting theory; and existence and duality. Prerequisite: Mathematics 242 or 245. 1 unit.
- 484. Conjugate Duality and Optimization.** Convex analysis for constrained extremum problems; convex sets, cones, and functions; separation; Fenchel transform; duality correspondences; differential theory; nonlinear programming; sensitivity; and perturbational duality for primal, dual, and Lagrangian problems. Prerequisite: Mathematics 315 and 347, or consent of instructor. 1 unit.
- 487. Theory of Approximation.** Same as Computer Science 487. General approximation theory in normed linear spaces; primary emphasis on functions defined on an interval, and periodic functions; existence and uniqueness theorems; characterization of Chebyshev approximants; degree of approximation; interpolation with emphasis on the quality of interpolants as approximants; and use of approximations in computing. Prerequisite: Mathematics 318 and 348, or consent of instructor. 1 unit.
- 488. Topics in Applied Mathematics.** Prerequisite: Consent of instructor. 1 unit.
- 490. Reading Course.** Prerequisite: Consent of instructor. 1 to 2 units.
- 499. Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

MECHANICAL AND INDUSTRIAL ENGINEERING

Head of Department: Professor B. T. Chao

Department Office: 152 Mechanical Engineering Building, 1206 West Green, Urbana

Industrial Engineering

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 232. Methods-Time Analysis.** Principles of motion economy affecting the design of a product or service; the effective use of human effort as related to the tools and equipment used in manufacturing and commercial endeavors; reasons for time study and the principles of determining time standards; study of standard data and other specific types of micro-motion standards; and applications of all phases of the studies to specific cases. Prerequisite: Junior standing. 3 hours.
- 238. Analysis of Data.** Nature of probabilistic models for observed data; discrete and continuous distribution function models; inferences on universe parameters based on sample values; and introduction to control charts, acceptance sampling, and measurement theory. Prerequisite: Completion of basic calculus. 3 hours.
- 282. Process Planning and Economy in Manufacturing.** Principles of engineering economy and their applications to manufacturing problems; studies of typical manufacturing processes and their economic factors; and exercises in planning processes for maximum efficiency. Prerequisite: Junior standing in engineering. 3 hours.
- 287. Job Evaluation and Wage Incentives.** Study of job evaluation techniques and wage incentive systems; problems of installing and maintaining job and position evaluation systems in industrial organizations. Prerequisite: Industrial Engineering 232 or equivalent; senior standing. 3 hours.
- 291. Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of industrial engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in industrial engineering; must be taken in Spring Semester. 0 hours.
- 296. Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 299. Thesis.** Investigation of special subjects and preparation of thesis embodying report on investigation, review of literature, and discussion of results. Prerequisite: Industrial Engineering 293 or 296. 3 hours.
- 305. Principles of Ergonomics.** Same as Physiology and Physical Education 305. Concepts and design criteria to achieve optimum mutual adjustment of man and his work; consideration of such topics as static and dynamic forces on the human frame; response to environmental stress (heat, vibration, noise); vigilance and fatigue; and man-machine systems. Prerequisite: Senior standing; consent of instructor. 4 hours or 1 unit.
- 332. Standard Time Systems.** The study of development, uses, and limitations of standard time data and predetermined time systems. Prerequisite: Industrial Engineering 232. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 334. Introduction to Reliability Engineering.** Same as General Engineering 334. An introduction to concepts in engineering design, testing, and management for highly reliable components and systems. Prerequisite: Industrial Engineering 238 or Mathematics 361, or equivalent with consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 335. Industrial Quality Control.** Control charts for attributes and variables; modified control chart techniques; acceptance sampling for attributes and variables; relationship to design, production, and procurement; quality cost analysis; military standards practice; survey

- and reports of current quality literature; and management of quality programs. Prerequisite: Industrial Engineering 238 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 336. Design and Analysis of Industrial Experimentation.** Randomized blocks, t-tests, and factorial and fractional factorial designs; concepts of randomization, blocking, screening, and confounding; second-order designs, response surface methodology, and evolutionary operation; and introduction to mechanistic model building and nonlinear estimation. All topics are treated through engineering applications and case studies. Prerequisite: Industrial Engineering 238 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 350. Computer-aided Manufacturing Systems.** The application of computer technology and operations research in manufacturing systems; includes the use of minicomputers and microprocessors for direct numeric control of machine tools, adaptive control and optimization, and integrated manufacturing systems, including applications of industrial robots. Prerequisite: Mechanical Engineering 285 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 355. Numerical Control of Manufacturing Processes.** Study of numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control. Prerequisite: Mechanical Engineering 285 or consent of instructor; background in computer technology. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 357. Safety Engineering.** Study of engineering principles applied to industrial accident prevention; safe plant layout; safety in maintenance; boilers and pressure vessels; design and application of machine guards; material handling and storage; hand and power tools; welding hazards; electrical hazards; flammable liquids and fire protection; industrial health engineering; and toxic materials. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 360. Analysis of Materials Machining.** An analytical approach to the mechanics and physics of various machining processes; covers the basic phenomena underlying process characteristics, such as wear, plastic flow, surface integrity, friction, and economics. Prerequisite: Mechanical Engineering 231 and 285, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Industrial Engineering Design Laboratory.** Covers basic experiments and computer-based laboratory projects in manufacturing, production planning and facilities management, and human factors, using realistic industrial engineering problem settings; stresses the development of objectives and evaluation criteria as well as methods for design synthesis, analysis, and testing. Prerequisite: Credit or concurrent registration in all required courses in the industrial engineering curriculum which carry the I E designation. 3 hours or $\frac{3}{4}$ unit.
- 385. Operations Research, I.** A first course in operations research techniques and their application to systems analysis and design; includes linear programming, linear models, simplex method, transportation methods, assignment algorithms, sensitivity analysis, dynamic programming, and introduction to inventory and queueing theory. May not be used toward fulfillment of the M.S. in industrial engineering degree requirements nor toward the Ph.D. in mechanical engineering degree requirements for industrial engineering majors. Prerequisite: Completion of basic calculus; junior standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 386. Operations Research, II.** Continuation of Industrial Engineering 385; includes advanced linear programming, matrix forms, revised simplex method, bounded variables, primal-dual methods, parametric programming, integer programming, stochastic processes, queues, inventories, maintenance, simulation, and modeling; and emphasizes model building and treatment of uncertainty. Prerequisite: Industrial Engineering 238 and 385, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 388. Applications of Operations Research to Industrial Systems.** Application of operations research and systems analysis techniques to problems in engineering and management; uses cases and games to introduce the student to problem formulation, decision making, and evaluation of results; and includes introductory decision theory, network models, project planning with CPM and PERT, scheduling and sequencing, assembly line balancing, and replacement models. Prerequisite: Industrial Engineering 385 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 393. Special Problems.** Study of advanced problems related to industrial engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Mathematical Programming, I: Applied Nonlinear Programming.** Optimization of nonlinear systems, including a survey of classical methods and concepts such as the Lagrangian method, the Jacobian method, and Kuhn-Tucker conditions; emphasizes modern algorithms, numerical methods for digital computers, applications in engineering design, and use of state of the art computer codes. Prerequisite: Industrial Engineering 385 or equivalent, or consent of instructor. 1 unit.
- 402. Mathematical Programming, II: Dynamic and Geometric Programming.** The formulation and construction of dynamic programming models and advanced dynamic programming concepts such as treatment of multistate variables, nonserial systems, and Markov processes; geometric programming, including treatment of degree of difficulty, mixed signs, and computational refinements; and emphasis on applications in engineering design. Prerequisite: Statistics 310 and Industrial Engineering 385, or equivalent; or consent of instructor. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Civil Engineering 416. Basic concepts, theories, and techniques of systems analysis, including modeling of large scale systems, forecasting, planning, control, and information handling; emphasizes the modeling of systems with network techniques, including distance, flow, and project networks; and discusses advanced network topics such as out-of-kilter algorithm and project resource analysis. Prerequisite: Industrial Engineering 388 or Civil Engineering 292, or equivalent, or consent of instructor. 1 unit.
- 417. Systems Analysis, II: Digital Simulation.** Same as Civil Engineering 417. The application of simulation techniques to systems analysis; includes modeling for simulation, design of simulation experiments, random number generation, process generation, simulation of queueing systems, inventory systems, and project networks, analysis of simulation results, and some digital simulation languages and programs in use, such as GASP II and GERTS III. Prerequisite: Industrial Engineering 385 or Civil Engineering 293, and some exposure to computer programming. 1 unit.
- 458. Laboratory Investigations in Industrial Engineering.** Special investigations of such problems as optimization of operations, programming systems, work standards, plant layout, and flow of materials. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.

Mechanical Engineering

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Thermodynamics.** Introduction to classical thermodynamics through the second law; system and control volume analyses of thermodynamic processes; irreversibility and availability; relations among thermodynamic properties; and discussion of microscopic aspects. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
- 207. Thermodynamics.** Energy and its transformations; properties of thermodynamic media, including kinetic theory analysis; thermodynamic processes of open and closed systems; reversibility and limitations; entropy and the second law; thermodynamics temperature scales; and second law analysis of chemically reactive systems. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
- 209. Thermodynamics and Heat Transfer.** Thermodynamic analysis of energy transfer and transformation; properties of simple working substances; analysis of open and closed systems, direct and reversed cycles, and processes involving transfers of mass and energy; and basic laws of heat transfer. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
- 211. Introductory Gas Dynamics.** Introduction to dynamics; special emphasis on the theory and engineering applications of compressible high velocity flows. Prerequisite: Mathematics 345, Physics 107, and credit or concurrent registration in Mechanical Engineering 205. 3 hours.
- 213. Heat Transfer.** Principles and application of heat transfer by conduction, convection, and thermal radiation. Prerequisite: Mechanical Engineering 211. 3 hours.

- 220. Mechanics of Machinery.** Fundamentals of linkages, design of cams, kinematics of gearing, analysis of gear trains, velocity, acceleration and force analysis of systems of rigid bodies, and balance of rigid rotors and reciprocating machinery. Prerequisite: Engineering mechanics (statics and dynamics) and Computer Science 101. 3 hours.
- 225. Mechanism, Kinematics and Design.** Linkages, cams and gears, velocities, accelerations, inertia forces, vibrations, fasteners, springs, clutches and other machine elements. Prerequisite: Theoretical and Applied Mechanics 154 and 221. 4 hours.
- 231. Introduction to the Science of Materials.** Relates atomic structures of materials to bonding and structure in crystalline and non-crystalline solids; uses elementary thermodynamic concepts in discussing phase diagrams, phase transformations, corrosion, and oxidation; discusses mechanical behavior of materials and its relationship to crystal structure, dislocations, and strengthening mechanisms; describes structural-property relations in ceramics from atomistic and microstructural points of view; introduces polymers and polymerization mechanisms and relates their structure to mechanical properties; and describes composite materials and their failure modes. Prerequisite: Junior standing in engineering. 3 hours.
- 232. Thermal Processing of Materials.** Discusses thermal processing of materials with reference to solidification, heat treatment and welding of metals, extrusion and molding of polymers, and sintering of ceramics; relates control of shape, structure, and properties of materials to the fundamentals of heat flow, solidification, and heat treatment; and describes processing of thermosetting plastics and thermoplastics, vulcanization, and fiber manufacture. Prerequisite: Mechanical Engineering 213 and 231. 2 hours.
- 233. Materials Laboratory.** Materials laboratories dealing with the following subjects: crystallography, metallography, mechanical testing, solidification and foundry, recrystallization, age hardening, hardenability, fracture, and mechanical properties of polymers. Prerequisite: Concurrent registration in Mechanical Engineering 232. 1 hour.
- 240. Modeling and Analysis of Dynamic Systems.** Dynamic analysis of mechanical systems; modeling of mechanical components and systems; analysis of single and multiple degree of freedom linear systems; simulation of nonlinear systems; introduction to continuous systems and lumping techniques; and introduction to feedback control systems. Prerequisite: Mathematics 345. 4 hours. Credit is not given for both Mechanical Engineering 240 and General Engineering 222.
- 250. Thermal Science Laboratory.** Basic experiments in thermodynamics, gas dynamics, and heat transfer and their applications; experiments selected to introduce pertinent instrumentation and experimental techniques, and to further the understanding of fundamentals via physical observations. Prerequisite: Mechanical Engineering 205 and 213. 3 hours.
- 261. Introduction to Instrumentation, Measurement, and Control Fundamentals.** Basic elements of a measurement system; recording instruments, transducers, and signal conditioning; and data recording and controls, analog and digital devices and control. Prerequisite: Electrical Engineering 260. 3 hours.
- 270. Analysis and Design of Machines.** Applications of mathematics, material science, and engineering mechanics to problems in analysis and design of machine components; considers function, production, and economic factors of design; and includes fasteners, springs, gearing, bearings, shafting, clutches, and lubrication. Prerequisite: Mechanical Engineering 220 and Theoretical and Applied Mechanics 221. 4 hours.
- 275. Creativity in Engineering Design.** Study of engineering systems to show the creative use of scientific principles and design procedures; survey of natural laws and examples of their creative application; and introduction to methods for promoting creativity in engineering. Prerequisite: Mechanical Engineering 270. 3 hours.
- 285. Analysis of Manufacturing Processes.** Introduction to materials processing methods, including chip formation and deformation processes; analysis of process performance, including forces and energy, surface roughness, tool wear and tool life, and dimension precision; machine tool dynamics and vibrations, process planning, and optimization; nontraditional machining processes; introduction to numerical control of machine tools; and polymer processing and the use of various materials including plastics. Prerequisite: Mechanical Engineering 231 or equivalent. 3 hours.

- 291. Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of mechanical engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in mechanical engineering; must be taken in Spring Semester. 0 hours.
- 293. Special Projects.** Experimental and analytical investigation in mechanical engineering research. Prerequisite: Senior standing in mechanical engineering; consent of head of department. 3 hours.
- 296. Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 299. Thesis.** Investigation of special subjects and preparation of thesis embodying report on investigation, review of literature, and discussion of results. Prerequisite: Mechanical Engineering 293 or 296. 3 hours.
- 301. Intermediate Thermodynamics.** Basic considerations of the three laws of thermodynamics; elementary statistical principles for the prediction of properties of pure substances and mixtures; transport properties; electric magnetic and chemical processes. Prerequisite: Mechanical Engineering 205 or first course in thermodynamics. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 302. Nuclear Power Engineering.** Same as Nuclear Engineering 302. See Nuclear Engineering 302.
- 304. Energy Conversion Systems.** Analyzes processes and systems for energy conversion; design cases include power and refrigeration cycles, thermionics, thermoelectrics, fuel cells, and radiation batteries. Prerequisite: Mechanical Engineering 205, 207, or 209; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in mechanical engineering.
- 305. Intermediate Gas Dynamics.** Solution of internal compressible flow problems by one-dimensional techniques, both steady and unsteady; considers flows with area change (smooth and abrupt), with friction, with heat addition, and with mass addition. Examines flows with weak and strong waves, multiple confined streams, and shock waves. Prerequisite: Mechanical Engineering 205 and 211, or first course in fluid mechanics. 4 hours or 1 unit.
- 306. Intermediate Heat Transfer.** Conduction heat transfer, radiation heat transfer, mass transfer, phase change, heat exchangers, and introductory numerical methods. Prerequisite: Undergraduate courses in fluid mechanics and heat transfer, or consent of instructor. 4 hours or 1 unit.
- 307. Solar Energy Utilization.** Emphasizes solar thermal processes; considers basic sun-earth geometry, the optics of solar energy collectors, and associated heat transfer mechanisms in detail; and includes flat plate collectors, concentrating collectors, energy storage, modeling and system simulation, and economics. Prerequisite: Mechanical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 308. Fluid Mechanics of Convective Heat Transfer.** Same as Theoretical and Applied Mechanics 308. Analyzes viscous flows and heat transfer by convection processes; solution to Navier-Stokes equations for heat conducting laminar and turbulent shear layers; similarity concepts; thermal entry lengths pipe flows; computer solution techniques. Prerequisite: Mechanical Engineering 211 or first course in fluid mechanics. 4 hours or 1 unit.
- 311. Instrumentation and Measurements.** Same as Agricultural Engineering 311. See Agricultural Engineering 311.
- 312. Modern Control Theory.** The concept of state; state-space representation of systems; transfer function decomposition and state-variable diagrams; state response of continuous and discrete-data systems; determination of the transition matrix; diagonalization; state response of time-varying systems; controllability and observability; stability and Lyapunov's method; and introduction to optimization and design. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 4 hours or 1 unit.

- 313. Computer Control of Mechanical Engineering Systems.** Examines microcomputer control of thermal and mechanical systems: sensing and transducing of variables, transmitting and converting signals, and actuating regulators associated with mechanical engineering systems. Prerequisite: Mechanical Engineering 261 or Agricultural Engineering 311. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Introduction to Tribology.** Basic concepts of friction and wear; lubricants and their application; hydrodynamic bearing theory; lubrication requirements and methods; externally pressurized bearings; gas bearings; dynamics and stability of bearings systems; elastohydrodynamic lubrication of rolling element bearings and gears; numerical approaches to lubrication problems. Prerequisite: Mechanical Engineering 211 or equivalent; or consent of instructor. 4 hours or 1 unit.
- 321. Refrigeration and Cryogenics.** The theory of operation and the design of equipment for the production of low temperatures from below ambient down to near absolute zero; applications to industrial, consumer, aerospace, medical, and various research uses. Prerequisite: Mechanical Engineering 205, 211, and 213, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Design of Thermal Systems.** Selection of components in fluid- and energy-processing systems to meet system performance requirements; computer-aided design; system simulation; optimization techniques; and investment economics and statistical combinations of operating conditions. Prerequisite: Credit or concurrent registration in Mechanical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Internal Combustion Engines.** Study of the fundamental principles underlying the theory and analysis of reciprocating internal combustion engines, fuels, carburetion, combustion, exhaust emissions, detonation, fuel injection, and factors affecting performance; basic laboratory work involving measurements of effects of variables on performance. Prerequisite: Credit or concurrent registration in Mechanical Engineering 304 or Agricultural Engineering 346, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 332. Theory of Internal Combustion Engines.** Analysis of internal combustion engines, including thermodynamics, combustion and effects of mixtures, chemical equilibrium and dissociation, exhaust emissions and air pollution, flow through valves, breathing, supercharging and turbocharging, lubrication, friction, and combustion chamber design. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 333. Air Pollution and Combustion.** Same as Aeronautical and Astronautical Engineering 335 and Civil Engineering 358. See Aeronautical and Astronautical Engineering 335.
- 335. Power Systems Engineering and Economy.** Application of thermodynamic principles and fluid flow and heat transfer processes to power systems; determination of system characteristics and methods to satisfy these requirements with awareness of economic factors and ecological considerations. Prerequisite: Mechanical Engineering 211, 213, and credit or concurrent registration in Mechanical Engineering 304; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 336. Automotive Vehicle Dynamics.** Introduction to the dynamics and control of automotive multidegree of freedom systems; the development and solution of governing equations for both steady state and transient conditions by computer simulation techniques; investigation of the performance, handling, and safety aspects of vehicles and their interaction with external and internal interfaces; examination of the influence of tires, suspension, steering, and aerodynamic forces; and laboratory experiments and demonstrations. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 341. Engineering Analysis and Design.** Correlation of previously acquired design experience with the creative problem of synthesis and analysis that depend upon design judgment. Prerequisite: Mechanical Engineering 270 or senior standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 342. Kinematic Analysis and Synthesis.** Geometry of constrained motion; application of mathematical and other techniques to the kinematic analysis and synthesis of mecha-

nisms. Prerequisite: Mechanical Engineering 270 or senior standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 345. Introduction to Finite Element Analysis.** Applies the finite element method to solve problems from various branches of mechanical engineering; topics include stress analysis, vibration, heat transfer, and fluid flow. Prerequisite: Computer Science 101, Mechanical Engineering 213, and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 346. Materials and Design.** Examines the relationship of material properties and mechanics concepts to the design of structures and components; topics include a brief introduction to elasticity, plasticity, viscoelasticity, creep, fatigue, and fracture as they relate to materials selection and design. Prerequisite: Theoretical and Applied Mechanics 221, Mechanical Engineering 233, or Theoretical and Applied Mechanics 224; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 355. Polymer Processing.** Analyzes polymer processing operations from engineering fundamentals; fluid and heat flow of non-Newtonian fluids; relationship of processing to material structure and properties; considers conventional processes, such as extrusion and injection molding; uses computer-aided design techniques; synthesis of new processes. Prerequisite: Mechanical Engineering 232 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 357. Introduction to Laser Materials Processing.** Examines the application of lasers in materials processing; laser/material interaction mechanisms, laser optics, welding, surface alloying, cladding, chemical vapor deposition, heat treatment, cutting and surface glazing processes, mathematical modeling of processes, microstructure and mechanical properties of processed materials, and correlation of process parameters and properties through transport phenomena modeling. Prerequisite: Mechanical Engineering 232 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 375. Introduction to Bionics.** Biological concepts and data aiding in the solution of engineering problems; analysis of mechanisms found in living systems and their application to the design of mechanical devices. Prerequisite: Mechanical Engineering 270 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 388. Industrial Control Systems.** The study of industrial control techniques by case studies of actual industrial systems; provides competence in the design, selection, and maintenance of industrial control systems; and introduces applications to electromechanical, pneumatic, thermal, and hydraulic systems. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 389. Transport Phenomena in Metals Processing.** Fundamentals of control of shape, structure, and properties of metals through processing; fundamentals of heat flow, fluid flow, and mass transport applied to metals processing. Examples of processes considered: thermal treatments, solidification, vapor deposition and powder processing and consolidation. Prerequisite: Mechanical Engineering 232 and 233, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 393. Special Problems.** Study of advanced problems related to mechanical engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Thermodynamics and Transport Properties.** Thermodynamic and microscopic considerations for the prediction of properties; caratheodory principle; relations among properties; microscopic considerations and statistical methods; thermodynamic and transport properties; and fluctuation and nonequilibrium thermodynamics. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
- 402. Nonequilibrium Multiphase Processes.** Dynamics and thermodynamics of multiphase and multicomponent systems with special relevance to air pollution control and energy conversion; relaxation phenomena; general motion of systems of disparate elemental masses; diffusion in gravitational and electric fields, and boundary layer motion with mass transport; dispersion and collection of particulate matter; and transport with surface reactions. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
- 403. Fundamentals of Combustion.** Same as Aeronautical and Astronautical Engineering 438. See Aeronautical and Astronautical Engineering 438.

- 404. Gas Dynamics, I.** Introduction to theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Prerequisite: Mechanical Engineering 305 or equivalent, or consent of instructor. 1 unit.
- 405. Convective Heat Transfer.** Fundamentals of convective heat transfer; calculation of heat transfer within conductor and over submerged objects for laminar and turbulent flow; natural convection; film condensation and boiling; and liquid metals. Prerequisite: Mechanical Engineering 308 or consent of instructor. 1 unit.
- 406. Heat Conduction in Solids.** Fundamentals of heat conduction in isotropic and anisotropic solids; methods of solution to steady and transient heat conduction problems in one, two, and three dimensions; internal heat sources; periodic flow of heat; problems involving phase change; and approximate analytical techniques. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
- 408. Laboratory Investigation in Thermodynamics.** Special investigations involving thermodynamic analysis, thermodynamic properties, and performance of physical and chemical systems. Prerequisite: One-year course in thermodynamics; one half-year course in thermal science laboratory or equivalent. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 409. Laboratory Investigations in Fluid Flow, Heat Transfer, and Combustion.** Special investigation in flow, metering, heat transfer, and heat exchanger performance and design. Prerequisite: Courses in thermodynamics and fluid mechanics. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 410. Thermal Radiation.** Fundamentals of radiant energy transport in absorbing and nonabsorbing media; pyrometry; and applications to selected problems involving combined energy transport mechanisms. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
- 411. Control of Air Pollution from Stationary Sources.** Same as Civil Engineering 448. See Civil Engineering 448.
- 412. Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Environmental Studies 449. See Civil Engineering 449.
- 423. Thermal Systems.** Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: Mechanical Engineering 323. 1 unit.
- 428. Investigations in Thermal Systems.** Investigations in the modeling, simulation, and optimization of thermal systems such as power generating, heating and cooling, and thermal processing systems. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 429. Investigations in Environmental Control.** Investigations in heating, ventilating, air conditioning, and human comfort. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 432. Theory of Rotary Compressors.** Thermodynamical and mechanical fundamentals; compression with and without cooling; classification of compressors; similarity considerations and characteristics; principles of and computations for radial compressors; improvement in performance of integrating parts; axial flow compressors; lattice and airfoil theory; change in operating conditions of turbo-compressors; regulation; and rotary positive blowers. Prerequisite: Mechanical Engineering 304 and 305, or consent of instructor. 1 unit.
- 433. Gas Turbine Engines.** Comprehensive description of gas turbine theory and technology; aerothermodynamics of inlet, compressor, combustor, turbine, and nozzle flows; optimization of performance; and applications to aircraft engines and stationary gas turbine power plants. Prerequisite: Mechanical Engineering 305 or equivalent. 1 unit.
- 438. Laboratory Investigations in Power Machinery.** Special investigations in power machinery, such as turbines, engines, fans, and compressors. Prerequisite: One-year course in power laboratory. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 440. Analysis, Modeling, and Design of Man-Machine Systems.** Input-output models of man as an information processor, controller, and decision maker are critically evaluated and applied to the analysis and design of specific man-machine systems. Intended for graduate students working in areas of man-machine systems, engineering psychology, control systems, or operations research. Prerequisite: Mechanical Engineering 240 and Industrial Engineering 238, or equivalent and consent of instructor. 1 unit.

- 443. Dynamics of Machinery.** Examines generalized equations of motion for single-degree-of-freedom mechanisms; modeling of mechanical systems; dynamics of flexible cam systems; dynamics of rotor systems; dynamics of clutches and brakes; isolation of mechanical vibration and impact; introduction to impact; balancing of machines. Prerequisite: Theoretical and Applied Mechanics 311 or equivalent; consent of instructor. 1 unit.
- 445. Design of Internal Combustion Engines.** Comprehensive study of the design of internal combustion engines, including gas forces, inertia loads, bearing analysis, torsional vibration, balance, lubrication, valve and cam design, and stress analysis of major parts of the engine. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 1 unit.
- 448. Laboratory Investigations in Machine Design.** Special investigations in machine design. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 452. Solidification Processing.** Same as Metallurgical Engineering 452. Principles of control of structure, properties, and shape in processes involving liquid/solid transformations; stresses heat flow, mass transport, solute redistribution, nucleation and growth kinetics; and the relationship between process variables and structures and properties in the resultant material. Examples are drawn from existing commercial and new developing processes. Prerequisite: Mechanical Engineering 389 or consent of instructor. 1 unit.
- 455. Polymer Rheology and Processing.** Continuum models for non-Newtonian fluids: generalized Newtonian, linear viscoelastic and nonlinear viscoelastic models; examines relationship of rheology to processing; considers advanced problems in polymer processing such as numerical simulations of nonisothermal non-Newtonian flows, reactive processing and processing of composites. Prerequisite: Mechanical Engineering 355 or consent of instructor. 1 unit.
- 493. Seminar.** Required of all graduate students each semester with the exception of doctoral candidates who have passed their preliminary examination. Presentation and discussion of significant developments in mechanical engineering. $\frac{1}{4}$ unit.
- 497. Special Problems in Mechanical Engineering.** Lectures, seminars, and individual investigations or studies in selected areas of mechanical engineering. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
- 499. Thesis Research.** 0 to 4 units.

MEDICAL SCIENCES

Assoc. Dean of College of Medicine: Professor William E. Sorlie

College Office: 190 Medical Sciences Building, 506 S. Mathews, Urbana

- 300. Medical Sciences.** First-year program in preparation for the M.D. degree involving guided study of anatomy, behavioral science, biochemistry, genetics, immunology, microbiology, neuroscience, pathology, embryology, histology, introduction to clinical medicine, nutrition and medical statistics, and physiology. Elements of clinical experience are monitored and presented by faculty in the clinical and basic medical sciences. Prerequisite: Enrollment is limited to students accepted by the College of Medicine. 19 hours (summer session, 9 hours).
- 301. Clinical Medicine.** Second-year program in preparation for the M.D. degree involving classroom and clinical instruction in skills required for acquisition of clinical data base (history-taking, physical exam, lab use, biostatistics); basic pathology and pharmacology; and patho-physiological bases of clinical problems. For instructional purposes, medicine is divided into twenty-one instructional segments. Faculty present and monitor learning experiences, which include lecture/discussion, tutorials, and supervised clinical experiences. Prerequisite: Limited to second-year students in the College of Medicine. 19 hours (summer session, 9 hours).
- 302. Supervised Medical Practice.** Third year of preparation for the M.D. degree. Students

rotate among affiliated hospitals in medicine, surgery, obstetrics and gynecology, pediatrics, and other fields and are assigned to patient care teams. Physicians and clinical faculty supervise their clinical practice. Increases students' understanding of the pathophysiological basis of patient problems and teaches patient management skills. Prerequisite: Third-year standing in the College of Medicine. 19 hours (summer session, 9 hours).

- 303. Medical Electives.** Fourth year of preparation for the M.D. degree. With approval and guidance of their faculty advisor, students select a program of elective courses which will enhance their clinical skills. These elective courses may be in medicine, surgery, obstetrics and gynecology, pediatrics, family practice, urology, dermatology, basic science or clinical research, and other fields approved by the Elective Committee. Prerequisite: Fourth-year standing in the College of Medicine. 0 or 19 hours (summer session, 0 or 9 hours).
- 370. Patient Assessment.** Introduction for nurses and nursing students to basic techniques for eliciting a medical history and performing a physical examination; simulated patients, practical instructors, paired practice, and videotape techniques facilitate instruction by M.D.'s and mid-level health care practitioners. Prerequisite: Consent of instructor. 9 hours.
- 374. General Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
- 461. Advanced Clinical Nutrition, I.** Same as Nutritional Sciences 461. See Nutritional Sciences 461.
- 462. Advanced Clinical Nutrition, II.** Same as Nutritional Sciences 462. See Nutritional Sciences 462.

METALLURGY AND MINING ENGINEERING

Head of Department: Professor C. A. Wert

Department Office: 201 Metallurgy and Mining Building, 1304 W. Green, Urbana

Metallurgical Engineering

- 198. Introduction to Metallurgy.** Lecture series by the faculty to orient freshmen to the field of metallurgy and to the study of materials. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 296. Metallurgical Seminar.** Review of current metallurgical literature; classroom reports and discussions; and preparation of technical abstracts and reports. Prerequisite: Senior standing in metallurgical engineering. 2 hours.
- 299. Thesis.** Investigation of special problems and preparation of a thesis. May be substituted for certain technical subjects in the senior year. Prerequisite: Senior standing; approval of head of department. 1 to 3 hours.
- 301. Welding and Joining Processes.** Same as Civil Engineering 375. The physical principles of fusion welding; heat flow; thermal cycles; physical metallurgy and mechanical properties of welded joints; applications of welding to large structures; testing of welds; nondestructive testing; design, economics, and weld specifications; and laboratory experiments in welding. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 306. Design of Engineering Alloys.** A study of the fundamental principles which determine the constitution, structure, treatment, and application of alloy steels and other special-purpose high-performance alloys. Prerequisite: Metallurgical Engineering 372. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 307. Corrosion of Metals.** Electrochemistry, thermodynamics, and kinetics of corrosion; behavior of ferrous and nonferrous metals; corrosion rates; corrosion control; cathodic and anodic protection; high-temperature corrosion; corrosion testing; and electrolytic machining methods. Prerequisite: Mechanical Engineering 234 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 310. Crystallography and Diffraction.** Study of structure and composition of solids using X-rays and electron beams; radiography, spectroscopy, and X-ray and electron metallography. Prerequisite: Physics 108. 4 hours or 1 unit.
- 312. Ternary Phase Diagrams.** Interpretation of ternary phase diagrams and applications to engineering alloy systems. Prerequisite: Metallurgical Engineering 334 or 370 or equivalent, or consent of instructor. 1 hour or $\frac{1}{4}$ unit. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
- 314. Metallurgical Thermodynamics.** Thermodynamic principles applied to the study of phase and chemical equilibrium and to the calculation of free energy of phases. 3 hours or $\frac{3}{4}$ unit.
- 316. Mechanical Metallurgy.** Fundamentals of plastic deformation of crystalline solids; elementary theory of statics and dynamics of dislocations; applications to deformation of single crystals and polycrystals; fracture; and effect of metallurgical variables on mechanical properties. Prerequisite: Junior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Fracture Mechanisms and Failure Analysis.** Mechanisms of the various forms of fracture of metals and alloys; relationships between microstructure and resistance to common modes of fracture; environmental effects on fracture; alloy design to optimize fracture resistance; and failure analysis using optical and electron microscopy. This course emphasizes the atomistic aspects of fracture and is complementary to Theoretical and Applied Mechanics 324. Prerequisite: Theoretical and Applied Mechanics 224 or Metallurgical Engineering 316, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 318. Physics of Metals.** The nature of the perfect and imperfect crystal, the electronic structure of solids, electrical conduction in metals and semiconductors, and dielectric and magnetic properties of solids. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 334. Physical Metallurgy for Engineers.** Fundamentals of crystallography, imperfections, alloying, and deformation; consideration of composition, temperature, and prior thermal and mechanical treatment in the use of metals, with emphasis on their mechanical properties. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 or Aeronautical and Astronautical Engineering 224, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Physical Metallurgy, I.** First of a two-semester sequence treating metallurgical phenomena and their utilization in engineering materials and processes; defects, diffusion, phase diagrams, solidification and casting, and plastic deformation and annealing. Prerequisite: Junior standing in engineering; Mathematics 345; Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
- 371. Physical Metallurgy Laboratory, I.** Laboratory course to be taken simultaneously with Metallurgical Engineering 370. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 370. 3 hours or 1 unit.
- 372. Physical Metallurgy, II.** Continuation of Metallurgical Engineering 370. Precipitation; eutectoid reactions; martensite; ordering; surface reactions; cast iron; and joining. Prerequisite: Metallurgical Engineering 370 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 373. Physical Metallurgy Laboratory, II.** Laboratory course to be taken simultaneously with Metallurgical Engineering 372. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 372. 3 hours or 1 unit.
- 375. Introduction to Polymers.** Fundamentals of polymer science and engineering; polymer chain structure and statistics; polymerization mechanisms and kinetics; molecular weight distributions; rheological and mechanical properties of amorphous polymers; the glassy state; crystalline morphology, mechanisms and kinetics of polymer crystallization, and mechanical behavior of crystalline polymers; methods of fabrication; and solution properties. Prerequisite: Advanced undergraduate or graduate standing. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 376. The Amorphous State of Polymers.** Fundamental concepts of amorphous, disordered polymer systems; topics include chain statistics, rubber elasticity, polymer solutions, the glassy state, polymer flow properties, colloidal stabilization, polymer adsorption, block copolymers, and scaling concepts. Prerequisite: Metallurgical Engineering 375 and an undergraduate-level course covering classical thermodynamics, or consent of instructor. 3 hours or 1 unit.
- 377. The Crystalline State of Polymers.** Examines the crystalline state of polymers in terms of molecular structure, thermodynamics and kinetics of crystallization, morphology, mechanical, thermal and electrical properties, and processing. Prerequisite: Metallurgical Engineering 375 or consent of instructor. 3 hours or 1 unit.
- 378. Polymer Characterization Laboratory.** Characterizes polymeric materials experimentally to investigate molecular, microstructural and macroscopic aspects of their mechanical, thermal, electrical, and optical properties. Prerequisite: Metallurgical Engineering 375 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 386. Electron Microscopy and Diffraction Theory.** Theory and application of transmission electron microscopy and diffraction with emphasis on thin crystals; electron optics, interference phenomena, interpretation of images and diffraction patterns, specimen preparation, etc. Prerequisite: Metallurgical Engineering 310 or equivalent. 3 hours or 1 unit.
- 387. Advanced Physical Metallurgy.** Advanced physical metallurgy designed for graduate students whose undergraduate degrees are in engineering or physical science fields other than metallurgy or materials sciences; discusses the standard topics of physical metallurgy with an emphasis on underlying physical principles; and includes selected laboratory experiments. Not to be taken by undergraduates registered in the Department of Metallurgy and Mining Engineering. Students may not receive credit for Metallurgical Engineering 387, and Metallurgical Engineering 370 or 372. Prerequisite: Advanced undergraduate standing in a field other than metallurgy, or graduate standing. 4 hours or 1 unit.
- 401. Defects and Plastic Deformation in Metals.** Studies point, line, and surface defects in metals; configuration, thermodynamics, and motion; quantitative description of single dislocation properties; and interactions among defects. For students in metallurgy, ceramics, physics, and other solid state sciences. Prerequisite: Mathematics 345 and Metallurgical Engineering 316 and 318; or consent of instructor. 1 unit.
- 408. Dislocations and Mechanical Properties of Metals.** General static and dynamic properties of single dislocations in crystals; dislocation interactions; properties of dislocation arrays; and role of dislocations in metallurgical phenomena with particular emphasis on mechanical properties. Prerequisite: Consent of instructor. 1 unit.
- 410. Advanced X-Ray Metallography.** X-ray diffraction as applied to the study of metals and alloys; effects of cold work, annealing, substructures, preferred orientation, and ordering; and principles of electron and neutron diffraction. Prerequisite: Consent of instructor. 1 unit.
- 420. Metallurgical Thermodynamics.** Fundamental thermodynamic considerations and applications of thermodynamics to metallurgical problems; particular emphasis on heterogeneous equilibrium and thermodynamic properties of solutions. Topics approached from the viewpoints of both macroscopic thermodynamics and statistical mechanics. Prerequisite: Metallurgical Engineering 314 or equivalent. 1 unit.
- 421. Kinetics of Phase Changes in Metals.** The viewpoint of statistical thermodynamics, rate theory, diffusion in solids, interface energy, nucleation theories, and phenomenological analysis of nucleation and growth; application to crystal growth, diffusionless phase changes, oxidation, pearlite reaction, precipitation, and sintering. Prerequisite: Metallurgical Engineering 420 or consent of instructor. 1 unit.
- 430. Surface Physics.** Same as Physics 430. Introduction to theory and experiment of atomic behavior on crystal surfaces; thermodynamics of surfaces; surface energy; diffraction and structure; gas-solid collisions; Brownian motion, diffusion, and evaporation; electron and ion emission, tunnelling; Van der Waals forces; theory of chemical interactions; and kinetics and statistics of adsorption. Prerequisite: Metallurgical Engineering 421 or Physics 489, or consent of instructor. 1 unit.

- 452. Solidification Processing.** Same as Mechanical Engineering 452. See Mechanical Engineering 452.
- 485. Metallurgical Engineering Problems.** Individual study in areas of metallurgy not covered by regular course offerings; carried out under the supervision of a member of the faculty. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
- 486. Laboratory Investigations in Metallurgy.** Special investigations in metallurgy providing an opportunity for instruction in experimental methods of research. Available only to nonthesis students enrolled in a Master of Science program. Prerequisite: Consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 492. Research Seminars.** Discussion and lectures on current research topics. 0 or $\frac{1}{4}$ unit. May be repeated each semester.
- 498. Colloquium on Materials Research.** Reviews current materials research in other laboratories by visiting lecturers; also presents some of the research currently done in the department. Required of all graduate students in the department. 0 or $\frac{1}{4}$ unit. May be repeated. No more than $\frac{1}{2}$ unit may be counted toward the M.S. degree.
- 499. Thesis Research.** Individual research in specialized problems under the supervision of members of the staff. Results of research may be used for graduate thesis. 0 to 4 units.

Mining Engineering

- 302. Political, Economic, and Environmental Aspects of Minerals and Their Utilization.** The availability and utilization of national and world mineral resources and the related environmental, economic, and political implications are examined through lectures, readings, student reports, panel discussions, guest speakers, field trips, and films. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 351. Geophysical Prospecting.** Same as Geology 351. See Geology 351.
- 393. Special Problems.** Individual studies of any phase of mining or petroleum engineering selected by the student and approved by his adviser and the staff member who supervises the study. Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit.
- 414. Physical Chemistry of Clays and Soils.** Same as Soils and Ceramic Engineering 414. See Soils 414.
- 497. Special Problems.** Individual studies in areas of mining or petroleum engineering not covered by regular course offerings; carried out under the supervision of a member of the staff. Prerequisite: Consent of instructor. 0 to 2 units.
- 499. Thesis Research.** Individual research in some phase of the general field of mining or petroleum engineering under the supervision of a member of the staff. 0 to 4 units.

MICROBIOLOGY

Head of Department: Professor J. Konisky

Department Office: 131 Burrill Hall, 407 S. Goodwin, Urbana

- 100. Introductory Microbiology.** Introduction to the principal activities and properties of microorganisms, including bacteria, yeasts, molds, and viruses; consideration of the role of natural processes, such as photosynthesis; and man's use and control of microorganisms in the production of antibodies and vaccines in industrial fermentations, in sanitation and public health, and in agriculture. There are no prerequisites for Microbiology 100, but some chemistry is recommended. 3 hours. Credit is not given for more than one of the following: Microbiology 100, 113, or 200.
- 101. Introductory Experimental Microbiology.** Laboratory introduction to the techniques employed in the investigation of microbial activities and properties; experiments designed to familiarize the student with the handling, identification, and characterization of micro-

- organisms and their activities, particularly those of interest to man. Prerequisite: Credit or concurrent registration in Microbiology 100. 2 hours. Credit is not given for both Microbiology 101 and 201.
- 113. Man and Microbes.** General education biological science course for nonscience majors; examines the effects of microbes on the activities of man; emphasizes environmental, economic, and disease effects of microbial activity on society; and presents microbiology as an example of a modern biological science. 3 hours. Credit is not given for more than one of the following: Microbiology 113, 200, or 100.
- 200. Microbiology.** Emphasizes fundamental concepts of microbiology, including nutrition, ecology, physiology, genetics and molecular biology of microorganisms, and their role in nature and in infection and immunity. Prerequisite: Credit or concurrent registration in organic chemistry. 3 hours. Credit is not given for more than one of the following: Microbiology 200, 100, or 113. (Counts for advanced hours in LAS.)
- 201. Experimental Microbiology.** Laboratory emphasizing the fundamentals of microbiology, including the biochemical basis of microbial physiology, ecology, and nutrition; microbial genetics and gene-enzyme relationships. Emphasis and encouragement are given to the experimental approach to microbiology. Prerequisite: Credit or concurrent registration in Microbiology 200 and in organic chemistry. 3 to 5 hours. Credit is not given for both Microbiology 201 and 101. (Counts for advanced hours in LAS.)
- 290. Research and Special Problems.** Prerequisite: Fifteen hours of microbiology; consent of instructor. 3 to 5 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 292. Senior Thesis.** Research under the direction of a senior staff member in microbiology. Normally, the student takes two semesters of Microbiology 292 in the senior year. Recommended for all those planning future research and graduate study; prerequisite for graduation with distinction in microbiology. In the semester preceding initial enrollment, interested students should consult with their advisors concerning the procedures for enrollment. A minimum of 2 hours per senior semester is required, and a thesis must be presented for credit to be received, but graduation with distinction is not an automatic result of enrollment in Microbiology 292. Prerequisite: Consent of senior thesis adviser. 2 to 6 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 309. Comparative Microbial Chemistry.** Emphasis on comparative biochemical activity and other chemical characteristics as a basis for discussion of the features of major groups of microorganisms; stress on comparison of the energy metabolism of microbial groups. Prerequisite: Biochemistry 350 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 311. Food and Industrial Microbiology.** Same as Food Science 311. Relationship of microorganisms to food manufacture and preservation, to industrial fermentation and processing, and to sanitation. Prerequisite: Microbiology 101 or 201 or equivalent; credit or concurrent registration in organic chemistry laboratory, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 312. Techniques of Applied Microbiology.** Consideration, through experimentation, of properties of bacteria, yeasts, molds, and actinomycetes important to industrial processes; exploration of methods of control of microbial processes in industry and sanitation. Prerequisite: Credit or concurrent registration in Microbiology 311, and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 316. Genetic Analysis of Microorganisms.** Prokaryotic and eukaryotic microbial genetic systems; emphasis on typical data analyses, together with the basic classes of genetic phenomena. Prerequisite: General genetics, Microbiology 200, or Microbiology 330. 3 hours or $\frac{3}{4}$ unit.
- 317. Experimental Techniques in Molecular Biology.** Laboratory emphasizing current molecular biology techniques. Topics include genetic techniques, use of transposons, genetic regulation, *in vitro* transcription, restriction endonuclease mapping, cloning, and DNA sequencing. Prerequisite: Microbiology 201, and credit or concurrent registration in Microbiology 316; Biochemistry 355; consent of instructor. 5 hours or 1 unit.

- 326. Biology of Bacterial Pathogens.** Emphasizes prokaryotes that cause important diseases in humans and other animals; host-parasite bacteriology; and chemistry and genetics of mechanisms of pathogenesis. Prerequisite: Microbiology 200 or 309; and Biochemistry 350 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 327. Immunochemistry.** Study of the field of immunology with emphasis on the chemistry of the proteins and cells involved in the immune response. Lectures and laboratory. Prerequisite: Credit or concurrent registration in biochemistry; and consent of instructor. 5 hours or 1 unit.
- 328. Properties of Bacterial Pathogens.** Laboratory study of methods of recognition and differentiation, diagnostic tests, and mechanisms of pathogenesis; students are voluntary donors of microorganisms used in experiments. Prerequisite: Microbiology 101, 201, or 409; credit or concurrent registration in Microbiology 526 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 329. Lectures in Immunochemistry.** Analyzes the field of immunology emphasizing chemistry of antigens, antibodies and their interactions. Prerequisite: Biochemistry 350 or equivalent; and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated as segments differ to a maximum of 4 hours or $\frac{1}{2}$ unit. Students may not receive credit for both Microbiology 329 and 327.
- 330. Molecular Biology of Microorganisms.** Modern contributions to the science of microbiology; emphasizes the structure, function, and synthesis of informational macromolecules and on the role microorganisms have played in molecular biology. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 331. Microbial Physiology.** Examines bacterial physiology, including discussions of energetics, regulation of metabolism, and cell structure. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 351. Viruses.** Same as Plant Biology 351. Introduces the molecular basis of virus structure, replication, genetics, infection, and virus-host interactions; discusses also animal viruses as agents of disease and their role in epidemics and persistent infections. Prerequisite: Credit or concurrent registration in Microbiology 330 or Biochemistry 350; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 409. Cultivation and Properties of Microorganisms.** Nutritional and metabolic properties of the major groups of microorganisms; a comparative study of the ecology, selective isolation, and cultivation of bacteria. Laboratory. Prerequisite: Biochemistry 355 or equivalent; credit or concurrent registration in Microbiology 509; consent of instructor. 1 unit.
- 412. Advances in Microbiology.** Discussions of current research in the following areas of microbiology: a) general microbiology; b) microbial physiology and metabolism; c) immunochemistry; and d) molecular genetics. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 419. Animal Virology.** Same as Veterinary Pathobiology 419. See Veterinary Pathobiology 419.
- 446. Bacterial Energetics.** Same as Biophysics 446. See Biophysics 446.
- 485. Topics in Microbiology and Molecular Biology.** Discussions, reviews, and appraisal of special topics in microbiology and molecular biology; seminar or lecture. Topics do not repeat. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
- 490. Individual Problems.** Prerequisite: Consent of instructor. $\frac{1}{4}$ to 4 units.
- 491. Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. First seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 491. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 492. Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. Second seven weeks of each semester.

Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 491. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.

495. Seminar. Required of all graduate students whose major is microbiology. Prerequisite: Ten hours of microbiology; consent of instructor. 0 or $\frac{1}{4}$ unit.

499. Thesis Research. 0 to 4 units.

MILITARY SCIENCE

Head of Department: Lieutenant Colonel Kent R. Gonser

Department Office: 111 Armory Building, 505 East Armory, Champaign

- 111. Introduction to Military Science.** An introduction to the U.S. Defense Establishment and its significance in modern society; includes the organization, mission, and functions of the Army, as well as an insight into military life and customs. Normally the first Military Science course taken. 1 hour.
- 112. Leadership Laboratory.** Introductory practical application of military skills and leadership; includes basic military mountaineering and rappelling, first aid, individual marching and weapons familiarization. Field trip may be required. 0 hours.
- 113. Military Rifle Marksmanship.** Characteristics of small bore rifles, weapons safety, and basic military marksmanship techniques. Prerequisite: Military Science 111 or consent of the instructor. 1 hour.
- 114. Leadership Laboratory.** A continuation of Military Science 112 to include actual firing of weapons. Field trip may be required. 0 hours.
- 121. Land Navigation.** Fundamentals of military and USGS map reading including methods such as intersection and resection; includes land navigation and orienteering techniques and their application during a field trip. 1 hour.
- 122. Leadership Laboratory.** Intermediate level practical application of military skills and leadership; includes mountaineering and rappelling, first aid, small unit marching, weapons firing, and physical fitness. Field trip required. 0 hours.
- 123. Military Tactics.** Basic concepts of tactical doctrine including Principles of War, the evolution of tactics, mechanized warfare, soviet doctrine and tactics, the affect of technology on modern tactics, and the application of contemporary tactics in small unit offensive and defensive operations. 1 hour.
- 124. Leadership Laboratory.** A continuation of Military Science 122 to include military radio communication procedures and defense measures in a nuclear or chemical environment. Field trip required. 0 hours.
- 231. Military Operations.** Fundamentals of small unit military operations including operations planning, military orders, troop leading procedures, deployment techniques such as fire and maneuver, and combined arms operations. Prerequisite: Concurrent registration in the AROTC advanced course. 3 hours.
- 232. Leadership Laboratory.** Advanced level practical application of military skills and leadership with emphasis on the student's ability to direct and supervise others; includes advanced land navigation, advanced first aid, platoon and company drill and ceremonies, and advanced communications procedures. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
- 233. Military Leadership.** Principles of leadership including management practices and their relationship to leadership, problem solving, decision making, human behavior and motivation, superior-subordinate relations and the problems of leadership in the military environment. Prerequisite: Concurrent registration in the AROTC advanced course. 2 hours.
- 234. Leadership Laboratory.** A continuation of Military Science 232 to include small unit tactics and reconnaissance operations. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.

- 241. Military Law.** Fundamentals of military law including the Law of Land Warfare, the application of federal law to the military, and the Military Justice system; includes financial and legal affairs. Prerequisite: Concurrent registration in the AROTC advanced course. 2 hours.
- 242. Leadership Laboratory.** A unique opportunity for advanced course students to fully plan, execute, and supervise the military training and activities of other military science students. Emphasis is on leadership, organizing and managing activities, decision making, and effective instructional techniques. Prerequisite: Concurrent registration in the AROTC advanced course. Field trip required. 0 hours.
- 243. Military Professionalism and Ethics.** Examines ethics, values and professional standards through military case studies; discusses military administrative skills, written and verbal communications, meeting management, and briefing techniques. Prerequisite: Concurrent registration in the AROTC advanced course. 2 hours.
- 244. Leadership Laboratory.** A continuation of Military Science 242. Prerequisite: Concurrent registration in AROTC advanced course. Field trip required. 0 hours.

MINING ENGINEERING

(See Metallurgy and Mining Engineering)

MUSIC

Director of School: Professor R. E. Bays

School Office: 3054 Music Building, 1114 W. Nevada, Urbana

- 100. Introduction to Music Theory.** Basic terminology and notation of Western music, plus visual and aural recognition of simple melodic and harmonic intervals; provides remedial assistance to music majors wishing to take Music 101. Music majors can not use this course as credit for graduation. 2 hours.
- 101. Fundamentals of Music Theory and Practice, I.** Notation, vocabulary, and basic concepts, including scales, modes, intervals, chords, and terminology; aural and visual analysis of musical forms and procedures; and stresses the development of melodic, harmonic, and rhythmic vocabularies. Prerequisite: Music 100 or placement into Music 101 by examination. 3 hours.
- 102. Fundamentals of Music Theory and Practice, II.** A continuation of Music 101 with gradually increased emphasis on visual elements (score reading and analysis); links theory and practice through analytical understanding. Prerequisite: Music 101. 3 hours.
- 103. Fundamentals of Music Theory and Practice, III.** Continuation of Music 102 with gradually increased emphasis on contrapuntal techniques, dissonance in tonal music, and musical form. Prerequisite: Music 102 and 101. 3 hours.
- 104. Fundamentals of Music Theory and Practice, IV.** Continuation of Music 103 with emphasis on late tonal chromaticism; introduction to serial techniques, nontonal centrality, cellular structure, twentieth-century rhythmic techniques, and noise and indeterminacy. Prerequisite: Music 103 and 102. 3 hours.
- 106. Beginning Composition.** Music composition in its beginning stages; practice in phrase, section, and short form construction, analysis, and writing; instruction in range, characteristics, and idiom of instruments and voices. Prerequisite: Consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
- 107. Aural Skills, I.** Practice in developing basic reading, notating, and listening skills in rhythmic, melodic, contrapuntal, harmonic, and formal aspects of musical structure; emphasizes diatonic tonal pitch structures. Prerequisite: Music 101 or placement by examination. 1 hour.

108. **Aural Skills, II.** Continuation of Music 107 with emphasis on extensions of tonality by means of changing tonal centers and altered chords. Prerequisite: Music 107 or placement by examination. 1 hour.
109. **Aural Skills, III.** Continuation of Music 108 with emphasis on atonal pitch structures. Prerequisite: Music 108. 1 hour.
110. **Basic Music Literature.** An introduction to the standard concert repertory through intensive guided listening. Representative works by major composers are chosen to illustrate the principal forms, styles, and techniques of vocal and instrumental music emphasizing the period since 1700. Required of freshmen in music. 2 hours.
120. **Seminar in Music Education.** Music education lecture and performance series. Selected topics and performances are presented each week focusing on trends in music and music education. Prerequisite: Registration in music education. 0 hours.
130. **Introduction to the Art of Music.** Designed to provide the non-music students with basic listening skills, the ability to discuss music intelligently, and an acquaintance with many types of music. 4 hours.
131. **Masterworks of Western Music.** Studies in detail approximately half a dozen works of different eras and types with regard to form, style, performance practice, and historical significance. Prerequisite: Music 130; consent of instructor. 4 hours.
132. **The Varieties of Music.** The appreciation of a major musical type such as the symphony, the concerto, chamber music, opera, jazz, or popular music. 3 hours.
133. **Introduction to World Music.** A survey of the musics of Asia, Africa, and Oceania and the native traditions of the Americas. 3 hours.
134. **The Eras of Music.** Examines major works and composers representative of an era in the history of music such as the Baroque, the Classical, or the Romantic. 3 hours.
135. **Composers' Lives and Works.** A Survey of the life and work of a single composer, or of a pair of composers, that will relate the musical and biographical material to pertinent social and historical events. 3 hours.
140. **Introduction to Music Education.** Introduces basic issues and principles of music education and teaching, with an emphasis on philosophy and the identification of the exceptional child and learning disabilities; includes 16 clock hours of early field experience in the teaching of music. 2 hours.
142. **Elements of Conducting.** Fundamentals of conducting, score preparation, and transcription for choral and instrumental ensembles. 2 hours.
143. **Pre-Student Teaching Experience.** Early field experience in teacher education, including a practicum of observation, teacher aide, and teaching experiences in music. Thirty-two clock hours of early field experience is required for each 1 hour of credit. 1 or 2 hours. May be repeated to a maximum of 4 hours; only 2 hours may be applied toward the degree.
144. **Music Teaching Technique Laboratory.** Class and individual instruction on musical instruments and voice for non-music majors; serves as a laboratory for undergraduate music education students to teach in major music field. 2 hours. May be repeated to a maximum of 6 hours.
145. **Unit One Seminar and Instruction in Music.** Experimental seminar courses and individual and group music lessons to introduce non-music students to contemporary ideas in music and to encourage personal exploration of instrumental and voice performance. 1 to 4 hours.
150. **Jazz Piano Improvisation, I.** The study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 162 or equivalent; Music 104 and 109, or equivalent; consent of instructor. 2 hours.
151. **Jazz Piano Improvisation, II.** Continuation of Music 150. The study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 150 or consent of instructor. 2 hours.
158. **Group Instruction in Piano for Non-Music Majors, I.** Teaches non-music majors the

fundamentals of beginning piano study: basics of reading, technique, and creative activities. Includes study and performance of simple solo and ensemble repertoire. 2 hours.

- 159. Group Instruction in Piano for Non-Music Majors, II.** Elementary piano for non-music majors. Continuation of basic skills presented in Music 158: reading, technique, creative work, simple solo and ensemble repertoire. Prerequisite: Music 158 or equivalent. 2 hours.
- 160. Group Instruction in Piano, I.** Beginning group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; studies simple piano literature and the development of skills in technique, sight reading, harmonization, transposition, improvisation, and analysis. 2 hours.
- 161. Group Instruction in Piano, II.** Elementary group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; easy solos from the main periods with appropriate technical development; continuation of skills introduced in Music 160; and introduction of piano ensemble literature. Prerequisite: Music 160 or equivalent; consent of instructor. 2 hours.
- 162. Group Instruction in Piano, III.** Intermediate group instruction in piano for music majors whose main performing medium is voice or an orchestral or band instrument; study of intermediate level solos and ensemble compositions; harmonization with chromatic chords, sight reading, transposition of four-voice works, improvisation, and learning of patriotic songs. Prerequisite: Music 161 or equivalent; consent of instructor. 2 hours.
- 163. Group Instruction in Piano, IV.** Moderately advanced group instruction in piano for music majors whose performing medium is voice or an orchestral or band instrument; continuation of Music 162 with emphasis on solos, ensemble works, technical development, and more advanced work in sight reading, harmonization, improvisation, transposition, and aural skills. 2 hours.
- 165. Class Instruction in Voice.** Group instruction in the fundamentals of singing. Places special emphasis upon the vocal skills needed for music teachers in the public schools unique to each of the following specializations: elementary-general, instrumental, and comprehensive. 2 hours.
- 166. English Diction.** Phonetics applied to English song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
- 167. Italian Diction.** Phonetics applied to Italian song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
- 168. German Diction.** German pronunciation as applied to German vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
- 169. French Diction.** Principles of French pronunciation applied to French vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
- 170. String Instruments.** Class instruction in the fundamentals of playing violin, viola, cello, and string bass. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 2 hours.
- 171. Woodwind Instruments.** Class instruction in the fundamentals of playing and teaching clarinet, flute, saxophone, oboe, and bassoon. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. ½ or 2 hours.
- 172. Brass Instruments.** Class instruction in the fundamentals of playing and teaching trumpet, French horn, trombone, euphonium, and tuba. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. ½ or 2 hours.
- 173. Percussion Instruments.** Class instruction in the fundamentals of playing and teaching percussion instruments. Prerequisite: Enrollment in the School of Music; for non majors, consent of instructor. 2 hours.
- 174. Guitar Techniques.** Techniques of playing and teaching classic and folk guitar. Prerequisite: Consent of instructor. 2 hours.

- 175. Techniques of Teaching Classroom Instruments.** Fundamental techniques for playing the guitar, the recorder, and the autoharp; includes methods for implementing the use of these instruments in the teaching of elementary and junior high school vocal-music classes. 2 hours.

NOTE: Music 178 through 198 (applied music) have the following prerequisite: Passing of a performing examination is required as a prerequisite to the initial registration in any applied music course.

- 178. Guitar.** Instruction in guitar at the undergraduate level, predominantly classical. 2 or 4 hours (summer session, 1 or 2 hours).
- 179. Harpsichord.** Instruction in harpsichord at the undergraduate level. 2 or 4 hours.
- 180. Piano.** Instruction in piano at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 181. Voice.** Instruction in singing at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
- 182. Organ.** Instruction in organ at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 183. Violin.** Instruction in violin at the undergraduate level. 2 or 3 hours (summer session 1 or 2 hours).
- 184. Viola.** Instruction in viola at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
- 185. Cello.** Instruction in violoncello at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
- 186. String Bass.** Instruction in string bass at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
- 187. Flute.** Instruction in flute at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 188. Clarinet.** Instruction in clarinet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 189. Oboe.** Instruction in oboe at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 190. Bassoon.** Instruction in bassoon at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 191. Cornet and Trumpet.** Instruction in cornet and trumpet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 192. French Horn.** Instruction in French horn at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 193. Trombone.** Instruction in trombone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 194. Euphonium.** Instruction in euphonium at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 195. Tuba.** Instruction in tuba at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 196. Percussion.** Instruction in percussion at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 197. Harp.** Instruction in harp at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 198. Saxophone.** Instruction in saxophone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Instrumentation, I.** Orchestration and arranging for orchestral groups. Prerequisite: Senior standing in music. 2 hours.
- 201. Instrumentation, II.** Problems in arranging for all wind instruments. Required of composition majors. Prerequisite: Music 200 or consent of instructor. 2 hours.
- 202. Rudiments of Theory, I.** A course for nonmajors introducing basic terminology and

- notation, intervals, and triads, as well as the concepts of scale, tonality, and musical form. 3 hours.
- 203. Rudiments of Theory, II.** Continuation of Music 202, for nonmajors only. Topics included are: modulations, chromatically altered chords, 18th/19th centuries musical forms, as well as twentieth century trends and contemporary music notation. Prerequisite: Music 202 or passing of placement test. 3 hours.
- 204. Compositional Problems: Serial Techniques.** Studies serial techniques and levels of determinacy through composition and analysis. Prerequisite: Consent of composition/theory faculty. 2 hours.
- 205. Compositional Problems: Technological and Visual Aspects.** Studies electronic and computer applications, visual and gestural elements, and levels of determinacy through composition and analysis. Prerequisite: Consent of composition/theory faculty. 2 hours.
- 206. Intermediate Composition.** Music composition at the secondary stages, including analysis and writing of shorter musical forms. Prerequisite: Music 106 and consent of composition/theory faculty. 2 hours. May be repeated to a maximum of 6 hours.
- 209. Kodaly: Philosophy and Methods.** An introduction to the music education philosophy of Zoltan Kodaly through experiences in relative sol-fa and the expansion of aural awareness. Prerequisite: Consent of instructor. 2 hours.
- 210. Computer-Assisted Instruction in Music.** Introduction to computer-assisted instruction (CAI) and its uses in public school, college, and continuing education programs in music; familiarization with visual and audio programming strategies and the research potential of CAI systems. Prerequisite: Consent of instructor. 2 hours.
- 211. Practicum in Piano Teaching.** Coordinates lesson planning for teaching pre-college piano pupils with extensive teaching experiences; gives close examination to beginning and intermediate teaching literature. Prerequisite: Music 143 or 242. 2 hours.
- 213. The History of Music, I.** Survey of music and its development in Western civilization to 1750; emphasis on an acquaintance with representative musical works and style, and on understanding musical concepts in the light of their historical background. Required of all music students. Prerequisite: Music 110 or consent of instructor. 3 hours.
- 214. The History of Music, II.** Survey of the development of music as an art in Western civilization from 1750 to the present; emphasis on an acquaintance with formal and stylistic problems through the study of representative works and on understanding specific musical concepts in the light of their historical and general cultural context. Required of all music students. Prerequisite: Music 213. 3 hours.
- 229. Thesis and Advanced Undergraduate Honors in Music.** Special individual research projects. Required of seniors in the history of music and composition-theory curricula; open also to advanced undergraduates, including James Scholars, who have achieved University or college honors and who desire to do research in specialized areas of music, including performance. Prerequisite: Senior standing in the history of music and composition-theory, or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
- 230. Choral Literature and Conducting, I.** A laboratory course which includes choral literature for secondary choral groups. Students conduct choral singing groups (their conducting is videotaped), learn to analyze and prepare choral scores, and conduct in a choral laboratory. Prerequisite: Music 142. 2 hours.
- 231. Choral Literature and Conducting, II.** A laboratory course which includes the study and conducting of public school choral music. Students conduct choral groups, prepare choral scores, learn rehearsal techniques, conduct in a choral laboratory, and conduct vocal ensembles in the public schools. Prerequisite: Music 230. 2 hours.
- 232. Instrumental Literature and Conducting, I.** Survey of music literature for wind ensemble and band; principles of interpretation and techniques of conducting emphasized through detailed study and performance of selected compositions. Prerequisite: Music 142. 3 hours.
- 233. Instrumental Literature and Conducting, II.** Principles of interpretation and techniques of orchestral conducting emphasized through detailed study and performance of selected orchestral compositions appropriate for public school groups. Prerequisite: Music 232. 3 hours.

- 234. Workshop in Elementary Music Education.** Detailed consideration of music objectives, principles of learning, and their implications for teaching methods; major emphasis on techniques and materials suitable for teaching music in the elementary school by the classroom teacher. Specifically designed for the experienced classroom teacher. Prerequisite: Consent of instructor; public school teaching experience. 2 hours. Offered in the summer session only.
- 235. Elementary and Junior High School Instrumental Music.** Examines pedagogical and organizational techniques for teaching elementary and junior high school instrumental music in a laboratory school setting. Prerequisite: Music 232. 2 hours.
- 236. Choral Techniques in Elementary and Junior High School.** A detailed consideration of literature, arranging for elementary and junior high school choruses, and the changing voice. Prerequisite: Advanced music undergraduate standing or consent of instructor. 3 hours.
- 237. Orff: Philosophy and Methods.** An introduction to the Carl Orff-Schulwerk approach to music for children; techniques include the use of Orff instruments and materials and the adaptation of these materials for classroom use with or without instruments. Prerequisite: Sophomore standing in music education or consent of instructor. 2 hours.
- 239. Principles and Techniques in Music Education.** A comprehensive examination of interrelationships among the various segments of music education; the role of music education at all levels in the total school program, elementary through secondary, with emphasis upon philosophy, learning theory, curriculum design, identification of the exceptional and learning disabilities, administration and current trends; includes 20 clock hours of early field experience in the teaching of music. Prerequisite: Senior standing in music education or consent of instructor, plus 80 hours of early field experiences in the teaching of music. 3 hours.
- 240. Music for Elementary Teachers, I.** A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Junior standing in elementary education or consent of instructor. 3 hours.
- 241. Music for Elementary Teachers, II.** Continuation of Music 240. A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Music 240 or consent of instructor. 3 hours.
- 242. Teaching Music in the Elementary School.** Techniques of and material suitable for teaching music in the elementary school. 3 hours.
- 243. Teaching Music in the Junior High School.** Detailed consideration of the music program in the junior high school; special emphasis on instructional material and methods of instruction. 3 hours.
- 244. Teaching of Instrumental Music.** Organizing and rehearsing school marching and jazz bands; techniques of administering and publicizing school instrumental music programs. Prerequisite: Music 232. 3 hours.
- 245. Choral Score Preparation.** Detailed consideration of the techniques of choral music analysis and score preparation for performance; includes stylistic considerations and effective programming. Prerequisite: Music 142, 230, or 231, or consent of instructor. 2 hours.
- 246. Teaching of Choral Music.** A methods course designed for junior and senior high school vocal and choral majors; includes rehearsal management, choral style, and materials suitable for organizing and teaching choral music in the public schools. Prerequisite: Music 142, 230, 231, or consent of instructor. 3 hours.
- 247. Repertory for the Secondary School Choral Program.** An exploration of literature appropriate for public school music groups through demonstrative rehearsals and public performances. Prerequisite: Music 142, 230, 231, or consent of instructor. 1 or 2 hours. May be repeated to a maximum of 6 hours.
- 249. Music for Early Childhood Teachers.** Development of musical competencies essential for teachers in nursery schools and kindergartens; singing, rhythmic keyboard improvisation, and creative and music reading skills; and extensive study of music materials suitable for use in early childhood music. Prerequisite: Music 240 or consent of instructor. 3 hours.

- 250. University Orchestra.** Prerequisite: Consent of instructor. 1 hour.
- 251. Chamber Orchestra.** A chamber orchestra for the purpose of performing literature of all periods written specifically for a chamber-sized orchestra. Prerequisite: Consent of instructor. 1 hour.
- 253. Collegium Musicum.** Ensemble work in the performance of medieval, Renaissance, and baroque music; various small groups formed for the performance of sonatas and cantatas of Bach and Handel, wind serenades of Mozart, etc. Interested students may play on viola, lute, harpsichord, and other instruments from the University's collection. Prerequisite: Consent of instructor. 1 hour.
- 254. String Ensemble.** The student participates in various ensemble groups, such as trios, quartets, quintets, etc., for the study of chamber music literature. The course may be repeated or taken during the freshman and sophomore year without credit. Prerequisite: Consent of instructor. 1 hour.
- 255. Woodwind Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 256. Brass Ensemble.** Ensembles of mixed brasses in both small and large forms. Prerequisite: Consent of instructor. 1 hour.
- 257. Percussion Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 258. Piano Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 259. Organ Keyboard Techniques.** Development of practical keyboard skills related to the work of the church organist: transposition, score-reading, harmonization, modulation, hymn-playing, and solo and anthem accompaniment. Prerequisite: Consent of instructor. 1 hour.
- 260. Oratorio Society.** Performance of oratorios and other major choral works in cooperation with the University Symphony Orchestra; an advanced mixed-voice chorus open to students, faculty, and townspeople. Prerequisite: Consent of instructor. 1 hour.
- 261. University Chorus.** Performance of cantatas and other choral works; a mixed-voice chorus for average and beginning singers. Open to students, faculty, and townspeople. Prerequisite: Consent of instructor. 1 hour.
- 262. Women's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all women students. Prerequisite: Consent of instructor. 1 hour.
- 263. Men's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all men students. Prerequisite: Consent of instructor. 1 hour.
- 264. Concert Choir.** Practical experience in mixed-voice singing of accompanied and unaccompanied music of various periods and styles; a highly advanced group of competent student singers. Prerequisite: Consent of instructor. 1 hour.
- 265. Opera-Musical Theatre.** Preparation and public performance of grand or light opera; covers the music and acting only. Students desiring experience in costuming, stage management, scenery, publicity, etc., should apply to the University Theatre which cooperates in the opera productions. Admission is by audition. Prerequisite: Consent of instructor. 1 hour.
- 266. Jazz Band.** Designed to acquaint proficient instrumentalists with jazz compositions, arrangements, and improvisational procedures, and to promote a high degree of stylistic and technical competence in performance. Prerequisite: Consent of instructor, determined by auditions. 1 hour.
- 267. Harp Ensemble.** Ensembles of multiple harps and harp in combination with other instruments. Prerequisite: Consent of instructor, or Music 197 or 397. 1 hour.
- 268. Small Choral Ensembles.** Open to a limited number of undergraduate students who desire experience in performance of music specifically written for smaller choral groups. Membership through audition only. Prerequisite: Consent of instructor. 1 hour.
- 269. String Chamber Music, Literature, and Performance.** Extensive study of chamber music literature for or including string instruments (violin, viola, cello, double bass); assigns students to chamber groups coached on a weekly basis by members of the string faculty. Requires one performance per semester. Prerequisite: Enrollment in instrumental

music curriculum for string instrument majors, or consent of instructor. 1 hour. May be repeated to a maximum of 8 hours.

- 270. String Education, I: Teaching of Stringed Instruments at the Elementary Level.** Organization, materials, and techniques. Prerequisite: String major standing or consent of instructor. 3 hours.
- 271. String Education, II: Teaching of Stringed Instruments at the Secondary Level.** Organization, materials, and techniques. Prerequisite: Music 270 or consent of instructor. 3 hours.

Music 280-290 are open to all students who have been accepted by examination, with assignments being made according to proficiency and instrumentation. Completion of each course involves, in addition to the regular schedule of rehearsals, participation in the public appearances of the bands.

- 280. Wind Ensemble.** Mixed woodwind-brass-percussion ensembles for the study and performance of wind chamber compositions. Prerequisite: Junior standing or consent of instructor. 1 hour.
- 281. Symphonic Band.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 1 hour.
- 282. Symphonic Band, II.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 1 hour.
- 283. First Concert Band.** Maintains the instrumentation of the standard band and serves as a training organization for the symphonic bands. The literature studied and performed is of the highest calibre and technical difficulty. 1 hour.
- 284. Second Concert Band—A.** Enrolls those who do not at first qualify for positions in the other bands until they become eligible for promotion as improvement is shown and as vacancies occur. The band literature studied is of high quality but technically is less difficult than the music for the top three bands. 1 hour.
- 285. Second Concert Band—B.** Enrolls those who do not at first qualify for positions in the other bands until they become eligible for promotion as improvement is shown and as vacancies occur. The band literature studied is of high quality but technically is less difficult than the music for the top three bands. 1 hour.
- 286. Marching Band.** The Marching Band prepares and performs at least six shows per football season; music used is of the highest available quality. 1 hour.
- 287. Basketball Band.** This band is organized to perform for home basketball games. Prerequisite: Band Department audition during early November. 1 hour. Credit is given for spring semester only.
- 288. Brass Band.** Maintains a complete British Brass Band Instrumentation for the study and performance of all types and styles of brass band literature. Prerequisite: Concurrent registration in one of the concert bands: Bands 101, 102, 103, 104, or 105. 1 hour.
- 289. Summer Band.** Maintains the instrumentation of the Standard Band for the study and performance of all types of band literature. Prerequisite: Consent of instructor. 1 hour.
- 290. Clarinet Choir.** Maintains a complete clarinet choir instrumentation for the study and performance of all types and styles of clarinet choir literature. Prerequisite: Concurrent registration in one of the concert bands: Music 281, 282, 283, 284, or 285. 1 hour.
- 300. Counterpoint and Fugue.** The study of contrapuntal writing in the eighteenth century, including fugue, with emphasis on the works of J. S. Bach; involves both writing and analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 301. Schenkerian Analysis of Tonal Music.** Studies analytical systems and their application to tonal music; includes a survey of theoretical works by important theorists from Rameau to Schenker. Emphasizes practical application of Schenkerian analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 302. Musical Acoustics.** Theory and application of simple resonators, wave motion, resonances of string and pipes; perception of loudness, pitch and timbre; musical scales; and acoustics of rooms and musical instruments. Prerequisite: Mathematics 112 and Music 101, or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 304. Contemporary Compositional Techniques.** Studies in specialized areas of composition for advanced undergraduates and graduates majoring in composition-theory. May be elected by others with consent of instructor. Prerequisite: Music 104, 106, or 109, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 305. Analytical Systems for Twentieth Century Music.** Studies analytical techniques developed for music written in the twentieth century not based upon tonal principles from the common practice period. Includes a survey of important theorists such as Forte, Hindemith, and Babbitt; studies set theory and twelve-tone theory; and surveys other specialized analytical systems. Prerequisite: Music 104, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 306. Composition.** Work in original composition including small and large forms. Prerequisite: for undergraduates, Music 204, 205, and 206 and consent of composition faculty; for graduate students, consent of composition faculty. Students submit scores of their compositions to the composition faculty in order to obtain consent to register; consent is granted on the basis of the quality of the music the student has composed and the level of skill demonstrated in the work submitted. 3 hours or $\frac{1}{2}$ unit.
- 308. Analysis of Musical Form.** An extensive study of the formal structure of representative musical compositions from various historical periods, including Renaissance and Baroque, Viennese Classical, Nineteenth Century, first half of Twentieth Century, and since World War II. Prerequisite: Music 104 and 109. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 9 hours or $1\frac{1}{2}$ units.
- 310. Ancient and Medieval Music.** A history of Western music to about 1400. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 311. Music in the Renaissance.** A history of music from about 1400 to 1600. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 312. Music of the Seventeenth Century.** A history of music from about 1600 to 1700. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 313. Music of the Eighteenth Century.** A history of music from about 1700 to 1800. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 314. Music of the Nineteenth Century.** A history of music from about 1800 to 1900. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 315. Music of the Twentieth Century.** A history of music from about 1900 to the present. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 316. Anthropology of Music.** Same as Anthropology 316. An introduction to the anthropological study of music, including the role of music in the world's societies and nonwestern musical systems and cultures. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 317. Area Studies in Ethnomusicology.** Same as Anthropology 315. A seminar devoted to intensive study in the music of one specific culture, e.g., Japan, China, Indonesia, India, the Near East, African and New World Negro, European and American folk cultures, or American Indian. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{1}{4}$ unit. May be repeated to a maximum of 12 hours or 2 units.
- 318. History of Performance Practices, I.** Study of musical performance from about 900 to 1650 A.D.; discussion of musical instruments, makeup of instrumental and vocal ensembles, etc., supplemented by demonstration performances of selected works using the University's collection of instruments. Prerequisite: Senior standing in music theory and music history, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 319. History of Performance Practices, II.** Study of musical performance from 1600 to 1750 A.D.; discussion of musical instruments, ornamentation, basso continuo, etc., supplemented by demonstration performances using the University's collection of instruments. Prerequisite: Senior standing in music theory and music history, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 320. Proseminar.** Special preparation in specialized fields of musicology, theory and composition, and music education. Prerequisite: Senior or graduate standing in music or music education; consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units. Open Option Students may repeat to a maximum of 16 hours.

- 321. Electronic Music Techniques, I.** Introduces electro-acoustic music, including historical background, literature, techniques of notation and realization, and compositional application in the areas of musique concrete, classical electronic music, and voltage-controlled electronic music. Prerequisite: Junior standing in music or consent of instructor. 4 hours or 1 unit.
- 322. Electronic Music Techniques, II.** Advanced study in the use of voltage-controlled synthesizers in music composition and study of compositional, technical, and performance considerations in combining electronics with traditional instruments and/or voices in music composition. Prerequisite: Music 321 or placement by examination. 2 hours or ½ unit.
- 323. Opera Production, I.** Helps interested students on the graduate level study the problems of the lyric stage; investigation of and practice with casting methods, program selection, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 265 and 381; consent of instructor. 3 hours or ½ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 324. Opera Production, II.** Helps interested students on the graduate level study the problems of the lyric stage; investigation of and practice with casting methods, program selections, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 323. 3 hours or ½ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 325. Introduction to Musicology, I.** Survey of the discipline of musicology, its scope, and its history with bibliographical studies and sample problems for investigation. Prerequisite: Graduate standing in musicology or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or ½ unit).
- 326. Introduction to Musicology, II.** Continuation of a survey of the discipline of musicology; special attention to class projects in systematic musicology and to the philosophy of music history. Prerequisite: Music 325 or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or ½ unit).
- 327. Urban Popular Music.** Introduction to the world's popular music; emphasis on its role in society, based on American, European, Latin American, and non-Western repertoires. Prerequisite: Music 130 or equivalent, or consent of instructor. 2 hours or ½ unit.
- 328. Composer-Choreographer Workshop.** Same as Dance 328. See Dance 328.
- 330. Applied Music Pedagogy.** Survey of techniques, practices, and materials; presentation of group and individual instruction; an approach to teaching problems, tone production, musical styles, and interpretation for various age levels; and actual teaching experience under faculty supervision. Required of applied music majors in voice and string instruments. Prerequisite: Junior standing in music or consent of instructor. 2 hours or ½ unit. May be repeated to a maximum of 4 hours or 1 unit.
- 331. Piano Pedagogy, I.** Objectives, techniques, literature, and materials for teaching the child from about ages five through ten (elementary level); observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or ½ unit.
- 332. Piano Pedagogy, II.** Objectives, techniques, literature, and materials for teaching the young pianist from about ages eleven through eighteen (middle school to pre-college level); teaching the adult beginner; and observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or ½ unit.
- 333. The History of Opera.** Surveys opera and related forms from the end of the 16th century to the present; studies representative works in some detail. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or ¾ unit.
- 334. The Music of America, I.** Study of folk, popular, and art music in America from the time of the first European settlers through the middle of the nineteenth century; psalmody, early opera and concert life, African and European folk music, the singing school, music of European immigrants, and the roots of jazz. Prerequisite: Senior standing in music or consent of instructor. 3 hours or ¾ unit.

- 335. The Music of America, II.** Study of chamber, choral, and orchestral music written by American composers from 1850 to the present; jazz and its offshoots; folk and popular music; and experimental music in America. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 336. Music in Latin America.** The history of music in Latin America from colonial times to the present, including its cultural and social background. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 337. National and Regional Studies in European Music History.** Studies in the history of music of individual nations and regions of Europe. Each semester is devoted to one area, such as Great Britain, Spain and Portugal, Russia, Scandinavia, or eastern Europe. Prerequisite: Junior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.
- 339. Functional Music for Exceptional Children and Youth.** Features techniques and methods to aid exceptional children and youth in acquiring and improving self-concept, socialization skills, attention span, listening skills, language acquisition, and academic readiness; considers the use of music techniques and methods in acquiring these skills in the mainstreamed classroom. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 340. Marching Band Procedures.** A detailed consideration of principles and procedures for preparing a marching band to participate in parades, ceremonials, and shows for sports events. Prerequisite: Junior standing in instrumental music education. 2 hours or $\frac{1}{2}$ unit.
- 341. Seminar in Instrumental Music Education.** Intensive study of musical, scientific, and educational concepts and principles related to the teaching of heterogeneous combinations of instruments. Prerequisite: Completion of student teaching or graduate standing in music education. 2 hours or $\frac{1}{2}$ unit.
- 342. Band Arranging.** The development of basic scoring and arranging skills for various instrumental ensembles. Marching and smaller instrumental combinations are the performance media used for scoring purposes. Prerequisite: Music 104 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 343. Tests and Measurement in Music Education.** Construction, design, appraisal, and use of measurement devices for music teaching and research. Prerequisite: Consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Teaching Techniques of Music Theory.** Teaching materials, methods, texts, and pedagogical sequence are discussed and analyzed, including an intensive survey of the structural materials normally covered during the first two years of collegiate study. Prerequisite: Music 300 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 346. Workshop in Music Education.** Development of essential facts, attitudes, and principles through a consideration of problems encountered in music education. Parallel with this study is the preparation of resource materials for music programs in elementary and secondary schools. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units. Offered in the summer session only.
- 347. Teaching of Woodwind Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
- 348. Teaching of Brass Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
- 349. Music in Early Childhood.** Same as Human Development and Family Ecology 349. Detailed consideration of the music program in nursery schools, kindergarten, and the primary grades; topics include the nature of early musical responses, objectives, experience levels of the program, methods of teaching, and materials. Observation of music teaching at the Child Development Laboratory is included in the course work. Prerequisite: Senior or graduate standing in music or human resources and family studies, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 350. Advanced Ensemble Music.** Selected projects in the study and performance of ensemble literature, including the areas of operatic, instrumental, and vocal-choral music and accompanying. Prerequisite: Consent of instructor. 1 to 2 hours, or $\frac{1}{4}$ to $\frac{1}{2}$ unit.

- 355. School/Community Musical Theatre Production.** Problems and techniques involved with technical and artistic production of musicals in the junior and senior high schools and in the community. Prerequisite: Advanced undergraduate or graduate standing in music education or performance curricula, or consent of instructor. 2 hours or ½ unit.
- 360. Advanced Group Instruction in Piano, I.** A comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163, and Music 104 and 109, or equivalent; consent of instructor. 2 hours or ½ unit.
- 361. Advanced Group Instruction in Piano, II.** Continuation of Music 360. Comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163; Music 104 and 109 or equivalent; Music 360 or equivalent and consent of instructor. 2 hours or ½ unit.
- 362. Advanced Jazz Piano Improvisation.** Study of solo jazz piano improvisation on an advanced level. Includes practical experience in traditional, modern, and abstract solo performance, as well as theoretical, stylistic, and historical background. Prerequisite: Music 151 or equivalent. 2 hours or ½ unit. May be repeated to a maximum of 4 hours or 1 unit.
- 366. Vocal Repertoire, I.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice or consent of instructor. 1 hour.
- 367. Vocal Repertoire, II.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice; consent of instructor. 1 hour.
- 377. Principles of Accompanying.** Grasp of the fundamental principles of accompanying singers and instrumentalists; practical experience in accompanying; and facility in sight reading for keyboard performers. Prerequisite: Advanced undergraduate or graduate standing in music or music education and consent of instructor. 4 hours or 1 unit (summer session, 2 hours or ½ unit). May be repeated to a maximum of 16 hours or 4 units. NOTE: Music 378 through 398 (applied music) have the following prerequisite: For students in the Bachelor of Music programs for the curricula in Vocal and Instrumental Music, junior standing in the major applied music subject as approved by the faculty of the appropriate applied music division; for students in music education, completion of the curricular requirement in the major applied music subject; and for students in other colleges of the University, completion of four semesters in the comparable applied music course at the 100-level. 378. Guitar. Instruction in guitar at the advanced undergraduate and graduate levels; predominantly classical. 2 or 4 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).
- 379. Harpsichord.** Instruction in harpsichord at the advanced undergraduate and graduate level. 2 or 4 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).
- 380. Piano.** Instruction in piano at the advanced undergraduate and graduate level. 2 or 4 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).
- 381. Voice.** Instruction in singing at the advanced undergraduate and graduate level. 2 or 3 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).
- 382. Organ.** Instruction in organ at the advanced undergraduate and graduate level. 2 or 4 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).
- 383. Violin.** Instruction in violin at the advanced undergraduate and graduate level. 2 or 3 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).
- 384. Viola.** Instruction in viola at the advanced undergraduate and graduate level. 2 or 3 hours, or ½ or 1 unit (summer session, 1 or 2 hours, or ¼ or ½ unit).

- 385. Cello.** Instruction in violoncello at the advanced undergraduate and graduate level. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 386. String Bass.** Instruction in string bass at the advanced undergraduate and graduate level. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 387. Flute.** Instruction in flute at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 388. Clarinet.** Instruction in clarinet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 389. Oboe.** Instruction in oboe at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 390. Bassoon.** Instruction in bassoon at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 391. Cornet and Trumpet.** Instruction in cornet and trumpet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 392. French Horn.** Instruction in French horn at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 393. Trombone.** Instruction in trombone at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 394. Euphonium.** Instruction in euphonium at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 395. Tuba.** Instruction in tuba at the advanced undergraduate and graduate level. 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 396. Percussion.** Instruction in percussion at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 397. Harp.** Instruction in harp at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 398. Saxophone.** Instruction in saxophone at the advanced undergraduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 400. Advanced Instrumentation: Chamber and Symphonic.** Orchestration for chamber and symphony orchestras; works of classical, romantic, and modern composers. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
- 401. Advanced Instrumentation: Band.** Arrangement for the concert band of works from orchestra, organ, and chamber music by composers of the classical, romantic, and modern periods. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
- 402. Analysis in Relation to Performance and Interpretation, I.** A unifying course in the structure of music, in which analysis is related to the performance and understanding of music; course material drawn from standard literature from the Renaissance to the present day with emphasis on the smaller forms. Prerequisite: Music 104 or equivalent; consent of instructor. $\frac{1}{2}$ or 1 unit.
- 405. Individual Topics in Music Theory.** Studies in specialized areas of analysis, theory systems, and aesthetics for theory-composition majors. Prerequisite: Graduate standing in music; consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
- 406. Composition.** Advanced study of contrapuntal forms: study of contemporary melodic and harmonic practices; and original work in advanced composition. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 410. History of Music Theory.** Prerequisite: Graduate standing in musicology or composition, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 411. Introduction to Ethnomusicology.** Comprehensive survey of concepts, problems, and methods of research in non-Western and folk music. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
- 412. History of Musical Aesthetics, I.** Survey of the principal philosophies of music from Pythagoreanism to the humanistic period, their historical backgrounds, and their relation to musical styles. Prerequisite: Graduate standing in music. $\frac{1}{2}$ or 1 unit.
- 414. Notation, I.** History of notation from its beginning to 1400. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.

- 415. Notation, II.** History of notation from 1400 to 1600, including instrumental tablatures. Prerequisite: Music 414 or consent of instructor. $\frac{1}{2}$ unit.
- 417. History of Instrumental Music from 1600 to 1750.** Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
- 418. Topics in Opera History.** Intensive study of a period or school of opera composition or of a particular aspect of the history of opera. Wide reading in the social and intellectual climate of the period concerned; literary, dramatic, and musical analysis; and work with primary sources whenever possible. Prerequisite: Music 428, graduate standing in musicology, or consent of instructor. 1 unit (summer session, $\frac{1}{2}$ unit).
- 421. Research in Music Education.** Introduction to problems and methods of research in music education. Required of all candidates for the Doctor of Education in music education. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
- 422. Seminar in Theory of Music.** Intensive study of selected topics in the fields of music theory, history of theory, and history of musical materials. Prerequisite: Graduate standing in music theory or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 423. Seminar in Musicology.** Problems in historical and systematic musicology or ethnomusicology; discussions of special problems and reports on individual research. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
- 424. Seminar in the Works of a Selected Composer.** A seminar devoted to intensive historical and analytical study of the works of important composers; each semester devoted to one composer, e.g., Bach, Beethoven, Handel, Haydn, Mozart, or Wagner. Prerequisite: Music 213 and 214; two of the following: Music 310, 311, 312, 313, or 315, or equivalent. 1 unit (summer session, $\frac{1}{2}$ unit). May be repeated for a maximum of 2 units.
- 425. Readings in Musicology and Music Theory.** Individual guidance in intensive readings in the literature of musicology or music theory, selected in consultation with the instructor and in accordance with the needs and interests of the student. Prerequisite: Graduate standing in musicology or music theory. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit).
- 426. Choral Literature, I.** Survey of choral and vocal ensemble repertoire from the Middle Ages to 1750. Prerequisite: Open to graduate music students by consent of instructor. $\frac{1}{2}$ unit.
- 427. Choral Literature, II.** Survey of choral repertoire from 1750 to the present. Prerequisite: Open to graduate music students by consent of instructor. $\frac{1}{2}$ unit.
- 428. Problems and Methods.** Introduction to methods in research and stylistic criticism and to bibliographic aids, editions, and editing of music, as related to the work of the musician and composer. Reports of bibliographic problems and on individual projects are presented orally and in writing. Required of all students in the Master of Music program, except those majoring in musicology. 1 unit.
- 429. Historical Studies in Twentieth-Century Music.** A seminar in contemporary music, with emphasis on the historical foundations of current trends in musical composition. Prerequisite: Music 315 or 422, or equivalent. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit). May be repeated to a maximum of 2 units.
- 430. Advanced Orchestra Conducting and Literature.** Intensive study of conducting techniques and problems related to standard orchestral literature; survey of materials for school and community orchestras. Prerequisite: Music 233 or equivalent, and consent of instructor. $\frac{1}{2}$ or 1 unit.
- 431. Advanced Band Conducting and Literature.** Study of problems and techniques of band conducting; survey of literature for the concert band. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
- 432. Advanced Choral Techniques, I.** An intensive laboratory approach to the development of advanced techniques necessary for working effectively with choral ensembles. Prerequisite: Graduate standing in music. $\frac{1}{2}$ or 1 unit.
- 433. Advanced Choral Techniques, II.** An intensive survey of choral literature with laboratory organization for reading, conducting, and interpreting choral music of all periods, styles, and voice arrangements. Prerequisite: Graduate standing in music, Music 432 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.

- 434. Piano Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 435. Vocal Literature.** Study of solo song in larger works, and solo art song. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 436. Organ Literature.** An intensive study of organ literature from Bach to the present; includes the music itself, recordings, and collateral readings. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 437. String Instrument Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 438. Wind Instrument Literature.** Survey at the graduate level of the field of solo and ensemble wind literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. 1 unit. May be repeated to a maximum of 2 units.
- 439. Percussion Instruments Literature.** Survey and analysis of the field of solo and ensemble percussion literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. Prerequisite: Graduate standing in music; consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 440. Foundations and Principles of Music Education, I.** A consideration of the historical and philosophical foundations of music education and their application to the process of program development in music education. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
- 441. Foundations and Principles of Music Education, II.** A consideration of the psychological foundations of music education and their application to the processes of instruction, administration, supervision, and evaluation of music education programs. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
- 442. The General Music Program in Secondary Schools.** Detailed consideration of the general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
- 443. Administration and Supervision of Music Education.** Deals with the functions of supervisors and directors of music education in administering music programs in elementary and secondary schools. $\frac{1}{2}$ or 1 unit.
- 444. The General Music Program in Elementary Schools.** Detailed consideration of elementary general music, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
- 445. Music in Higher Education.** An orientation to the organization, teaching, and administration of music in the college and university. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit. Offered in summer session only.
- 446. Seminar in Experimental Music, I.** Survey of contemporary electronic music, computer music, and related types of music; discussion of relevant music theory. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 447. Seminar in Experimental Music, II.** Continuation of Music 446. Prerequisite: Music 446 or consent of instructor. $\frac{1}{2}$ unit.
- 448. Computer Music.** Representation of sound signals in a digital computer; methods for input and output of sounds to and from a computer; sound synthesis programs; synthesis of simple musical structures; use of graphics; processing of live sounds by computer; editing and retrieval; fidelity of computer-produced sounds; and hybrid analog/digital computers. Prerequisite: Graduate standing in composition-theory or consent of instructor. 1 unit.
- 449. Problems in Band Conducting.** An examination of techniques of rehearsal, conducting, and preparation of band organizations for concert performance; emphasizes discussion, analysis, and preparation of selected scores and the problems they present. Prerequisite: Graduate standing or experience as a band conductor. $\frac{1}{2}$ or 1 unit.

- 450. History of Vocal Ensemble and Choral Music.** A critical and analytical study of vocal ensemble and choral music from the Middle Ages to the present. Prerequisite: Music 426 and 427, or equivalent, or consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 452. Choral Conducting Project.** Required of candidates for the degree of Master of Music with choral music option during the final semester in residence; includes participation in a graduate choral conducting laboratory and preparation of a choral ensemble for public performance. Prerequisite: Music 432 and consent of instructor. $\frac{1}{2}$ unit.
- 454. Advanced Choral Performance Techniques.** Study of performance problems and musical analysis of choral music with techniques of preparation and rehearsal from the various style periods: Renaissance, baroque, classic-romantic, and contemporary. Prerequisite: Admission into the Doctor of Musical Arts choral music program, or the equivalent background in other doctoral degree programs. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 455. The Choral Program in Secondary Schools.** An in-depth study of the methods and materials appropriate for teaching choral music in the secondary schools. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
- 456. Advanced Computer Music.** Compositional approaches to computer music; advanced digital computer sound synthesis using the computer programs MUSIC 360 and MUSIC 4BF; compositional algorithms; user-written sound generation routines; new concepts of timbre in digital sound synthesis; digital/analog and analog/digital conversion; and installation of computer music programs. Prerequisite: Music 448 or consent of instructor. 1 unit.
- 460. Practicum in Group Piano Teaching: Children and Teenagers.** Student teaching of group piano and musicianship classes for elementary, middle, and high school students; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 331 or equivalent. 1 unit.
- 461. Practicum in Group Piano Teaching: Adults.** Student teaching of group piano for adults in the private studio, community college, and university; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 332 or equivalent. 1 unit.
- 462. Literature of Guitar and Related Instruments.** Survey of solo and ensemble literature for guitar. The first semester considers music for the guitar, vihuela, lute, and related instruments up to 1750; the second semester covers music for the guitar and related instruments from 1750 to the present. Prerequisite: Graduate standing in music. 1 unit. May be repeated to a maximum of 2 units as topic varies.
- 477. Advanced Accompanying.** Grasp of the fundamental principles of accompanying singers and instrumentalists, practical experience in accompanying, and facility in sight reading for keyboard performers. Prerequisite: Graduate standing in music or music education and/or consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 480. Piano.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 481. Voice.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 482. Organ.** Selected studies from the masterworks of organ literature. Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 483. String Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 484. Wind Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 485. Percussion Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 489. Doctoral Projects.** Special projects for candidates for the Doctor of Musical Arts; open only to students in the Doctor of Musical Arts program. Prerequisite: Consent of instructor. 0 to 4 units (summer session, 0 to 2 units).

- 499. Thesis Research.** Research in special projects. Prerequisite: Consent of instructor. 0 to 4 units.

NAVAL SCIENCE

Head of Department: Captain Robert L. Prath, USN

Department Office: 236 Armory Building, 505 E. Armory, Champaign

- 100. Naval Science Laboratory.** A noncredit course designed to give the Naval ROTC student, through practical application, a better grasp of the naval science subjects taught in the classroom and a working knowledge of close order drill. 0 hours.
- 111. Introduction to Naval Science.** Naval organization and management practices examined within the context of the naval service; command and control, organization for logistics, service and support, functions and services of major components of the Navy and Marine Corps, and shipboard organization; and emphasis on management and leadership functions. Prerequisite: Approval of professor of naval science; concurrent registration in Naval Science 100. 2 hours.
- 112. Naval Ships Systems, I.** Studies ship compartmentation, propulsion systems, auxiliary power systems, interior communications, and ship control; types, structure, and purpose of naval ships; and examination of elements of ship design and ship stability. Prerequisite: Naval Science 111 or consent of instructor. 3 hours.
- 121. Naval Ships Systems, II.** Introduction to concepts of naval weapons systems, their capabilities and limitations, and their individual and complementary roles in a wide variety of offensive and defensive situations. Prerequisite: Credit or concurrent registration in Physics 102 or equivalent, and one course in computer science; or consent of instructor. 3 hours.
- 124. Sea Power and Maritime Affairs.** Investigates the characteristics of sea power and their impact on the affairs of our nation; discusses those characteristics with historical and modern applications to the United States and other world powers. 2 hours.
- 231. Navigation and Naval Operations, I.** Provides the student with an understanding of the theory and techniques of the three types of marine (nautical) navigation: piloting, electronic, and celestial. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100 or consent of instructor. 3 hours.
- 232. Navigation and Naval Operations, II.** Designed to give an understanding of the concepts and use of relative motion principles, international maritime law and the rules of the nautical road, and the fundamentals of U.S. fleet organization, communication, and operations. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
- 241. Naval Leadership and Management, I.** Introduction to management and organizational behavior with emphasis on motivation, leadership, communication, interpersonal relations, and decision making processes; applies theory to current problems in the naval organization. Prerequisite: Senior standing in NROTC Program or consent of instructor. 2 hours.
- 242. Naval Leadership and Management, II.** Continuation of Naval Science 241. Examines Navy organization, personnel administration procedures, human resource management programs, and military justice in terms of current management theory. Prerequisite: Naval Science 241 or consent of instructor. 2 hours.
- 291. Evolution of Warfare.** Survey of the evolution of warfare emphasizing the philosophies and trends which have been significant in land warfare. Prerequisite: Concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
- 293. History of Amphibious Warfare.** Studies amphibious operations and the evolution of amphibious warfare doctrine and development. Prerequisite: Advanced undergraduate standing or consent of instructor. 3 hours.

NUCLEAR ENGINEERING

Chairperson of Program: Professor G. H. Miley

Program Office: 214 Nuclear Engineering Laboratory, 103 South Goodwin, Urbana

- 197. Nuclear Energy and Its Uses.** Discussions and lectures to orient freshmen and sophomores to the role of nuclear engineering in society and technology. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 241. Introduction to Radiation Protection.** Same as Environmental Studies 241. An introductory course in the elements of radiation protection and health physics, emphasizing practical applications. Prerequisite: Math 120 or equivalent. 2 hours.
- 243. Radiation Protection Laboratory.** A laboratory course designed to provide an understanding of radiation and to introduce various radiation detection instruments and devices used in radiation protection. Prerequisite: Credit or concurrent registration in Nuclear Engineering 241 or consent of instructor. 1 hour.
- 290. Special Topics.** Considers selected areas which are of current interest to undergraduates in nuclear engineering but which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours.
- 295. Special Problems.** Individual investigations or studies of any phase of nuclear engineering selected by the student and approved by the department. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours. May be repeated.
- 302. Nuclear Power Engineering.** Same as Mechanical Engineering 302. Principles of release and utilization of fission energy in nuclear power engineering; includes such topics as fission processes and controlled chain reactions; nuclear reactor types, design principles, and operational characteristics; power reactor design criteria; radiation hazards and radioactive waste treatment; economics; and other applications such as propulsion and research reactors. Students who plan to take more extensive training in nuclear technology are advised to take the Physics 346 - Nuclear Engineering 347 sequence. Prerequisite: Consent of instructor. 3 hours or 1 unit. Credit for both Nuclear Engineering 302 and Nuclear Engineering 347 cannot be given toward the same degree.
- 312. Nuclear Power Economics and Fuel Management.** A quantitative analysis of the economic impact of the nuclear power industry; nuclear fuel cycle and capital costs for thermal and fast reactors; optimization of the use of nuclear fuels to provide the lowest energy costs and highest system performance; and comparison between fossil fuel systems, fission systems, and controlled thermonuclear systems. Prerequisite: Junior standing; Mechanical Engineering 302, or Nuclear Engineering 302 or 347, or consent of instructor. 3 hours or 1 unit.
- 321. Introduction to Controlled Thermonuclear Fusion.** Same as Electrical Engineering 321. Review of Maxwell's equations and introduction to plasma physics as it applies to controlled thermonuclear fusion problems; energy balance; plasma confinement and stability; and recent approaches to the fusion reactor. Prerequisite: Senior or graduate standing, or consent of instructor. 4 hours or 1 unit.
- 331. Materials in Nuclear Engineering.** Develops a materials engineering background applied to nuclear systems; relates structure of metals, ceramics, glasses, and concretes to their physical and mechanical properties; develops phase formation and reaction kinetics from basic thermodynamics principles; and discusses materials performance in nuclear systems, including irradiation damage and effects. Prerequisite: Junior standing in engineering or the physical sciences. 3 hours or $\frac{3}{4}$ unit.
- 341. Principles of Radiation Protection.** Sources of nuclear radiation; ionization and energy deposition in physical and biological media; principles of dosimetry; determination of protection limits for external and internal emitters; and basic shielding analysis. Prerequisite: Physics 346 or Chemistry 397, or consent of instructor. 4 hours or 1 unit.
- 342. Radioactive Waste Management.** Sources and characteristics of radioactive wastes; methods of treatment; monitoring techniques; methods of hazard evaluation; special aspects of solid, liquid, and gaseous wastes; and disposal, both temporary and permanent. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 2 hours or $\frac{1}{2}$ unit.

- 346. Modern Physics for Nuclear Engineers.** Same as Physics 346. See Physics 346.
- 347. Introduction to Nuclear Engineering.** Energy resources and nuclear power systems; basic principles of fission reactor operation; reactor control and heat removal; radiation protection and shielding of reactors; and safeguards, licensing, and environmental considerations. Prerequisite: Credit or registration in Physics 346, or equivalent. 3 hours or $\frac{3}{4}$ unit. Credit for both Nuclear Engineering 347 and Nuclear Engineering 302 cannot be given toward the same degree.
- 351. Nuclear Engineering Laboratory.** Radiation detection and instrumentation; radiation dosimetry and shielding; subcritical assemblies; reactor operations; basic measurements in nuclear engineering; and engineering applications. Prerequisite: Physics 346 or equivalent, and credit or concurrent registration in Nuclear Engineering 347. 3 hours or $\frac{3}{4}$ unit.
- 355. Reactor Statics and Dynamics.** Intermediate-level analysis of thermal and fast reactor assemblies; reactor statics, reactor dynamics, and introductory transport theory; homogeneous and heterogeneous reactors; and multigroup diffusion theory, perturbation theory, reactivity coefficients, and control rod analysis. Prerequisite: Nuclear Engineering 347 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 357. Safety Analysis of Nuclear Reactor Systems.** Basic safety philosophy in nuclear reactor systems; brief review of nuclear reactor systems; regulatory processes; siting considerations; safety problems related to reactor dynamics; evaluation of postulated accidents; risks associated with nuclear fuel cycle; and methods of systems safety analysis. Prerequisite: Nuclear Engineering 302 or 347, or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 358. Design in Nuclear Engineering.** Introduction to design in nuclear engineering systems; basic principles of definition, organization, constraints, modeling, and optimization of system design; case studies; and class design projects applying these basic principles. Prerequisite: Nuclear Engineering 347. 3 hours or $\frac{3}{4}$ unit.
- 388. Nuclear Ceramics.** Same as Ceramic Engineering 388. See Ceramic Engineering 388.
- 390. Intermediate Special Topics.** Considers selected areas of current interest in nuclear engineering which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 397. Radiochemistry.** Same as Chemistry 397. See Chemistry 397.
- 401. Fundamentals of Nuclear Engineering.** A lecture and problem course to provide background for further work in nuclear engineering; problems in materials, heat transfer, and fluid flow; and special emphasis on basic ideas and the mathematical similarity of problems in heat transfer, fluid flow, and neutron diffusion. Prerequisite: Mathematics 345 or equivalent; credit or concurrent registration in Chemistry 397 or Physics 382, or equivalent. 1 unit.
- 411. Nuclear Reactor Heat Transfer.** Selected topics in nuclear reactor heat transfer: thermal analysis of fuel elements under steady and transient operation; convective energy transport from reactor cores; two-phase flow and boiling in reactor cores; and liquid metal coolant systems. Prerequisite: Nuclear Engineering 401 or consent of instructor. 1 unit.
- 421. Interaction of Radiation with Matter.** Topics in the interaction of radiation with matter of interest to the nuclear engineering field: the kinematics, kinetics, and cross sections involved in the interaction of charged particles, electromagnetic radiation, and neutrons. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 1 unit.
- 422. Controlled Fusion Systems, I.** Same as Electrical Engineering 422. Development of plasma models for fusion analysis; treatment of plasma heating and confinement with applications to current experiments; energy balances; and energy extraction. Prerequisite: Nuclear Engineering 321 or consent of instructor. 1 unit.
- 423. Controlled Fusion Systems, II.** Development of plasma models for high-beta pulsed fusion systems and for pellet fusion systems; heating and confinement mechanisms; energy balances and energy extraction; and applications to current experiments. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
- 424. Stability Problems in Fusion Systems.** Survey of instabilities of interest in controlled thermonuclear fusion; overall system instabilities in fusion power reactors and applica-

- tions; macro-instabilities and micro-instabilities of interest in CTR devices, and practical implications for proposed fusion reactor designs; and instabilities resulting from refueling and heating. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
- 425. Nuclear-Electrical Energy Conversion.** Same as Electrical Engineering 425. Advanced concepts in nuclear radiation energy conversion of importance in both power production and radiation detection; analysis and applications of direct collection of charged particles; and theory and applications of radiation-induced ionization and excitation. 1 unit.
- 431. Nuclear Metallurgy.** Metallurgical principles applied to materials problems in nuclear engineering; includes topics in production of uranium, corrosion, radiation damage, fuel element fabrication, and fuel reprocessing. Prerequisite: Consent of instructor. 1 unit.
- 441. Nuclear Radiation Shielding.** Basic concepts, radiation sources, elementary gamma ray and neutron shielding, geometry factors in shielding, advanced techniques (such as Monte Carlo and discrete ordinates), special topics (such as shield heating, duct streaming, and albedo theory), and practical aspects. Prerequisite: Nuclear Engineering 341 or consent of instructor. 1 unit.
- 454. Nuclear Engineering Laboratory Investigations.** Individual investigation in nuclear engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
- 455. Reactor Theory, I.** Same as Physics 455. Advanced development of neutron transport theory; neutron slowing-down and resonance absorption; approximations to the transport equation; direct numerical methods and other techniques of approximation theory applied to the neutron transport equation; and advanced topics. Prerequisite: Nuclear Engineering 355, graduate standing in physics, or consent of instructor. 1 unit.
- 456. Reactor Theory, II.** Same as Physics 456. Advanced treatment of the theory of slow-neutron scattering, neutron thermalization, Doppler broadening, fuel depletion and fuel loadings, properties of neutron migration operators, and mathematical neutron transport theory; interpretation of related experiments; and advanced topics. Prerequisite: Nuclear Engineering 421 or 455, graduate standing in physics, or consent of instructor. 1 unit.
- 457. Advanced Reactor Analysis.** Forms of the multigroup neutron transport and diffusion equations; analysis of heterogeneous reactors; direct numerical solution of the transport and diffusion equations; integral and coarse mesh methods; iterative solutions, convergence, and acceleration; synthesis methods; Monte Carlo methods for particle transport; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
- 458. Advanced Nuclear Engineering Design.** A classroom exercise in the conceptual design of a nuclear engineering system involving a synthesis of previous learning in the field of nuclear engineering and related disciplines; the design includes all necessary ingredients for the system, such as core, thermal-hydraulics, shielding, material selection, and control. Prerequisite: Five 300- and/or 400-level nuclear engineering courses including Nuclear Engineering 347 and 401, or equivalent; or consent of instructor. 1 unit.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Physics, and Theoretical and Applied Mechanics 459. See Mathematics 459.
- 460. Reactor Kinetics and Dynamics.** Diffusion and transport neutron balances with delayed neutrons; formal development of the point reactor kinetics equations; analytic and numerical solutions of the point reactor kinetics equations; space-dependent, multigroup reactor kinetics; reactivity measurements; reactor noise analysis; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
- 490. Special Topics.** Considers selected areas of current interest in research which are not adequately covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
- 495. Nuclear Engineering Problems.** Individual study in areas of nuclear engineering and closely related fields not covered by regular course offerings. The work is carried out under the supervision of a member of the faculty. Prerequisite: At least 3 units of graduate work; consent of instructor. $\frac{1}{4}$ to 2 units.
- 497. Seminar in Nuclear Science and Engineering.** Lectures and discussions on current work in research and development in nuclear engineering and related fields by staff, advanced students, and visiting lecturers. 0 or $\frac{1}{4}$ unit.

499. Thesis Research. 0 to 4 units.

NURSING

(Including General Nursing, Medical-Surgical Nursing, and Public Health Nursing)

Assistant Dean: Nancy S. Creason

Office: 1115 ½ West Oregon, Urbana

The following courses are among the first to be offered in the College of Nursing R.N. Baccalaureate Completion and Adult Health Nursing Graduate Programs on the Urbana-Champaign campus. Although these courses are part of the undergraduate and graduate offerings of the College of Nursing at the Chicago campus, which has ultimate responsibility for them, under a cooperative arrangement they are being offered on the Urbana-Champaign campus as well. The graduate offerings are a part of the Graduate College at the Chicago campus.

NOTE: In the following courses, enrollment is limited to students who have senior standing in the College of Nursing R.N. Baccalaureate Completion Program, or who are admitted to the Graduate College of the Health Sciences Center.

General Nursing

- 203. Nursing Concepts III.** Examines concepts related to organizational, management, and leadership theories and related processes applied to the health care and nursing care delivery systems. Prerequisite: Senior standing; concurrent registration in Medical-Surgical Nursing 203. 1 hour.
- 204. Concepts of Professional Practice.** Focuses on the nursing process as a basic tool of professional nursing practice; examines the basis of nursing practice in terms of concepts and theory as a means of organizing knowledge for nursing action. Prerequisite: General Nursing 293 or consent of department; concurrent registration in General Nursing 205. 3 hours.
- 205. Professional Practice Practicum.** Application of nursing process in a variety of clinical settings. Prerequisite: Concurrent registration in General Nursing 204. 2 hours.
- 293. Seminar in Nursing.** Exploration, reporting, and discussion of issues in nursing and related fields; effect of contemporary concepts and values on nursing today and on future development of the profession. 3 hours.
- 296. Introduction to Research Methods.** Principles of scientific investigation; relationship of research design to nursing theory; sampling; data collection and analysis techniques; ethical issues. Application to critical examination of nursing research literature. Prerequisite: A course in introduction to statistics. 2 hours.
- 300. Principles of Nursing Administration.** Overviews the principles, objectives, and methods of managing nursing services in a division of a health services institution or agency and skill training in applying this knowledge. Prerequisite: Graduate standing in nursing. 2 hours.
- 400. Theoretical Basis of Adult Health Nursing.** The first in a sequence of graduate courses in adult health nursing. Examines selected adult development theories, the interaction of major postulates of those theories with the individual adult's health status and the relevance to nursing process in the nursing care of the adult. Prerequisite: Graduate standing in nursing or consent of instructor. 3 hours.
- 401. Concepts in Adult Health Nursing.** Follows in sequence of General Nursing 400. Critical analysis of selected theories of and concepts useful in the practice of adult health nursing;

considers nursing behaviors essential to effective intervention. Emphasizes current research. Prerequisite: General Nursing 400, graduate standing in nursing, or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.

- 402. Methods in Adult Health Nursing.** Provides concentrated field practice in adult health nursing in a variety of health care agencies (clinics, hospitals, public health agencies, etc.). Prerequisite: Graduate standing in nursing, and concurrent registration in General Nursing 400 and 401 or consent of instructor. 1 to 4 hours.
- 405. Theoretical Basis for Nursing.** Reviews several schemes for evaluating theory; evaluates selected theories using the above schemes. Pays particular attention to the historical development of nursing theory and the use of theory in nursing. Prerequisite: Graduate standing in nursing or consent of instructor. 2 hours.
- 410. Nursing Research Design.** Critically examines common research designs; presents a variety of data collection procedures; discusses concepts of reliability and validity; explores methods of analysis appropriate to the data; and investigates ethical issues associated with each stage of research. Prerequisite: Graduate standing in nursing or consent of instructor. 2 hours.
- 420. Methods of Teaching in Nursing.** Field experience in teaching nursing in classroom and clinical settings. Students have the opportunity to develop and teach content in their own nursing specialty; includes supervising, counseling, and evaluating students in clinical practice settings. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing; consent of instructor. 1 to 4 hours.
- 429. Methods of Management in Clinical Nursing.** Guided experience in planning, organizing, and managing a division of nursing service in the student's clinical specialty; includes opportunity to observe and participate in the supervisory role, planning a supervisory program, and designing strategy for effective change and for evaluating outcomes. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing, General Nursing 300, or consent of instructor. 3 or 4 hours.
- 440. Special Topics in Nursing.** Selected topics of current interest; offered if there is sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing and consent of instructor. 1 to 3 hours.
- 480. Independent Study in Nursing.** Investigation of special selected problems in nursing under direction of a graduate faculty member; the nature of the selected nursing problem determines the modes of investigation. Prerequisite: Graduate standing in nursing and consent of instructor. 1 to 4 hours.
- 491. Seminar in Nursing.** Identifies and analyzes a broad range of issues related to modern nursing and nursing research. Topics will vary according to student interest. Prerequisite: Graduate standing in nursing and consent of instructor. 1 hour.
- 493. Research in Nursing.** Prerequisite: Credit or concurrent registration in General Nursing 410; graduate standing in nursing. 1 to 5 hours.
- 499. Thesis Research.** 0 hours.

Medical-Surgical Nursing

- 203. Nursing Concepts III Practicum.** Application of the theoretical concepts of leadership and the management process as related to delivery of health care. Prerequisite: Senior standing; concurrent registration in General Nursing 203. 1 hour.
- 220. Medical-Surgical Nursing, II.** Studies concepts and principles of rehabilitation applied to the care of adults with long term, permanent, and progressive disabilities, emphasizing patients with neurological and musculoskeletal conditions; emphasizes the impact of disabilities on families and community systems. Prerequisite: Senior standing; concurrent registration in Medical-Surgical Nursing 221. 3 hours.
- 221. Medical-Surgical Nursing II Practicum.** Applies concepts and principles of rehabilitation to the care of persons with long term, permanent, or progressive disabilities with emphasis on patients with neurological and musculoskeletal conditions; emphasizes pa-

tient and family teaching to foster optimal levels of functioning in the community. Prerequisite: Senior standing; concurrent registration in Medical-Surgical Nursing 220. 2 hours.

Public Health Nursing

- 260. Public Health Nursing.** Concepts and principles needed to provide comprehensive health care to individuals and families in homes and community settings; functions of public health nursing in community assessment and community health planning. Prerequisite: General Nursing 204, Health and Safety Studies 374, or equivalent; concurrent registration in Public Health Nursing 261. 3 hours.
- 261. Public Health Nursing Practicum.** Gives students an opportunity to work with families and aggregates in the community, to apply newly acquired public health concepts, and to synthesize previously acquired nursing knowledge and skills. Prerequisite: General Nursing 204; concurrent registration in Public Health Nursing 260. 2 hours.

NUTRITIONAL SCIENCES

Director: J. A. Milner

Program Office: 451 Bevier Hall, 905 S. Goodwin, Urbana

- 320. Nutritional Aspects of Disease.** Same as Foods and Nutrition 320. See Foods and Nutrition 320.
- 324. Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Foods and Nutrition 324. See Food Science 324.
- 400. Nutritional Sciences Seminar.** Discussions of current problems in nutritional sciences. Required of all graduate students in the nutritional sciences program. Prerequisite: Nutritional Sciences 410 and consent of instructor. 0 or $\frac{1}{4}$ unit.
- 410. Current Topics in Nutritional Research.** Same as Dairy Science and Food Science 410. Discussion of current research problems in experimental nutrition. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. $\frac{3}{4}$ unit.
- 411. Chemistry of Nutritional Processes.** Same as Dairy Science and Food Science 411. Biochemical aspects of nutrition with emphasis on the function, regulation, and metabolism of nutrients in man. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. 1 unit.
- 450. Problems in Clinical Nutrition.** Students meet weekly with University faculty and hospital clinical staff for rounds and tutorial-type discussions which evaluate the nutritional status of hospitalized patients and suggest appropriate nutritional management. Students write research proposals on specific problems or, by arrangement with the instructor, term papers on the nutritional management of a clinical problem. Prerequisite: Nutritional Sciences 410 and 411, or consent of instructor. $\frac{1}{2}$ unit.
- 461. Advanced Clinical Nutrition, I.** Same as Medical Sciences 461. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; reviews the theory behind nutritional treatment of disease states. Prerequisite: Credit or concurrent registration in Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 461.
- 462. Advanced Clinical Nutrition, II.** Same as Medical Sciences 462. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems

encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; incorporates the nutritional assessment and treatments learned in the first semester into nutritional care of hospitalized patients. Prerequisite: Nutritional Sciences 450, or consent of instructor. 2 hours or ½ unit. Hourly credit only applicable to Medical Sciences 462.

- 493. Individual Topics in Nutrition.** For students majoring in nutritional sciences who wish to undertake individual studies of a nonthesis nature in problems or topics not covered in other courses; may be taken under the direction of any member of the nutritional sciences faculty, with the exception of the student's own thesis adviser. Prerequisite: Consent of instructor. ¼ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

PAINTING

(See Art and Design)

PHILOSOPHY

Chair of Department: Professor R. L. Schacht

Department Office: 105 Gregory Hall, 810 S. Wright, Urbana

NOTE: Students are urged to consult the detailed descriptions of all philosophy courses to be offered in particular semesters. These descriptions may be obtained in the department office at any time beginning one week prior to advance enrollment.

- 101. Introduction to Philosophy.** Consideration of some main problems of philosophy concerning, for example, knowledge, God, mind and body, and human freedom. 3 hours.
- 102. Logic and Reasoning.** A practical study of logical reasoning; techniques for analyzing and criticizing arguments, with emphasis on assessing the logical coherence of what we read and write. 3 hours.
- 105. Introduction to Ethics.** Some basic questions of ethics, discussed in the light of influential ethical theories and with reference to specific moral problems, such as: what makes an action morally right? are moral standards absolute or relative? what is the relation between personal morality and social morality, and between social morality and law? 3 hours. Credit is not given for both Philosophy 105 and 106.
- 106. Ethics and Social Policy.** An examination of the moral aspects of social problems, and a survey of ethical principles formulated to validate social policy. 3 hours. Credit is not given for both Philosophy 106 and 105.
- 107. Introduction to Political Philosophy.** An examination of the philosophical bases of democracy and some alternative political forms. 3 hours.
- 110. World Religions.** Same as Religious Studies 110. Survey of the leading living religions, including Hinduism, Buddhism, Taoism, Mohammedanism, Judaism, and Christianity; examination of basic texts and of philosophic theological elaborations of each religion. 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 198. Freshman Seminar.** Investigation of selected fundamental topics of philosophical inquiry. See Timetable for current topics. Prerequisite: Freshman James Scholar. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Philosophy in Literature.** A consideration of the philosophical themes implicit in a variety of important literary works, both classical and modern; includes such authors as Sophocles, Shakespeare, Goethe, Dostoevsky, and Sartre. 3 hours.

- 202. Symbolic Logic.** An introduction to the techniques of formal logic, dealing primarily with truth-functional logic and quantification theory. 3 hours.
- 203. Ancient Philosophy.** An introduction to ancient philosophy, concentrating on Plato and Aristotle, dealing with such topics as metaphysics, ethics, and the theory of knowledge. 4 hours.
- 206. Early Modern Philosophy.** The history of philosophy from Descartes to Kant. 4 hours.
- 207. Early Modern Philosophy, I.** Bacon, Hobbes, Locke, Berkeley, and Hume. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
- 208. Early Modern Philosophy, II.** Descartes, Spinoza, Leibniz, and Kant. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
- 210. Ethics.** Problems in ethical theory; the nature of right and wrong, justice, conscience, moral feelings, etc. 3 hours.
- 214. Moral Problems in Medicine and Biology.** A philosophical study of selected moral and social problems concerning medicine and biology, such as euthanasia, abortion, allocation of scarce medical resources, health care and rights, and genetic engineering. 3 hours.
- 225. Recent European Philosophy.** Introduction to the major recent philosophical movements in Europe, such as phenomenology, existentialism, philosophical anthropology, and neo-Marxism. 3 hours.
- 230. Philosophy of Religion: Introduction.** Same as Religious Studies 230. Introduction to philosophical analysis of religions thought and experience. 3 hours.
- 250. Conceptions of Human Nature.** A comparative examination of important historical and contemporary conceptions of human nature. 3 hours.
- 270. Philosophy of Science.** Investigation of the nature of scientific knowledge by examining archetypal examples from physical science (e.g., Ptolemaic and Copernican astronomy); nature of scientific truth, validation of theories, nature of scientific theories, evolution of theories, experimental procedure, role of presuppositions, scientific revolutions, etc. 3 hours.
- 275. Technology and Human Values.** Same as Science, Technology, and Society 201. See Science, Technology, and Society 201.
- 280. Current Controversies.** Philosophical examination of positions taken on some issue of current concern, e.g., human sexuality, death and dying, feminism, race, intelligence, war, and sociobiology. See Timetable for current topics. 3 hours. May be repeated with consent of department Chair.
- 290. Individual Study.** Readings in selected philosophical topics. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to juniors and seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the Chair of the department. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 292. Thesis.** Special training in philosophical investigation. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the chair of the department. 2 to 4 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
- 298. Advanced Undergraduate Seminar.** Seminar on selected philosophical topics; intended primarily for advanced undergraduate philosophy concentrators. Prerequisite: A grade-point average of 4.0 and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
- 301. Philosophy and Film.** Study of procedures for interpreting narrative films and evaluating specific interpretations, as well as an examination of philosophical issues raised in selected films. Prerequisite: One course in philosophy or in cinema studies. 4 hours or 1 unit.
- 304. Medieval Philosophy.** The history of philosophy from St. Augustine to William of Ockham. Prerequisite: Philosophy 101 or 203. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 310. Classical Ancient Philosophers.** An intensive study of one ancient philosopher or the intensive study of a major philosophical problem through the consideration of a number of ancient philosophers; chief emphasis on Plato and/or Aristotle. Prerequisite: One course in philosophy, preferably Philosophy 203. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit with the consent of the Chair of the Department.
- 311. Nineteenth Century Philosophy.** Examination of the thought of such major figures as Hegel, Marx, and Nietzsche. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 312. Classical Modern Philosophers.** Intensive study of one, or in special cases, two major philosophers of the period 1600-1900, e.g., Descartes, Hume, Kant, or Hegel. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
- 313. American Philosophy.** Examination of American philosophers from colonial to recent times, for example, Edwards, Peirce, James, Dewey. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Major Recent Philosophers.** Intensive study of one or two important philosophers of the present century, e.g., Wittgenstein, Dewey, Heidegger, or Quine. Topic varies; see Timetable. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit as topic varies with consent of the department Chair.
- 316. Anglo-American Philosophy Since 1900.** Introduction to the major philosophical developments in England and America in the present century, focusing on such writers as G. E. Moore, Bertrand Russell, A. J. Ayer, Ludwig Wittgenstein, and W. V. Quine. Prerequisite: One course in philosophy. 3 hours or 1 unit.
- 317. Scientific Thought, I.** Same as History 339. A historical and critical survey of the development of science and its philosophical interpretation to the death of Newton. 3 hours or 1 unit.
- 318. Scientific Thought, II.** Same as History 340. A historical and critical survey of the development of science and its philosophical interpretation from the death of Newton to the early twentieth century. Prerequisite: Philosophy 317. 3 hours or 1 unit.
- 319. Space, Time, and Matter.** Same as Physics 319. See Physics 319.
- 321. Ethics and Value Theory.** A systematic study of selected classics in moral philosophy by such philosophers as Aristotle, Hume, and Kant. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 322. Recent Developments in Ethics.** Intensive treatment of issues in contemporary ethical theory. Prerequisite: One course in ethics. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit once with consent of the department Chair.
- 323. Philosophy of Art.** Examination of philosophical interpretations of art and aesthetic experience by influential classical and recent writers. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 324. Philosophy of Religion.** Same as Religious Studies 362. Considers central issues in the philosophy of religion, e.g., the justification of religious belief, the nature of God, religious experience, etc. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Philosophy of Mind.** Philosophical problems arising in connection with mental phenomena; the relation of mind and body; free will and determinism; our knowledge of other minds; and the self and personal identity. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 326. Metaphysics.** Investigation of various metaphysical issues concerning, for example, existence, substance, particulars and universals, and space and time. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 330. Theory of Knowledge.** Investigation of issues concerning, for example, the nature and possibility of knowledge; its forms and limits; its relation to belief, truth, and justification; and the nature of truth. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Analytic Philosophy.** Intensive study of works of important analytic philosophers, such as Wittgenstein, Austin, and Quine, on problems of knowledge, method, and other selected topics. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 335. Social Philosophy.** Selected topics from the nature of social organization, nature and convention, utility, justice, equality, liberty, rights, and duties. Prerequisite: Philosophy 105, 106, or 321, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 336. Philosophy of Law and of the State.** Examination of issues in the philosophy of law, such as the nature of law, law and morality, justice, liberty and authority, punishment, and legal responsibility. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 337. Semantics.** An investigation of semantical concepts such as denoting and truth; a study of the functions of language; definition, meaning and verification, and semantical paradoxes. Prerequisite: A course in logic. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 338. Philosophy of Language.** Same as Linguistics 338. A historical or comparative study of the philosophy of language. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 339. Philosophy of Mathematics.** Same as Mathematics 339. Introduction to some of the main philosophical problems and contemporary viewpoints concerning mathematical concepts, mathematical methods, and the nature of mathematical truths. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Existential Philosophy.** Study of a selection of the major writings of the more important existential philosophers, e.g., Heidegger, Jaspers, and Sartre. Prerequisite: One course in philosophy (preferably Philosophy 225 or 311), or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 343. Phenomenology.** Study of the development of phenomenology from Husserl to the present. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Topics in Phenomenology.** Examination of phenomenological treatments of selected phenomena, such as interpersonal relationships, emotions, the body, and perception; see Timetable for current topics. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Marxist Philosophy.** Examination of the philosophical writings of a number of Marxist writers, from Marx himself to such neo-Marxists as Schaff, Petrovic, Sartre, and Marcuse. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 347. Post-Structuralist French Philosophy.** Intensive study of a selection of the major writings of recent French philosophers, such as Foucault and Derrida. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 353. Formal Logic and Philosophy.** Techniques and results of symbolic logic, with special attention to topics of philosophical importance. Prerequisite: Philosophy 202, graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 354. Advanced Symbolic Logic.** Completeness, compactness, and Lowenheim-Skolem theorems for first-order logic; incompleteness and undecidability of formal systems; and additional material on proof theory, model theory, or axiomatic set theory as time permits. Prerequisite: Philosophy 202 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 371. Philosophy of Science: Contemporary Issues.** Examines important developments and controversies in recent philosophy of science. Prerequisite: Philosophy 270 or consent of instructor. 3 hours or 1 unit.
- 375. The Philosophy of Social Science.** Same as Anthropology 329 and Sociology 325. A survey of philosophical problems encountered in the disciplines concerned with man and society, with particular emphasis on the extent to which questions and subject matter in these fields are amenable to scientific treatment. 3 hours or 1 unit.
- 377. Philosophy of Psychology.** A philosophical examination of the aims, methods, and structure of psychology, with special attention to such issues as the nature of explanations of behavior, the adequacy of behaviorism as a philosophy of psychology, and the place of the mind in psychological investigation. Prerequisite: Two courses in psychology, or consent of instructor. 3 hours or 1 unit.
- 401. Seminar in the History of Philosophy.** Study of selected major philosophers, movements, problems, or topics in the history of philosophy; see Timetable for current topics. 1 unit. May be repeated.
- 411. Seminar in Ethical Theory.** 1 unit. May be repeated.
- 412. Seminar in Social Philosophy.** A seminar designed to study special problems in social philosophy. See Timetable for current topics. 1 unit. May be repeated.
- 413. Logical Theory.** Logical syntax and semantics. Prerequisite: A course in logic or consent of instructor. 1 unit. May be repeated.

417. **Seminar in the Philosophy of Science.** Various problems arising from specific studies in philosophy pertaining to science and vice versa. To be offered with varying topics. 1 unit. May be repeated.
420. **Seminar in Semantics.** Same as Communications 420. Intensive study of important contemporary contributions in the fields of semantics, analytic philosophy, and the philosophy of language. Prerequisite: Graduate standing in philosophy or equivalent. 1 unit. May be repeated.
421. **Seminar in Contemporary Problems.** Intensive study of selected problems or topics in contemporary philosophy. 1 unit. May be repeated.
423. **Seminar in the Theory of Knowledge.** Selected topics and writings of major importance in the contemporary philosophy of knowledge. 1 unit. May be repeated.
425. **Seminar in the Philosophy of Mind.** Selected topics from major writings in the philosophy of mind. 1 unit. May be repeated.
483. **Individual Topics.** Individual study and oral and written reports on topics not covered in other courses. Topics and plan of study must be approved by the candidate's adviser and by the staff member who directs the work. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ to 2 units).
490. **Directed Research.** Restricted to students satisfying requirements for the master's degree by writing a substantial essay. Normally taken for two units credit but may be taken for three units credit with consent of department Chair. 0 to 3 units.
499. **Thesis Research.** 0 to 4 units.

PHOTOGRAPHY

(See Art and Design)

PHYSICAL EDUCATION

Head of Department: Professor Karl M. Newell

Department Office: 117 Freer Gymnasium, 906 S. Goodwin, Urbana

100. **Developmental Activities.** Skills and knowledge essential for leisure-time activities which are classified as developmental activities. Prerequisites for each developmental activity are given below. More than one activity (Sections A through H) may be taken in the same term. 1 to 2 hours.
- Section A: Conditioning and Weight Control.** Activities and understanding which contribute to the development and/or maintenance of physical fitness and a well-proportioned body. 1 to 2 hours. May be repeated once for credit if taken in successive semesters; credit not to exceed a total of 2 hours.
- Section B: Personal Defense.** Skills and understanding essential for defense against an aggressor, with emphasis on avoiding attack. 1 hour.
- Section C: Weight Training.** Skills and knowledge essential for use of weights for conditioning the body. 1 hour. May be repeated once for credit if taken in successive semesters.
- Section D: Physical Fitness.** Activities and understanding which contribute to the development and maintenance of physical fitness according to social and hygienic standards. 1 hour. May be repeated once for credit if taken in successive semesters.
- Section E: Prescribed Exercise.** Prescribed exercise adapted to individual needs, capacities, and interests. Open only to paraplegic and handicapped students. 1 hour. May be repeated to a maximum of 4 hours.
- Section H: Hatha Yoga.** Introduction to Hatha Yoga, which is concerned with the physical well-being of the entire organism; includes a graduated program of postures (asanas), stretching movements, and muscular relaxation and breathing exercises. 1 hour.

Section I: Outdoor Adventures. Introductory skills and knowledge for development of life time activities in basic backpacking, basic river canoeing, and mountaineering techniques (balance climbing and rappelling). Includes participation in one field trip during the semester. Prerequisite: Physical Education 106A and 107A; or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 101. Dance Activities.** Skills and knowledge essential for leisure-time activities which are classified as dance activities. Prerequisites for each dance activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour.

Section A: Ballroom Dance, I. Introductory skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, cha-cha, and selected fad dances. 1 hour.

Section B: Ballroom Dance, II. Intermediate skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, and cha-cha as well as tango, samba, and paso doble. Prerequisite: Physical Education 101A or consent of instructor. 1 hour.

Section C: International Ballroom Dance. Skills and understanding essential for international ballroom dance steps; emphasis on tango, cha-cha, Viennese waltz, samba, rhumba, quickstep, paso doble, mambo, and merengue. Prerequisite: Physical Education 101B or consent of instructor. 1 hour.

Section D: American Square Dance. Introductory skills and understanding essential for square dancing; opportunities for conducting and calling dances. 1 hour.

Section E: International Folk Dance. Introductory skills, knowledge, and conditioning essential for exploring cultural characteristics via the folk dance idiom. 1 hour.

Section F: Modern Dance, I. Introductory skills, knowledge, and conditioning essential for free and creative dance. 1 hour.

Section G: Modern Dance, II. Intermediate level technique, improvisation, and composition for both men and women; multimedia approaches to dance and dance criticism. Prerequisite: Physical Education 101F or consent of instructor. 1 hour.

Section H: Afro-American Dance Forms. Beginning skills and knowledge and, under the repeat option, refined and more complex skills and heightened kinesthetic awareness essential for development of cultural characteristics via dance of West African, West Indian, Latin American, and contemporary Black American sources. 1 hour. May be repeated to a maximum of 3 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 102. Individual and Dual Activities.** Skills and knowledge essential for leisure-time activities which are classified as individual and dual activities. Prerequisites for each individual or dual activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour.

Section A: Tennis, I. Introductory skills, knowledge, and conditioning essential for court play. 1 hour.

Section B: Tennis, II. Intermediate skills, knowledge, and attitudes for effective court play. Prerequisite: Physical Education 102A or consent of instructor. 1 hour.

Section C: Golf, I. Introductory skills and understanding essential for course play, with emphasis on irons. For current fees, see Timetable. 1 hour.

Section D: Golf, II. Intermediate skills and understanding essential for use of irons and woods; analysis of course play. For current fees, see Timetable. Prerequisite: Physical Education 102C or consent of instructor. 1 hour.

Section E: Bowling, I. Introductory skills and understanding essential for bowling. For current fees, see Timetable. 1 hour.

Section F: Bowling, II. Intermediate skills and understanding essential for bowling. For current fees, see Timetable. Prerequisite: Physical Education 102E or consent of instructor. 1 hour.

Section C: Equitation and Horsemanship, I. Fundamentals of riding, including walk, trot, and canter; flatsaddle and bareback riding; use of reins and tack; saddling and unsaddling; and basic grooming. For current fees, see Timetable. 1 hour.

Section H: Equitation and Horsemanship, II. Intermediate riding skills, including individual control of walk, trot, and canter; smooth transfer of gaits; bareback riding in all three gaits; diagonals, figure eights, and serpentine; and tack maintenance. For current fees, see Timetable. Prerequisite: Physical Education 102G or consent of instructor. 1 hour.

Section I: Foil Fencing. Introductory skills, knowledge, and conditioning essential for foil fencing. 1 hour.

Section J: Target Archery. Introductory skills, knowledge, and conditioning essential for target shooting. 1 hour.

Section K: Track and Field. Introductory skills, knowledge, and conditioning essential for various track and field events. 1 hour. May be repeated once for credit.

Section M: Pocket Billiards. An introduction to the fundamentals of pocket billiards play; grip, stance, bridge, strategy, variation of shots, how to impart English on the cue ball, basic position play, and an 8-ball tournament; and rules of various billiard games. For current fees, see Timetable. 1 hour.

Section N: Basic Marksmanship. Introductory skills, knowledge, and safety measures for basic marksmanship techniques with small bore weapons. 1 hour.

Section O: Competitive Marksmanship. Development of advanced competitive shooting skills; includes match weapons, description use, match procedures and match techniques. Prerequisite: Physical Education 102N. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 103. Indoor Court Activities.** Skills and knowledge essential for leisure-time activities which are classified as indoor court activities. Prerequisites for each indoor court activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.

Section A: Racquetball, I. Introductory skills, knowledge, and strategies essential for racquetball. 1 hour.

Section B: Racquetball, II. Intermediate skills, knowledge, and strategies essential for racquetball. Prerequisite: Physical Education 103A or consent of instructor. 1 hour.

Section C: Badminton. Introductory skills, knowledge, and conditioning essential for badminton. 1 hour.

Section D: Handball. Introductory skills, knowledge, and conditioning essential for four-wall handball. 1 hour.

Section E: Squash Racquets. Introductory skills, knowledge, and conditioning essential for squash racquets. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 104. Skating Activities.** Skills and knowledge essential for leisure-time activities which are classified as skating activities. Prerequisites for each skating activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.

Section A: Figure Skating, I. Introductory skills, knowledge, and conditioning essential for figure skating. For current fees, see Timetable. 1 hour.

Section B: Figure Skating, II. Intermediate skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the United States Figure Skating Association's preliminary tests. For current fees, see Timetable. Prerequisite: Physical Education 104A or consent of instructor. 1 hour.

Section C: Figure Skating, III. Advanced skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the first eight tests of the United States Figure Skating Association. For current fees, see Timetable. Prerequisite: Physical Education 104B or consent of instructor. 1 hour.

Section E: Ice Dance. Introduction to set patterns of ice dance; emphasizes ice dance skills

designed to build control in footwork and balance when skating with a partner. For current fees, see Timetable. Prerequisite: Physical Education 104B or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 106. Swimming Activities.** Skills and knowledge essential for leisure-time activities which are classified as swimming activities. Prerequisites for each swimming activity are given below. More than one activity (Sections A, B) may be taken in the same term if these activities are offered on an 8-week basis. 1 hour.

Section A: Swimming, I. Introductory skills, knowledge, and conditioning essential for swimming. Open only to nonswimmers and those with no deep water experience. 1 hour. May be repeated once for credit.

Section B: Swimming, II. Intermediate skills, knowledge, and conditioning essential for swimming. Open only to swimmers who can execute a minimum of one of the five basic strokes in deep water, perform a standing dive, and tread in deep water. Prerequisite: Physical Education 106A or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 107. Aquatic Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as aquatic sport activities. Prerequisites for each aquatic sport activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour.

Section A: Canoeing. Introductory skills and knowledge essential for handling a canoe with safety. Prerequisite: Physical Education 106B or consent of instructor; the ability to jump or dive into deep water while clothed and maintain a survival position for 10 minutes. 1 hour.

Section B: Competitive Swimming. Skills, knowledge, and conditioning essential for strokes, starts, and turns; emphasis on training for competitive participation as well as meet organization. Prerequisite: Physical Education 106B or consent of instructor. 1 hour.

Section C: Springboard Diving. Introductory skills, knowledge, and conditioning essential for springboard diving. Prerequisite: Physical Education 106B or consent of instructor. 1 unit. May be repeated once for credit.

Section D: Synchronized Swimming. Introductory skills, knowledge, and conditioning essential for creating aquatic compositions. Prerequisite: Physical Education 106B or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 109. Team Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as team sport activities. Prerequisites for each team sport activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour.

Section A: Volleyball, I. Introductory skills, knowledge, and conditioning essential for power volleyball. 1 hour.

Section B: Volleyball, II. Intermediate skills, knowledge, and conditioning essential for power volleyball. Prerequisite: Physical Education 109A or consent of instructor. 1 hour.

Section C: Basketball. Introductory skills, knowledge, and conditioning essential for basketball. 1 hour.

Section F: Baseball. Introductory skills, knowledge, and conditioning for baseball. 1 hour.

Section H: Soccer. Introductory skills, knowledge, and conditioning essential for soccer. 1 hour.

Section I: Rugby Football. Introductory skills, knowledge, and conditioning essential for offensive and defensive strategies of the game. 1 hour.

Section J: Field Hockey. Introductory skills, knowledge, and conditioning essential for field hockey. 1 hour.

Section K: Lacrosse. Introductory skills, knowledge, and conditioning essential for lacrosse. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 110. Gymnastic Activities.** Skills and knowledge essential for leisure-time activities which are classified as gymnastic activities. Prerequisites for each gymnastic activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.

Section A: Apparatus, I. Introductory skills, knowledge, and conditioning relative to participation on heavy apparatus. 1 hour.

Section B: Apparatus, II. Intermediate skills, knowledge, and conditioning relative to participation on heavy apparatus. Prerequisite: Physical Education 110A or consent of instructor. 1 hour.

Section C: Tumbling. Introductory skills, knowledge, and conditioning for tumbling and free exercise. 1 hour. May be repeated once for credit.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 120. Injuries in Sport.** Emphasizes injury mechanisms, means of injury prevention, and emergency care applied to various types of sport injuries; laboratory sessions emphasize preventive and therapeutic taping and emergency first aid. 2 hours.

- 121. Survey of Sports Medicine.** Introduction to sports medicine for non-Physical Education majors; includes discussion of training, conditioning, and preparation for sports, injury aspects of sports, and rehabilitation. 3 hours.

- 130. Analysis and Performance of Basic Movement Skills.** Development of an understanding of basic movement skills; emphasizes performance and qualitative analysis of personal movement skills; and studies developmental aspects of typical and atypical movement skills in a variety of settings. 2 hours.

- 131. Movement Skills: Fitness.** Development of and participation in a physical fitness program including physical fitness assessment. 1 hour.

- 132. Movement Skills: Swimming.** Development of an understanding of basic swimming skills; emphasizes performance and qualitative analysis of personal aquatic skills, developmental aspects of aquatic skills, and analysis of atypical movement patterns in an aquatic environment. Prerequisite: Physical Education 130, and ability to execute a minimum of one of five basic strokes in deep water, perform a standing dive, and tread in deep water. 1 hour.

- 133. Movement Skills: Dance.** Development of an understanding of basic dance steps, positions and sequences; emphasizes performance and qualitative analysis of personal dance skills, developmental aspects of dance and rhythm, and analysis of atypical movement patterns in a dance setting. Prerequisite: Physical Education 130. 1 hour.

- 134. Movement Skills: Gymnastics.** Development of an understanding of basic gymnastic movements and sequences; emphasizes performance and qualitative analysis of personal gymnastic skills, developmental aspects of gymnastic skills, and analysis of atypical movement patterns in a gymnastic setting. Prerequisite: Physical Education 130. 1 hour.

- 135. Movement Skills: Field Activities.** Development of an understanding of basic field activity skills; emphasizes performance, as well as an appreciation of commonalities, in specific activities including soccer, speedball, speedaway, field hockey and flag football. Prerequisite: Physical Education 130. 1 hour.

- 136. Movement Skills: Racquet Activities.** Development of an understanding of basic racquet activity skills; emphasizes performance, as well as appreciation of commonalities in specific racquet activities such as tennis, badminton, squash or racquetball. Prerequisite: Physical Education 130. 1 hour.

- 140. Social Scientific Bases of Sport.** Introduction to the social science aspects of physical education and sport; particular emphasis on concepts derived from the social sciences (including psychology) that are appropriate to physical education and sport. 3 hours.

- 141. Sports in Greece and Rome.** Same as Classical Civilization 150. See Classical Civilization 150.
- 142. Contemporary Issues in Sport.** Examines current issues in sport relative to competition, economics, race, sex, youth, educational institutions, deviant behavior, religion, psychology, and the media. 3 hours.
- 150. Bioscientific Foundations of Human Movement.** Integrates anatomical and physiological aspects of human movement; emphasizes how the body moves, physiological responses to exercise stress, physical conditioning and physical fitness. 3 hours.
- 160. Physical Education as a Profession.** The nature and scope of physical education as a profession; emphasis on orientation to the profession as well as understanding necessary for selecting an area of specialization within physical education. 2 hours.
- 161. Principles of Motor Skill Acquisition.** Studies the basic principles of learning motor skills and their application in physical activities. Prerequisite: Physical Education 130, or consent of instructor. 3 hours.
- 166. Scuba Diving.** Introductory skills, knowledge, and conditioning essential for scuba diving. Includes only the pool and classroom sessions, not the open water dives required for certification; therefore, successful completion of this course does not result in certification. For current fees, see Timetable. Prerequisite: Physical Education 106B or equivalent with consent of instructor; medical certification required to use scuba apparatus. 2 hours.
- 168. Life Saving.** American Red Cross training for the prevention of aquatic mishaps and for life saving. Prerequisite: Ability to swim one-half mile including 20 yards of each of the following: sidestroke, breaststroke, and front crawl. 2 hours.
- 169. Water Safety Instructor Training.** American Red Cross Instructor training for the teaching of swimming and life saving. Prerequisite: American Red Cross Swimmer and Advanced Life Saving certificates (current), and consent of instructor. 2 hours.
- 171. Introduction to Sports Officiating.** Introduction to the fundamentals of sports officiating; a lecture course designed to foster the development of a sound knowledge of rules and an understanding of the mechanics involved in officiating selected sports. Content focuses upon those sports in season according to student demand and available faculty expertise; specific sports are announced in the Timetable. Each section is offered for eight weeks. 1 hour. May be repeated as specific activity varies.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. Fundamentals of Athletic Training.** Discusses the role of the athletic trainer: legalities, facilities, advanced emergency procedures, and injury prevention; emphasizes the understanding of the process of injury and healing as a basis for prevention and treatment of injuries. Laboratory sessions stress special taping, emergency procedures and equipment. Prerequisite: Physiology 103, Anatomy 234, Physical Education 120, or consent of instructor. 2 hours.
- 222. Bases for Prescription of Therapeutic Exercises.** Functional anatomy and injury constraints as a bases for prescription of therapeutic exercises for musculoskeletal conditions; laboratory sessions stress clinical evaluation of muscle and joint function and familiarization with therapeutic exercises. Prerequisite: Physiology 103 and Anatomy 234. 3 hours.
- 230. Coaching Strategies: Basketball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching basketball. 2 hours.
- 231. Coaching Strategies: Tackle Football.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tackle football. 2 hours.
- 232. Coaching Strategies: Baseball/Softball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching baseball/softball. 2 hours.
- 233. Coaching Strategies: Track and Field/Cross Country.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equip-

ment and facility management, and performance analysis related to coaching track and field/cross country. 2 hours.

- 234. Coaching Strategies: Volleyball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching volleyball. 2 hours.
- 235. Coaching Strategies: Gymnastics.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching gymnastics. 2 hours.
- 236. Coaching Strategies: Swimming/Diving.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching swimming/diving. 2 hours.
- 237. Coaching Strategies: Tennis/Badminton.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tennis/badminton. 2 hours.
- 238. Coaching Strategies: Soccer.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching soccer. 2 hours.
- 244. Anthropology of Play.** Same as Anthropology 244. The study of human play with emphasis on origin, diffusion, spontaneity, emergence, and diversity; includes functions of play in selected culture groups. Prerequisite: A course in anthropology. 3 hours.
- 247. Introduction to Sport Psychology.** An analysis of the competitive sport process, with study of how personality and situational variables affect motivation, anxiety, and aggression in sport. Attention is given to the psychological skills needed by coaches and athletes for successful and enjoyable sports participation. 3 hours.
- 249. Sport and Modern Society.** Same as Sociology 249. The sociological analysis of sport in modern societies with regard to social class, politics, community, education, and collective behavior. 3 hours.
- 251. Analysis of Physical Fitness Programs.** Introduction to the physiological adaptations of the body during physical conditioning; analysis and development of physical fitness programs for individuals and groups. Prerequisite: Physical Education 150 or consent of instructor. 2 hours.
- 255. Kinesiology.** Studies the biological and mechanical principles of human motor performance; analyzes selected movement skills in depth. Prerequisite: Physiology 103, Anatomy 234, Mathematics 111, or consent of instructor. 3 hours.
- 257. Introduction to Motor Learning.** A lecture/laboratory course surveying the basic variables and mechanisms governing motor learning and control; emphasizes experimental methods, research findings, and theory. Prerequisite: Physical Education 140 and 161, or consent of instructor. 3 hours.
- 262. Motor Development in Childhood.** Same as Human Development and Family Ecology 204. Studies the selection of specific movement experiences for the elicitation and maintenance of developmental sequences in children and youths based on physical growth and motor development; observational experiences provided with children in a variety of settings. Prerequisite: Physical Education 150 or Human Development and Family Ecology 105. 3 hours.
- 263. Physical Education Curriculum.** The identification, selection, and organization of movement knowledges and experiences into curricula for children and youth; emphasizes the decision-making process in curriculum development. Prerequisite: Junior standing. 3 hours.
- 267. Adapted Physical Education.** Organization, administration, and conduct of physical education programs for the most prevalent types of medical conditions found in school settings; emphasis on analyzing motoric needs and prescribing programs of motor activity for special populations, including individuals with mental retardation and learning disabilities. Prerequisite: Physical Education 150 and 161, or consent of instructor. 3 hours.
- 269. Physical Education for Children.** Theory and practice of physical education in preelementary and elementary schools; for non-physical education majors. 3 hours.

- 273. Instructional Strategies in Physical Education.** Analyzes the teaching-learning process, emphasizing the identification of instructional strategies specific to the development of skilled performance in movement activities. Prerequisite: Physical Education 161. 3 hours.
- 274. Instructional Strategies for Children.** The application of instructional strategies for the motor development of elementary and pre-school children. Prerequisite: Physical Education 262 and 273. 3 hours.
- 275. Instructional Strategies for Adolescents and Adults.** The application of instructional strategies for the motor development of adolescents and adults. Prerequisite: Physical Education 273. 3 hours.
- 280. Principles of Evaluation and Assessment.** An introduction to the methods and techniques of evaluation and assessment of human performance in physical education and sport. Prerequisite: Physical Education 160; Mathematics 111 or 112, or equivalent score on the Mathematics Placement Test. 3 hours.
- 285. Supervised Experiences in Physical Education Research.** Supervised laboratory experiences in physical education research; individual work under the supervision of members of the faculty in their respective fields. The student assists with data collection, processing, and analysis for research in progress. Prerequisite: Physical Education 160 or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
- 286. Supervised Experience in the Common School.** Supervised practice in observing, assisting, and teaching children in preelementary school, elementary school, junior high school, and senior high school; emphasis on understanding motor behavior, teacher-learner behavior, and interrelatedness with other aspects of the learning environment. Prerequisite: Physical Education 161 or equivalent. 3 hours. May be repeated to a maximum of 6 hours.
- 287. Supervised Experiences in the Agency Setting.** Supervised practical experience in physical education leadership roles in nonschool agency settings; emphasis on observing, planning, and conducting physical activity programs for children and/or adults in pre-school, recreation, or other social agencies. 3 hours. May be repeated for a maximum of 6 hours.
- 288. Supervised Experiences in Athletic Training.** Supervised practicum in the athletic training setting; places emphasis on evaluation of student progress in clinical experiences. Prerequisite: Sophomore standing, and selection into the National Athletic Trainers Association approved athletic training certification program. 1 hour. May be repeated for a maximum of 6 hours.
- 290. Honors Seminar.** Same as Health and Safety Studies 290 and Leisure Studies 260. Lectures and discussion dealing with issues in physical education, dance, health education, recreation education, and related fields. Prerequisite: James Scholar standing or grade-point average of 4.0. 2 hours. May be repeated for a maximum of 6 hours.
- 291. Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty advisor, instructor, and head of department. 2 or 3 hours. May be repeated for a maximum of 4 to 6 hours.
- 305. Principles of Ergonomics.** Same as Industrial Engineering and Physiology 305. See Industrial Engineering 305.
- 320. Advanced Assessment of Athletic Injuries.** Analyzes injury patterns and mechanisms for the various joints and body segments; emphasizes the nature of the injuries, clinical evaluation and therapeutic principles, on the physiology of the healing process, and functional anatomy. Prerequisite: Physical Education 220, or consent of instructor. 3 hours or 1 unit.
- 321. Therapeutic Modalities in Athletic Training.** Emphasizes instrumentation and application of therapeutic modalities in laboratory settings: therapeutic heat, electrotherapy, traction, massage, and hydrotherapy. Prerequisite: Credit or concurrent registration in Physical Education 320, or consent of instructor; Physics 140 is recommended. 2 hours or ½ unit.

- 322. Neurophysiological Bases of Therapeutic Exercise.** Examines neurological mechanisms underlying exercise performance with application to therapeutic programs. Prerequisite: Physiology 103 or Anatomy 234, or equivalent. 4 hours or 1 unit.
- 341. Games in Culture.** Examines game phenomena as cultural action systems with special emphasis on the biosocial behavior expressed in varying societies; topics include game components, cultural contexts, ecological strategies, enculturation, acculturation, symbolism, change process, and maladaptive behavior. Prerequisite: Physical Education 244 or consent of instructor. 3 hours or 1 unit.
- 345. Physical Education in Higher Education.** Examines the historical development of physical education in higher education in the United States since 1861: attention to the evolution of multi-disciplinary areas, issues, and trends. 3 hours or 1 unit.
- 346. Sociology of Sport.** Same as Sociology 346. Sociological analysis of sport as a socio-cultural system which progresses from the micro to the macro level; focuses on theoretical and conceptual issues in sociology of sport. Prerequisite: Physical Education 249 and 3 additional hours of sociology, or consent of instructor. 3 hours or 1 unit.
- 347. Social Psychology of Sport.** Same as Psychology 349. Outlines the social psychological parameters which influence behavior and performance in sport; emphasizes the impact of social influences upon the individual within the sport context, including such factors as achievement motivation, competition, anxiety, aggression, and personality. Prerequisite: Physical Education 140; Physical Education 247 or equivalent; Psychology 100, 103, or 105; Psychology 201; or consent of instructor. 4 hours or 1 unit.
- 352. Physiology of Physical Activity.** Study of the immediate and long-term physiological effects of exercise upon the body; mechanisms of neuromuscular, cardiorespiratory, and metabolic control and adaptation relative to physical activity. Laboratory and lecture. Prerequisite: Physical Education 150; Physiology 103 and Anatomy 234; or equivalent. 3 hours or 1 unit.
- 354. Growth and Physical Development of Children.** Same as Human Development and Family Ecology 354. A study of the growth and physical development of children through adolescence with emphasis on those systems and body composition changes related to motor performance and exercise stress. Prerequisite: Physiology 103 and Anatomy 234; Physical Education 280; or equivalent. 3 hours or 1 unit.
- 355. Cinematography in Kinesiology.** Designed to develop an understanding of the mechanics of human motion as related to performance in sport activities through the mode of cinematography. Prerequisite: Physical Education 255, or consent of instructor. 3 hours or 1 unit.
- 356. Electromyographic Kinesiology.** Focuses upon the biological components of volitional and reflexive movement in humans; theory and technology of electromyography are utilized to describe and quantify the neuromuscular input to the mechanical output. Prerequisite: Physiology 103 and Anatomy 234. 3 hours or 1 unit.
- 357. Motor Learning.** Discussion and analysis of scientific principles related to the learning and performance of motor skills; review of related literature and research in motor learning. Prerequisite: Psychology 100 or consent of instructor. 4 hours or 1 unit.
- 365. Movement Notation.** Same as Dance 349 and Psychology 312. See Psychology 312.
- 385. Clinical Experiences in Sports Medicine.** Clinical experiences in medical supervision of sports programs, in the areas of therapeutic exercises, fitness programming, and cardiac rehabilitation. Prerequisite: Consent of instructor. Prerequisites are determined on an individual basis in accordance with the clinical experiences to be undertaken. 2 to 8 hours, or $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 hours or 2 units.
- 394. Special Topics in Physical Education.** Lecture course on topics of current interest; specific topics announced in the Timetable. Prerequisite: To be determined for each subject and indicated in the Timetable. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
- 420. Issues in Sports Medicine.** Addresses current issues in the medical aspects of sports; examples of these issues are epidemiology of injuries and treatment forms, use of sports equipment, questionable sports practices, and preventive techniques. Prerequisite: Physical Education 352 and 320, or equivalent; or consent of instructor. 1 unit.

- 422. Kinesiotherapy.** Analyzes pathomechanics underlying injury and orthopedic problems; also analyzes rehabilitation methods for orthopedic and neurological dysfunctions. Prerequisite: Physical Education 322 or consent of instructor. 1 unit.
- 447. Sport Psychology.** Analysis of psychological factors and principles with special reference to motor performance, learning motor skills, perception, and emotion in sports situations; review of literature; and independent projects. Prerequisite: Psychology 100; Educational Psychology 211; consent of instructor. 1 unit.
- 449. Seminar: Sociology of Sport.** Same as Sociology 449. Sociological analysis of sport with emphasis on sociological theory; places stress on problems of comparative analysis, concept formation, and theory construction within the area of the sociology of sport. Prerequisite: Physical Education 346 and nine hours of sociology or anthropology; or consent of instructor. 1 unit.
- 451. Scientific Basis of Physical Performance.** Contemporary trends in the study of human performance and exercise stress; analysis of the research literature, experimental strategies, and research instrumentation. Lecture-discussion and laboratory. Prerequisite: Physical Education 352 or 354, or equivalent. 1 unit.
- 452. Neuromuscular Aspects of Human Performance.** In-depth study of the neuromuscular aspects of human activity; focus on selected topics related to growth, physical development, exercise prescriptions, athletic conditioning, and fitness. Prerequisite: Physical Education 451. 1 unit.
- 453. Circulorespiratory Aspects of Physical Activity.** Aerobic performance responses to short-term, intermittent, and prolonged physical activity; special consideration given to endurance training methods and assessment techniques, ergogenic aids, and problems associated with growth, environmental influences, and competitive sport. Prerequisite: Physical Education 451 or consent of instructor. 1 unit.
- 455. Experimental Kinesiology.** Mechanical and neuromuscular approach to human movement; analysis and experimental research. Prerequisite: Physical Education 355 and 356, or consent of instructor. 1 unit.
- 457. Sensorimotor Development.** Same as Human Development and Family Ecology 457. Studies the development of spatially adapted movement behavior in man; emphasis on the nature of sensorimotor systems and development of perception; the role of proprioceptive feedback mechanisms and associated reflexes; and the neurogeometric principles basic to the study of man interpreting and acting on the environment. Prerequisite: Physical Education 357 or equivalent. 1 unit.
- 461. Administration of Physical Education and Sport.** Analysis of completed research relating to theory and practice of administration in physical education and sport; the development of policy statements and procedures manuals for the various educational levels; and experience in the use of the case plan of instruction as a teaching technique for the development of competence and knowledge relating to human relations and administration in this specialized field. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar.** Lectures, discussions, and critiques on physical education and related subjects by faculty members and visiting professional leaders; presentation and criticism of student theses. 0 credit.
- 493. Independent Study.** Independent research on special projects; offered summers as a special group practicum. ½ or 1 unit.
- 494. Special Topics in Physical Education.** Lecture course in topics of current interest; specific subject matter announced in the Timetable. ½ or 1 unit. May be repeated.
- 495. Techniques of Research in Physical Education.** Review and appraisal of common research procedures; application of statistical procedures, library methods, evaluation procedures, and experimental methods. 1 unit.
- 499. Thesis Research.** Preparation of theses in physical education. 0 to 4 units.

PHYSICS

Head of Department: Professor R. O. Simmons

Department Office: 211 Loomis Laboratory of Physics, 1110 W. Green, Urbana

101. **General Physics (Mechanics, Heat, and Sound).** Lectures with demonstrations, recitations, and laboratory. For students in arts and sciences, architecture, agriculture, and veterinary medicine. Prerequisite: Trigonometry. 5 hours.
102. **General Physics (Light, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in arts and sciences, architecture, agriculture, and veterinary medicine. Prerequisite: Physics 101. 5 hours.
106. **General Physics (Mechanics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Mathematics 120; credit or concurrent registration in Mathematics 132. 4 hours.
107. **General Physics (Heat, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 106; credit or concurrent registration in Mathematics 242. 4 hours.
108. **General Physics (Wave Motion, Sound, Light, and Modern Physics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 107; credit or concurrent registration in Mathematics 242. 4 hours.
140. **Practical Physics: How Things Work—A Course for Nonscientists.** A nonmathematical lecture-demonstration course for nonscience students, underscoring the generality and ubiquity of basic physical laws in understanding commonplace phenomena: musical instruments, photography, electric and electronic circuits, television, motors, engines, etc. 3 hours. No credit for students in the College of Engineering.
141. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 140. Prerequisite: Credit or concurrent registration in Physics 140. 1 hour.
150. **Physics and the Modern World: A Course for Nonscientists.** A nonmathematical lecture course attempting to bridge the two-culture gap; takes examples from modern physics: relativity, elementary particles, quantum theory, statistics, etc., and covers basic philosophical concepts in physics which pervade all human disciplines: model-making, dynamics, ensemble behavior, and symmetry. 3 hours.
151. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 150. Prerequisite: Credit or concurrent registration in Physics 150. 1 hour.
170. **Physics of Photography.** Designed to enable nonscience students to understand photography. The nature of light, including reflection and refraction; how lenses work and why they are imperfect; the formation of the latent image in the film and the development of the image; light sources; color photography; special topics. Includes laboratory experiments. Prerequisite: High school algebra and geometry. 4 hours. No credit for students in the College of Engineering.
180. **Nuclear Weapons, Nuclear War, and Arms Control.** Same as Science, Technology, and Society 180. A beginner's course on the physics of nuclear weapons, nuclear weapon effects, delivery systems, and defenses against nuclear attack; nontechnical, but about technology. Designed to assist students in making informed judgments about nuclear armaments and arms control; includes presentation of current issues. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Introductory Relativity.** Examines the consequences of Einstein's postulates for space and time; relativistic momentum and energy: $E=mc^2$; the equivalence principle, gravity, and the spacetime viewpoint of general relativity; the relativistic unity of electric and magnetic fields. Prerequisite: Concurrent registration in Physics 102 or 107. 2 hours.
302. **Principles of Atmospheric Dynamics.** Same as Atmospheric Sciences 302. See Atmospheric Sciences 302.

- 303. Modern Experimental Physics, I.** Techniques and experiments in the physics of atoms, atomic nuclei, molecules, the solid state, and other areas of modern physical research. Prerequisite: Physics 333; concurrent registration in Physics 386. 3 to 5 hours, or $\frac{1}{2}$ to 1 unit. Students taking the course for the first time must register for 5 hours or 1 unit. Those repeating the course may do so for variable credit of 3 to 5 hours, or $\frac{1}{2}$ to 1 unit.
- 319. Space, Time, and Matter.** Same as Philosophy 319. A philosophical examination of some fundamental concepts and theories of the physical world, such as time, matter, causation, space, and geometry; interpretation of quantum theory. Graduate students write an additional paper. Prerequisite: Junior standing, one physical science course, and one of the following: Physics 108 or Philosophy 101, 270, or 317; alternatively, consent of instructor. 3 hours or 1 unit.
- 331. Intermediate Electricity and Mechanics.** Studies linear systems: electrostatics, electric circuits, mechanical oscillators; free and driven motion, a-c and transient behavior, linear response theory; filters, one-dimensional lattices, transition from discrete to continuous systems, strings, and transmission lines. Involves lectures, problems, and laboratory. Prerequisite: Two semesters of general physics, concurrent registration in Mathematics 341 or 345, and in Physics 108; or consent of instructor. 5 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without laboratory). No graduate credit given to physics majors.
- 332. Classical Mechanics.** Examines particle motion in two and three dimensions including planets and satellites, conservation laws for systems of particles, accelerated reference frames, rigid bodies in three dimensions, Newtonian gravitation, fluid flow, generalized coordinates, Lagrange's equations, normal modes, and phase space. Prerequisite: Physics 331, Mathematics 341 or 345, and concurrent registration in Mathematics 343; or consent of instructor. 4 hours or 1 unit.
- 333. Electromagnetic Fields.** Electrostatics, magnetostatics (including slowly varying currents); electromagnetic induction; energy and forces; Maxwell's equations; electromagnetic wave propagation, reflection and transmission; waveguides and cavities; radiation from dipoles and slow particles. Lectures, problems and laboratory. Prerequisite: Physics 331, Mathematics 341 or 345, and Mathematics 343. 5 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without laboratory).
- 343. Electronic Circuits, I.** The physics of semiconductor devices; theory and application of discrete and integrated devices in linear circuits; use of operational amplifiers and feedback; regulation, oscillators, and modulation; emphasizes practical experience. Lectures, problems, and laboratory. Prerequisite: Physics 331 or consent of instructor. 5 hours or 1 unit.
- 344. Electronic Circuits, II.** Continuation of Physics 343 with particular emphasis on nonlinear devices, switching circuits, digital logic, analog to digital and digital to analog conversion, and individual projects. Lectures, problems, and laboratory. Prerequisite: Physics 343 or consent of instructor. 5 hours or 1 unit.
- 346. Modern Physics for Nuclear Engineers.** Same as Nuclear Engineering 346. Those fundamentals of quantum theory, atomic structure, and nuclear behavior needed by students before taking advanced courses in nuclear engineering; basic information on radiation types, properties, and interactions. Prerequisite: Junior standing in engineering or physical science. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit to nuclear engineering students.
- 350. Biomolecular Physics.** Same as Biophysics 350. The physical concepts governing structure and function of biological macromolecules. Static and dynamical properties of proteins and nucleic acids; interaction with other molecules; catalysis and regulation. Emphasizes physical methods of approach to problems of current research interest; designed for students without any appreciable background in biology and chemistry. Prerequisite: Chemistry 102 or equivalent, Physics 383 or 387 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 361. Thermodynamics and Statistical Mechanics.** A course in statistical and thermal physics designed primarily for advanced undergraduates; topics include equilibrium thermodynamics, statistical mechanics, and kinetic theory of gases. A unified treatment is used in

that the principles of heat and thermodynamics are discussed along with statistical postulates and the microscopic approach of introductory quantum mechanics. Prerequisite: Two 300-level courses in physics or consent of instructor. 4 hours or 1 unit. Credit may not be earned in both Physics 361 and Mechanical Engineering 301, Chemistry 342 and 344, and Metallurgical Engineering 420.

- 365. Introduction to Plasma Physics.** Physical concepts underlying the description of ionized gases; individual particle and continuum models; collision processes in plasmas; charged particle motion in electromagnetic fields; waves in cold plasmas; elementary treatment of collective plasma behavior; simple plasma instabilities; selected topics of current interest. Prerequisite: Electrical Engineering 350 or Physics 333, or consent of instructor. 4 hours or 1 unit.
- 371. Light.** Wave kinematics; geometrical optics: basic concepts, ray-tracing and matrix formalism, Gaussian imaging by thick lenses, stops, and apertures, and intensity relations; interference; interference spectroscopy and coherence; diffraction: Fresnel-Kirchhoff formulation, Fraunhofer case, Fresnel case, and holography; polarized light. Lectures, laboratory, and problems. Prerequisite: Physics 101 and 102, or Physics 106, 107, and 108; Mathematics 345; or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 382. Subatomic Physics.** A lecture and problem course surveying subatomic physics: includes the nature and properties of nuclei and elementary particles, symmetries, interactions, nuclear models, tools and techniques of experimental subatomic physics, and applications to power generation, astrophysics, chemistry, medicine, and biology. Prerequisite: Physics 333 or 386, or consent of instructor. 4 hours or 1 unit.
- 383. Atomic Physics and Quantum Theory.** Introduction to the basic concepts of quantum theory which underlie modern theories of the properties of materials; topics covered include elements of atomic and nuclear theory; kinetic theory and statistical mechanics; quantum theory and simple applications; atomic spectra and atomic structure; molecular structure and chemical binding. Lectures and problems. Prerequisite: General physics; general chemistry; Mathematics 345 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 386. Atomic Physics and Quantum Mechanics, I.** Studies atomic phenomena integrated with an introduction to quantum theory; discussion of topics includes evidence for the atomic nature of matter and the properties of the Schrodinger equation, single particle solutions in one dimension, the hydrogen atom, perturbation theory, external fields, and atomic spectroscopy of outer electrons. Prerequisite: General physics; Mathematics 343 or 345, or consent of instructor. 4 hours or 1 unit.
- 387. Atomic Physics and Quantum Mechanics, II.** Continuation of Physics 386. Topics treated include identical particles, spectral hyperfine structure, magnetic properties of matter, atomic spectroscopy of inner electrons, high-energy photon effects, molecular binding and spectra, emission and absorption of light, and symmetry principles. Prerequisite: Physics 386. 4 hours or 1 unit.
- 389. Introduction to Solid State Physics.** Bonding and structure of crystals; energy bands in insulators, semiconductors, and metals; electrical conductivity; optical properties; lattice vibrations; elasticity; point defects; dislocations. Prerequisite: Junior standing in science or engineering, or equivalent. 4 hours or 1 unit.
- 397. Individual Study.** Individual study at an advanced level in a subject not covered by course offerings. Prerequisite: Upperclassman; consent of adviser and staff member who supervises the work. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 398. Seminar on Special Topics in Modern Physics.** Lecture course on topics of current interest in physics. For advanced undergraduates or graduates. Subjects and prerequisites to be announced in the Timetable. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 402. Theoretical Astrophysics.** Same as Astronomy 402. Application of physical principles to selected topics in astrophysics, including stellar structure and evolution, neutron stars and pulsars, cosmic electrodynamics, and cosmological problems; emphasis on the physics involved rather than on detailed factual description. Prerequisite: Physics 333 and 386, or consent of instructor. 1 unit.
- 404. Stellar Structure and Evolution.** Same as Astronomy 404. See Astronomy 404.

- 405. Diffuse Matter Astrophysics.** Same as Astronomy 405. See Astronomy 405.
- 406. High Energy Astrophysics.** Same as Astronomy 406. See Astronomy 406.
- 411. Special Functions and Boundary Value Problems in Physics.** Use of special functions in solving homogeneous partial differential equations of physics; emphasis on applications to topics such as electrostatics, wave guides and resonant cavities, vibrations of membranes, heat flow, and potential flow in fluids. Prerequisite: Mathematics 343 and 345, or equivalent. This course may be taken concurrently with Physics 413 or 414. $\frac{1}{2}$ unit.
- 412. Additional Techniques of Mathematical Physics.** Solution of inhomogeneous differential equations with particular emphasis on problems in electromagnetism; additional topics such as perturbation theory, variational methods, and integral equations; emphasis on application of the techniques to nonquantum physics problems. Prerequisite: Physics 411 or equivalent. This course may be taken concurrently with Physics 413 or Physics 414. $\frac{1}{2}$ unit.
- 413. Uses of Complex Variables in Physics.** A review of complex variable theory, with emphasis on calculations useful to physicists; integration, conformal mapping, Laplace and Fourier transforms, and additional topics of use in theoretical physics. Prerequisite: Undergraduate mathematics at the level of Mathematics 343 and 345; some previous exposure to complex variables helpful, but not required. $\frac{1}{2}$ unit.
- 414. Basics of Advanced Mechanics.** Fundamentals of classical Lagrangian and Hamiltonian mechanics, with emphasis on the relation between dynamical symmetries and constants of the motion; use of conservation laws to derive basic equations of fluid dynamics; discussion of some applications. Prerequisite: Mechanics at the level of Physics 332 or consent of instructor. $\frac{1}{2}$ unit.
- 420. Nonlinear Dynamics.** A broad introduction to nonlinear dynamics of physical systems with varying degrees of complexity; surveys a variety of concepts associated with bifurcation phenomena, mappings, nonlinear oscillations, chaotic behavior, strange attractors, solitons, and topics of current interest. Prerequisite: Mathematics 343 or 345 or equivalent; Physics 332 or equivalent; or consent of instructor. 1 unit.
- 424. General Relativity and Cosmology.** Same as Astronomy 424 and Mathematics 460. Foundations of general relativity and applications to problems of astrophysics; includes gravitation as geometry, mathematical tools, Einstein's equations, relativistic stellar structure, black holes and gravitational collapse, cosmology, gravitational radiation, and experimental tests. Prerequisite: Physics 332, 411, 412, and 442, or equivalent; or consent of instructor. 1 unit.
- 430. Surface Physics.** Same as Metallurgical Engineering 430. See Metallurgical Engineering 430.
- 435. Theory of Semiconductors and Semiconductor Devices.** Same as Electrical Engineering 435. See Electrical Engineering 435.
- 442. Classical Electromagnetic Radiation.** A review of Maxwell's equations followed by a relativistic formulation of the electromagnetic field and the motion of charged particles; plane and guided waves; retarded potentials; radiation from simple antennas; radiation from accelerated charged particles; synchrotron radiation, bremsstrahlung, scattering, and further topics. Prerequisite: Physics 411 and 412, or equivalent; electromagnetism at the level of Physics 333; special relativity at the level of Physics 210. 1 unit.
- 455. Reactor Theory, I.** Same as Nuclear Engineering 455. See Nuclear Engineering 455.
- 456. Reactor Theory, II.** Same as Nuclear Engineering 456. See Nuclear Engineering 456.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Theoretical and Applied Mechanics 459. See Mathematics 459.
- 462. Statistical Mechanics and Kinetic Theory.** Single-particle distribution functions; classical and quantum mechanical systems, Boltzmann equation, virial theorem, and equations of state for gases; formal theory: ensembles, identical particles, thermodynamics of simple systems, and distribution functions; nonequilibrium problems; conservation laws and hydrodynamic equations, sound waves, and transport coefficients; plasmas, normal Fermi fluid, superfluids, and systems with internal degrees of freedom. Prerequisite: Physics 361 and elementary quantum mechanics, or consent of instructor. 1 unit.

- 463. Liquid Helium and Superconductivity.** Emphasizes fundamental physical phenomena rather than detailed microscopic theory; normal Fermi liquids and normal liquid ^3He : equilibrium properties, kinetic equation, collective modes, and finite temperature effects; superfluid ^4He : equilibrium properties, two fluid model, Bogoliubov's microscopic model, condensates, and vortex lines; superconductivity: electrodynamic properties, Landau-Ginzburg theory, BCS theory, tunneling, Josephson effect, and superfluid ^3He . Prerequisite: Physics 462 and 481, or consent of instructor. 1 unit.
- 464. Phase Transitions.** Phenomenology of phase transitions, scaling, critical behavior, and multi-criticality; Landau theory of phase transitions; renormalization group methods, including lattice models and epsilon-expansion; numerical methods; critical dynamics; and selected additional topics. Prerequisite: Physics 462 or consent of instructor. 1 unit.
- 465. Plasma Physics.** Survey of plasma phenomena in nature and in the laboratory; physical description of plasma phenomena by the independent particle model, one- and two-fluid models, magnetohydrodynamic equations, and kinetic equations; applications to quantum plasmas; nonlinear effects and turbulence in plasmas; astrophysical and thermonuclear plasmas. Prerequisite: Physics 333 or equivalent, or consent of instructor. 1 unit.
- 466. Advanced Plasma Physics.** Microscopic theory of plasma collective behavior; plasma kinetic equations, fluctuations and correlations, linear waves and instabilities in magnetized plasmas, nonlinear plasma behavior, and plasma turbulence. Prerequisite: Physics 465, or consent of instructor. 1 unit.
- 470. Introduction to Nuclear and Particle Physics.** Nuclear systematics, nucleon-nucleon interaction, shell model, and single particle and collective excitations; hadron spectroscopy, hadronic quantum numbers, quark-parton model, and hadron dynamics; weak interactions. Prerequisite: Physics 480 and concurrent registration in Physics 481. 1 unit.
- 471. Nuclear Physics, I.** Systematics of stable nuclei and the nuclear potential; properties of odd-A nuclei; spherical single-particle shell model; residual interactions; collective states and deformed nuclei; summary of theory and experiment for low-lying states; momentum distribution of nucleons; fission. Prerequisite: Physics 470. 1 unit.
- 472. Nuclear Reactions.** Theory and observation of the interaction of electrons, photons, protons, neutrons, and heavier projectiles with nuclei; elastic and inelastic scattering and particle transfer; resonance reactions and fission; and exotic atoms, meson-nucleus interactions, and scattering. Prerequisite: Physics 382 and 481, or equivalent, or consent of instructor. 1 unit.
- 475. Particle Physics, I.** Basic calculations in elementary particle theory. Quantum electrodynamics, quantum chromodynamics, and the Glashow-Weinberg-Salam theory of weak and electromagnetic interactions as applied to the phenomenology of particle decays and high energy reactions. (Offered fall semester only.) Prerequisite: Physics 470; credit or concurrent registration in Physics 483 strongly recommended. In exceptional circumstances, Physics 470 may be taken concurrently. 1 unit.
- 476. Particle Physics, II.** Continuation of Physics 475. Current topics in particle theory; topics change from year to year. Typically treats three or four different subjects in depth. (Offered spring semester only.) Prerequisite: Physics 475, or consent of instructor. 1 unit. May be repeated as topics vary.
- 480. Quantum Mechanics, I.** A second course in quantum mechanics for students with a good background in wave mechanics and atomic and molecular structure. Operators, state vectors, and the formal structure of quantum theory; operator treatments of simple systems; angular momentum and vector addition coefficients; stationary state perturbation theory; introduction to scattering theory for particles without spin, partial wave analysis, and Born approximation; examples taken from atomic, nuclear, and elementary particle physics. Prerequisite: Senior-level atomic physics and quantum mechanics, or consent of instructor. 1 unit.
- 481. Quantum Mechanics, II.** Spin and identical particles, simple many-particle systems and elements of second-quantization theory; time-dependent processes, radiative transitions, and quantization of the electromagnetic field; scattering of particles with spin; polarization; introduction to the Klein-Gordon and Dirac equations, and properties of simple relativistic systems. Prerequisite: Physics 480 or consent of instructor. 1 unit.

- 483. General Field Theory.** Covers standard techniques of field theory as used by experimenters and theorists; relativistic quantum mechanics of a single particle; Lagrangian field theories, perturbation theory, and calculation of lowest-order processes; introduction to Feynman diagrams and higher order processes; examples taken from quantum electrodynamics, solid-state and elementary particle physics, and many-body theory. Prerequisite: Physics 481 or consent of instructor. 1 unit.
- 485. Advanced Field Theory.** Quantization and Feynman path integral; gauge theories and renormalization; renormalization group with applications to particle physics and critical phenomena; approximation methods and recent developments. Prerequisite: Physics 483 or consent of instructor. 1 unit.
- 486. The Constitution and Behavior of the Upper Atmosphere.** Same as Electrical Engineering 486. See Electrical Engineering 486.
- 489. Solid State Physics, I.** Crystalline perfection, free electron gas, screening, plasma oscillations, and dielectric response; Bloch electrons, Brillouin zones, and band structure; semiconductors, intrinsic and extrinsic, with applications; phonons, elasticity, and anharmonicity; ferromagnetism and second-order phase transitions; superconductivity. Prerequisite: Physics 361 or consent of instructor; and Physics 480. 1 unit.
- 490. Solid State Physics, II.** Hartree-Fock theory and electron-electron interactions; electron-phonon interactions; electron dynamics and transport; BCS theory of superconductivity; elastic properties; thermal properties due to anharmonicity; defects in solids. Prerequisite: Physics 481 and 489. 1 unit.
- 496. Seminar on Current Research.** Discussions and lectures on current research, including presentations by graduate students of their own work. 0 units.
- 497. Individual Study.** Individual study in a subject not covered in course offerings may be arranged for credit by registration under this number. $\frac{1}{2}$ to 4 units.
- 498. Seminar on Special Topics in Modern Physics.** Lecture course in topics of current interest. Several subjects are announced in each Timetable. Among them are semiconductor physics, magnetic resonance, surface physics, lattice dynamics, band theory of solids, crystal imperfections, nuclear structure, field theory, elementary particle physics, advanced statistical mechanics, plasma theory, astrophysics, atmospheric physics, group theory and applications. Prerequisite: Determined for each offering. See Timetable. $\frac{1}{4}$ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

PHYSIOLOGY AND BIOPHYSICS

Head of Department: Professor D. E. Buetow

Department Office: 524 Burrill Hall, 407 S. Goodwin, Urbana

Biophysics

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Reading and Individual Topics.** Reading or laboratory work chosen in consultation with a departmental faculty sponsor. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours.
- 301. Introduction to Biophysics.** Review of the field of biophysics designed to introduce the student to types of biological problems currently under investigation. Prerequisite: 8 hours of physics. 3 hours or $\frac{3}{4}$ unit.
- 302. Fundamentals of Nervous Activity.** The quantitative basis of the generation and transmission of electrical signals within and between nerve cells; develops and discusses, with examples, the physical relationships describing resting potential, core conduction, excitation, and synaptic transmission. Meets during the first half of the spring semester. Prerequisite: One year of calculus and one year of college physics. 2 hours or $\frac{1}{2}$ unit.

- 312. Introduction to Radiobiology.** Nature and mechanisms of the biological consequences of low dose and chronic irradiation. Intended primarily for students in engineering and physical sciences. Prerequisite: Mathematics 242 or 245; 8 hours of physics; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 320. Molecular Biophysics.** Same as Biochemistry 320. Examines structure and function of biological macromolecules and supramolecular assemblies; uses various display techniques to describe the three dimensional nature of biological structure. Specific topics include: diffraction methods, protein structure and the molecular basis of enzyme catalysis, antibody structure and function, virus structure and assembly; membrane proteins, microtubules and other supramolecular assemblies, nucleic acid structure, protein-nucleic acid interactions. Prerequisite: Biochemistry 352 or Chemistry 346 or Physics 350, or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 332. Photosynthesis.** Same as Plant Biology 332. A comprehensive description of photosynthesis; topics include: the photosynthetic membranes, light absorption, electron and proton transfer, photophosphorylation, water oxidation, RUBP carboxylase/oxygenase, photorespiration, whole plant photosynthesis, translocation and herbicide action. Prerequisite: Plant Biology 330, Biochemistry 350, Biophysics 301, or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 354. Biological Energy Conversion.** Introduces and explores the major mechanisms of energy conversion in biology, with particular emphasis on respiratory and photosynthetic bioenergetics, and the physico-chemical tools required to describe these processes. Prerequisite: Biochemistry 350, and Chemistry 340 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 404. Physiological Measurements.** Same as Physiology 404. See Physiology 404.
- 406. Principles of Biophysical Measurements.** Lecture course designed to acquaint the student with physical methods useful in the solution of biological problems; topics covered include bioelectric measurements, including basic electronics; optical methods, including microscopy, spectrophotometry, and measurement of action spectra; use of high-energy radiations; tracer techniques; and acoustical techniques. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 410. Special Topics in Biophysics.** Advanced course on some topic of interest in biophysics, such as electrophysiology, radiation biology, bioenergetics, bioacoustics, protein structure, or the physics of muscular contraction. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 411. Seminar.** Survey of literature in one area of biophysics, with special emphasis on student reports. Prerequisite: Enrollment in the biophysics program or consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 414. Sensory Biophysics.** Advanced treatment of sensory systems which are approachable in detailed quantitative terms, with emphasis on the visual system; lectures scheduled during the first quarter of the spring semester. Normally carries $\frac{1}{4}$ unit credit; however, students may develop a particular topic introduced in the lectures into a term paper for an extra $\frac{1}{4}$ unit credit. Prerequisite: Biophysics 301, Physiology 301 or 403, or consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit. Students must consult the instructor before enrolling for $\frac{1}{2}$ unit.
- 415. Radiation Biophysics.** Consideration in quantitative terms of the mechanisms of the responses of molecules and cells to ionizing radiation; meets during the second quarter of the spring semester. Prerequisite: Graduate standing in biophysics, one year of physics beyond introductory physics, and Biophysics 301 or 312, or consent of instructor. $\frac{1}{4}$ unit.
- 424. Ultrasonic Biophysics.** Same as Bioengineering 424. Ultrasonic propagation in, and interaction with, biological media at macromolecular, cellular, and organismic levels of structure; meets during the first quarter of the spring semester in alternate years. Prerequisite: Graduate standing in biophysics or consent of instructor. $\frac{1}{4}$ unit.
- 426. Kinetic Models in Biophysics.** Techniques of constructing kinetic models to correlate data from biological systems; includes drawing implications of physical mechanisms from model behavior; and considers intensive treatment of excitable cell membrane as an example of a modelled system. Meets during the second half of the spring semester in alternate years. Prerequisite: Cellular physiology and calculus. $\frac{1}{2}$ unit.

- 428. Cell Membranes.** Isolation and biochemical analysis; experimental membrane models Gouy-Chapman-Stern layers; equations of transport (diffusional, mediated, and active); phospholipid bilayers and protein subunits; and cell membrane synthesis (in vivo and in vitro). Meets during the second half of the spring semester in alternate years. Prerequisite: Biophysics 301 or Physiology 402; Biochemistry 350 or equivalent. ½ unit.
- 436. Plant Biophysics.** Same as Plant Biology 436. See Plant Biology 436.
- 438. Bioenergetics of Photosynthesis.** Same as Plant Biology 438. Biophysical and biochemical mechanisms of green plant and bacterial photosynthesis; includes the role of membranes; and emphasizes energetic aspects of photosynthesis. Meets during the last half of the fall semester. Prerequisite: One year each of college physics, chemistry, and biology; Biochemistry 350 or Biophysics 301; or consent of instructor. ½ unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biochemistry and Chemistry 440. See Chemistry 440.
- 446. Bacterial Energetics.** Same as Microbiology 446. Describes and analyzes the principles of biological energy transduction using diverse examples from prokaryotic metabolism; includes fermentations, aerobic and anaerobic respiration, photosynthesis. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. ½ unit.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Veterinary Biosciences and Animal Science 463. See Veterinary Biosciences 463.
- 475. Biophysics of Muscle.** Description and analysis of the fundamental physical processes underlying motility and contraction in living systems; surveys recent advances and assesses current status of relevant problems; meets during the second quarter of the fall semester in alternate years. Prerequisite: Chemistry 340 or 342, and Biochemistry 350. ¼ unit.
- 490. Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Topics covered include bioacoustics, electrophysiology, bioenergetics, cellular biophysics, dynamics of macromolecules, fluorescence spectroscopy, kinetics, mathematical biophysics, membrane biophysics, molecular biophysics, muscle biophysics, photosynthesis, protein-lipid interactions, radiation biophysics and oncology, senescence, thermoregulation, vision, protein structure. Prerequisite: Consent of department. ½ to 2 units.
- 499. Thesis Research.** Research may be conducted in one of the areas listed below, subject to approval of the staff member concerned and the department in which the research is to be done: (a) bioacoustics; (b) biophysics of excitable membranes; (c) physical properties of lipids and membranes; (d) lipid biophysics, and model membranes; (e) photobiology and photosynthesis; (f) biophysics of muscular contraction; (g) radiobiology; (h) information theory and cybernetics; (i) ion transport and permeability; (j) macromolecular structure; (k) biophysical chemistry; (l) sensory biophysics. 0 to 4 units.

Physiology

- 101. Introduction to Human Physiology: Physical and Chemical Bases of Cell Function, Principles of Physiological Control Systems, Coordinated Body Functions.** Emphasizes those aspects especially illustrative of general principles of biology; designed for biological sciences general education requirement; especially suitable for coupling with an anthropology or psychology course. Prerequisite: High school chemistry strongly recommended. 3 hours. Credit will not be given for Physiology 101 and either Physiology 102 or 103.
- 102. Introduction to Human Physiology: Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Emphasizes those aspects which make physiology unique among the life sciences; designed for biological sciences general education requirement; especially suited for coupling with another course in biology. Prerequisite: A college course in biology or equivalent (for example, 3 hours credit or credit waiver via CLEP examination). 3 hours. Credit will not be given for Physiology 102 and either Physiology 101 or 103.

- 103. Introduction to Human Physiology: The Physical and Chemical Bases of Cellular Function, Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Prerequisite: High school chemistry strongly recommended. 4 hours. Credit will not be given for Physiology 103 and either Physiology 101 or 102.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Reading and Individual Topics Course.** Readings or laboratory work in fields chosen in consultation with a departmental faculty sponsor. Must be taken in partial fulfillment of departmental honors requirements. Prerequisite: A course in physiology; consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours.
- 295. Special Topics in General Physiology.** Selected topics in general physiology. Prerequisite: Credit or concurrent registration in Physiology 301; consent of instructor. 2 hours.
- 296. Special Topics in Animal Physiology.** Selected topics in animal physiology. Prerequisite: Credit or concurrent registration in Physiology 302; consent of instructor. 2 hours.
- 301. General Physiology.** A consideration from the standpoint of experimental biology of functions that are common to most eukaryotic cells. Prerequisite: Biology 111 or 251, or equivalent; one year each of college-level mathematics and physics; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
- 302. Animal Physiology.** Examines organ physiology of animals; primary emphasis is on the control systems underlying regulation of homeostasis in mammals, including human beings. Prerequisite: Biology 111 or 251, or equivalent; one year college physics; Mathematics 120; chemistry through organic. 3 hours or $\frac{3}{4}$ unit.
- 303. General Physiology Laboratory.** An introduction to experimentation with cellular functions common to most eukaryotic cells; emphasis on biochemical, radioactive tracer, electrical, and mechanical recording techniques. Prerequisite: Credit or concurrent registration in Physiology 301. 2 hours or $\frac{1}{4}$ unit.
- 304. Experimental Physiology Laboratory.** Introduction to problems and techniques for studying the physiology of organ systems. Prerequisite: Credit or concurrent registration in Physiology 302. 2 hours or $\frac{1}{4}$ unit.
- 305. Principles of Ergonomics.** Same as Industrial Engineering and Physical Education 305. See Industrial Engineering 305.
- 312. Endocrinology.** Physiology and biochemistry of the endocrine system with special reference to vertebrates. Prerequisite: Physiology 301 or a course in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 316. Integrative Neurophysiology.** Advanced studies of mechanisms of neuron network function in behavior; topics include: neural coding, motor pattern generation, mechanisms of plasticity in neural function, epilepsy, and neural models of motivation, habituation and arousal, choice, and learning. Prerequisite: Biophysics 302, Physiology 302, or Biology 303; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 331. General Radiobiology.** Response of multicellular organisms, cells, and macromolecules to ionizing radiations. Lectures, student reports, and discussions. Prerequisite: One year each of mathematics, physics, chemistry, and biology. 4 hours or 1 unit.
- 341. Comparative Physiology of Animals.** Emphasizes comparative aspects of the nervous system and nervous integration; ionic and osmotic regulation in fresh water and marine environments; gas exchange mechanisms; temperature adaptation and endocrine systems in both invertebrates and vertebrates. Prerequisite: Biology 111 or 251, or equivalent; one year college physics; Math 120; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
- 401. Physiology of Systems and Organs.** Analysis of organization and function of vertebrate systems, which combines the viewpoints of traditional cellular, comparative, mammalian, and human physiology; nervous, circulatory, digestive, and excretory systems; and gross metabolism. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
- 402. Comparative and Adaptational Physiology.** The first half of the course deals with

comparative mechanisms of adaptation to the environment, including homeostatic theory, osmotic and ionic regulation, respiration and metabolism, nutrition and digestion, and temperature relations; the second half concerns comparative behavioral physiology, including sense organs, mechanisms of motility (especially muscles), and central nervous integration. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.

- 403. Cellular and Molecular Physiology.** Physicochemical analysis of cellular function and structure; consideration of the implications of the properties of cells for the physiology of multicellular animals. Students may enroll for the lecture series on physiology of cytoplasm and the nucleus, cell growth and division and cellular regulatory mechanisms, and/or for the lecture series on physiology of cell membranes, bioelectrics, and motility. Prerequisite: One year of college-level physics; chemistry including physical and biochemistry; an upper-division course in physiology; knowledge of calculus presumed. $\frac{1}{2}$ or 1 unit.
- 404. Physiological Measurements.** Same as Biophysics 404. Laboratories concerned with introducing at a graduate level current research techniques in the physiological and biophysical sciences; problem-oriented laboratories; students select up to four special topics representing different areas of physiology and biophysics, such as mammalian and human, molecular, cellular and radiation biology, comparative physiology, and biophysical measurements. Emphasis placed on ability to work independently, and students give written reports of their experiments. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 405. Neurochemistry.** Same as Psychology 405. See Psychology 405.
- 409. Faculty Research Topics.** Advanced seminars by the faculty on their current research activities. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 410. Special Topics in Physiology.** Advanced seminars on current topics of interest in physiology. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
- 412. Advanced Endocrinology.** Same as Animal Science, Dairy Science, and Veterinary Biosciences 412. Seminar, lectures, student reports, and discussions of recent advances in endocrinology. Prerequisite: Physiology 312; consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 413. Cardiovascular Physiology.** Same as Veterinary Biosciences 413. See Veterinary Biosciences 413.
- 416. Neurophysiology Laboratory.** Neurophysiological techniques and experiments illustrating nerve membrane properties, synaptic action and plasticity, organization and pattern generation in motor systems, and sensory coding in visual and acoustic systems. Prerequisite: Credit or concurrent registration in Physiology 316 or consent of instructor. $\frac{1}{2}$ unit.
- 418. Neuroendocrinology.** Advanced studies on central nervous system/hormone interaction in vertebrates. Neuroanatomy and maturation of neuroendocrine control systems; production, biochemistry, and physiological effects of neurohormones; and neuroendocrine techniques. Prerequisite: Physiology 312 and one of the following: Physiology 316, 401, or 402; consent of instructor. $\frac{3}{4}$ unit.
- 420. Mammalian Physiology Seminar.** Current trends in mammalian physiology. Prerequisite: Physiology 401 and 402, or equivalent; consent of instructor. $\frac{1}{2}$ unit.
- 431. Advanced Reproductive Endocrinology.** Same as Animal Science 431, Dairy Science 431, and Veterinary Biosciences 431. See Animal Science 431.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433, Dairy Science 433, and Veterinary Biosciences 433. See Animal Science 433.
- 441. Advanced Comparative Physiology.** Seminar, lectures, student reports, and discussions. Topics rotate in three-year cycle: adaptational physiology, comparative neurophysiology, and comparative physiology of motile mechanisms. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 451. Advanced Cellular Physiology.** Seminar, lectures, student reports, and discussions. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.

- 460. Human Pharmacology, I.** Studies the general principles of drug action and analyzes the actions of the major drug groups on biochemical and physiological processes. Prerequisite: Physiology 401; Biochemistry 350; consent of instructor. 1 unit.
- 461. Human Pharmacology, II.** Continuation of Physiology 460. Prerequisite: Physiology 460. 1 unit.
- 472. Human Physiology Seminar.** Topics of current emphasis in human physiology. Prerequisite: Two semesters of advanced physiology; one semester of biochemistry; consent of instructor. $\frac{1}{2}$ unit.
- 490. Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Prerequisite: Approval of department. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Research may be conducted in the following areas, with the consent of the instructor: (a) cellular and molecular physiology; (b) comparative physiology; (c) mammalian physiology; (d) human anatomy and human physiology; (e) endocrinology; (f) neurophysiology; (g) radiobiology; and (h) environmental and stress physiology. 0 to 4 units.

PLANT BIOLOGY

Head of Department: Professor T. L. Phillips

Department Office: 289 Morrill Hall, 505 S. Goodwin, Urbana

- 100. Plant Biology.** Basic principles of growth and form, physiology, genetics, evolution, and ecology in plant biology. 4 hours. Students may not receive credit for both Plant Biology 100 and 102.
- 102. Plants, Environment, and Man.** Designed primarily to give the nonscience student an introduction to plants, their role in the environment, and their relation to man. Discussions and demonstrations emphasize practical aspects of plant biology and science as they relate to man. 3 hours. Students may not receive credit for both Plant Biology 100 and 102.
- 220. Evolutionary Survey of the Plant Kingdom.** The morphology and evolution of plants representative of algae, fungi, liverworts, mosses, lower vascular plants, and seed plants. Prerequisite: Plant Biology 100 or 102, or Biology 110 and 111. 3 hours.
- 234. Form and Function in Flowering Plants.** Lecture course on the physiological and morphological attributes that underlie the biosynthesis, growth, and reproduction of flowering plants in relation to the environment. Prerequisite: Plant Biology 100 or 102, or a year of biology; Chemistry 102. 3 hours.
- 260. Introductory Plant Taxonomy.** Classification and identification of flowering plants, with special reference to the local flora and to the needs of high school teachers. Occasional field trips required. Prerequisite: Plant Biology 100, or Biology 100 and 101, or Biology 111. 3 hours.
- 263. Plants and Their Uses by Man.** A consideration of the plants which are useful or harmful to man: their origins and history, botanical relationships, chemical constituents which make them economically important, and their roles in prehistoric and modern cultures and civilizations. Prerequisite: Plant Biology 100 or 102, or Biology 110. 3 hours.
- 290. Individual Topics.** For juniors and seniors who wish to study individual problems and topics not assigned in other courses. Prerequisite: Ten hours of advanced work in plant biology or another biological science; junior or senior standing. 2 to 5 hours. May be repeated to a maximum of 5 hours. (Counts for advanced hours in LAS.)
- 292. Senior Thesis.** Independent research for seniors in plant biology; prerequisite for graduation with distinction in plant biology and recommended for students intending graduate study. A thesis must be submitted for credit to be received, but graduation with distinction is not an automatic result of enrollment in Plant Biology 292. Will substitute for Plant Biology 290 in fulfilling independent study requirement. Prerequisite: Candidacy for

degree with distinction in plant biology. 2 to 5 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)

- 304. General Plant Morphology.** Lecture and laboratory course dealing with the structure, reproduction, and evolution of representative algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. Prerequisite: Plant Biology 100, Biology 101, 111, 251, or consent of instructor. 4 hours or 1 unit.
- 320. The Biology of Bryophytes.** Study of mosses, liverworts, and hornworts with emphasis on problems unique to bryophytes and the use of bryophytes as experimental systems for broader botanical problems; topics include the systematics, anatomy, development, physiology, genetics, ecology, and evolution of bryophytes; and lecture, laboratory, and two or three field trips. Offered in alternate years. Prerequisite: One year of plant biology, or one year of biology plus consent of instructor. 4 hours or 1 unit.
- 325. Paleobotany.** Same as Geology 325. Structure, phylogeny, and geological distribution of representative fossil plants. Two or three field trips. Prerequisite: Plant Biology 100, or Biology 100 and 101; Geology 101 or 107; or consent of instructor. 5 hours or 1 unit.
- 330. Plant Physiology.** Same as Agronomy 330. General course concerned with plant functions, including water relations, mineral nutrition, metabolism, growth, and reproduction. Prerequisite: Chemistry 131; Plant Biology 100 or Biology 103, 111, or 251. 3 hours or $\frac{3}{4}$ unit.
- 332. Photosynthesis.** Same as Biophysics 332. See Biophysics 332.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Horticulture 333. A laboratory course in plant physiology; a supplement to Plant Biology 330 which serves the needs of those interested in acquiring familiarity with techniques of experimental plant physiology. Prerequisite: Credit or concurrent registration in Plant Biology 330 or equivalent. 4 hours or 1 unit.
- 335. Plant Development.** Mechanisms underlying plant development: cytodifferentiation and the cell cycle, regulation of gene expression, induction, determination, morphogenesis, and pattern formation. Prerequisite: Introductory courses in biochemistry, biology, or plant biology, and calculus. 4 hours or 1 unit.
- 338. Plant Molecular Biology.** Same as Biochemistry 338. Presents the basic concepts of plant gene expression, the structure and expression of the three plant genomes, and special topics on plant rectors, plant viruses, and transposable elements. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 341. Field Ecology.** Study of plant communities in various sections of North America during spring vacation. Trips rotate on a three- to five-year basis. Outdoor cooking and camping; transportation in University cars. Prerequisite: One of the following: Plant Biology 260, 366, or 381; consent of instructor. 1 hour or $\frac{1}{4}$ unit. May be repeated to a maximum of 3 hours or $\frac{3}{4}$ unit.
- 345. Plant Anatomy.** Lecture and laboratory course dealing with the structural characteristics of mature and developing cells, tissues, and organs of vascular plants, with special emphasis on the vegetative parts of seed plants. Prerequisite: One year of plant biology. 4 hours or 1 unit.
- 350. Phycology.** Introductory lecture and laboratory for the ecology, morphology, physiology, and systematics of the algae. Prerequisite: One year of plant biology or another biological science, or consent of instructor. 4 hours or 1 unit.
- 351. Viruses.** Same as Microbiology 351. See Microbiology 351.
- 363. Plant Products.** Lectures on the natural products of plants, with emphasis on relevant compounds of ecological, pharmacological, toxicological, and economic interest. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 366. Field Botany.** Identification and classification of native and naturalized flowering plants of eastern North America. Prerequisite: Plant Biology 100 or consent of instructor. 5 hours or 1 unit. Offered in the summer session only.
- 372. General Mycology.** Structure, classification, and identification of fungi, including those of economic importance. Prerequisite: One year of plant biology, entomology, microbiology, or biology; or consent of instructor. 4 hours or 1 unit.

- 381. Plant Ecology.** Principles of ecology exemplified by vegetation and environments of Illinois. Prerequisite: Plant Biology 260 or equivalent. 5 hours or 1 unit.
- 410. Discussions in Plant Biology.** All graduate students in plant biology, except those with conflicting teaching assignments, are required to register in and attend the general seminar. No credit given except to those students presenting the results of their Ph.D. thesis research. 0 or $\frac{1}{4}$ unit.
- 413. Discussions in Plant Physiology.** $\frac{1}{4}$ unit.
- 414. Discussions in Plant Morphology and Taxonomy.** $\frac{1}{4}$ unit.
- 418. Discussions in Plant Ecology and Plant Geography.** Developments in ecology and plant geography, with emphasis on one special division. Prerequisite: Graduate standing in plant biology, entomology, geography, or biology. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 419. Discussions in Photosynthesis and Related Topics.** Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 424. Enzymes and Metabolic Pathways of Plants.** Same as Agronomy and Horticulture 424. See Agronomy 424.
- 427. Discussions in Mycology.** Seminar course designed for discussion of current research in the morphology, taxonomy, and physiology of fungi, especially the nonparasitic forms. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit.
- 435. Mineral Nutrition of Plants.** Same as Agronomy 435. A study of the essential nutrient elements: accumulation, transport, and roles in plant metabolism. Prerequisite: Plant Biology 330 and Biochemistry 350; or consent of instructor. $\frac{3}{4}$ unit.
- 436. Plant Biophysics.** Same as Biophysics 436. Biophysical processes in higher and lower plants; emphasizes a quantitative approach to the cellular and subcellular phenomena underlying the structure/function relationships and energetic requirements of plants. Half semester only. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. $\frac{1}{2}$ unit.
- 438. Bioenergetics of Photosynthesis.** Same as Biophysics 438. See Biophysics 438.
- 439. Experimental Techniques in Plant Molecular Biology.** A laboratory course in plant molecular biology supplementing Plant Biology 338 with techniques of plant organelle isolation, DNA extraction, cell culture and recombinant DNA techniques. Prerequisite: Plant Biology 338; or equivalent and consent of instructor. 1 unit.
- 442. Environmental Plant Physiology.** Same as Agronomy 442. Lecture course dealing with the interaction of plants and environment at the level of the whole organism, extending to the cell and the community; emphasis on heat and mass transfer, plant and soil potentials, and effects of light on growth. Prerequisite: Chemistry 131; general physics; general or plant physiology; consent of instructor. 1 unit.
- 462. Origin of Variation in Plants.** Same as Agronomy 462. See Agronomy 462.
- 471. Advanced Mycology: Special Groups.** The several classes of fungi and their activities are considered in successive semesters. Special groups within these classes may be selected for concentrated study, depending upon the student's interest in mycology. Prerequisite: Plant Biology 372 or consent of instructor. $\frac{1}{2}$ unit.
- 472. Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Pathology 472. Identifies and classifies ascomycetes and fungi imperfecti emphasizing relationships between sexual and asexual forms; laboratory provides experience in collection, culturing and isolation, and identification. Prerequisite: Plant Biology 372 or equivalent. $\frac{1}{2}$ unit.
- 488. Plant Pigments.** Same as Horticulture 488. See Horticulture 488.
- 490. Advanced Studies in Plant Biology.** Not more than 1 unit may be applied toward the Graduate College master's degree requirement of 3 units of course work at the 400-level. Work may be taken in the following areas: (a) ecology; (b) evolution and systematics; (c) molecular biology and genetics; (d) physiology; and (e) ultrastructure. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Individual work under supervision of members of the staff in their respective fields. 0 to 4 units.

PLANT PATHOLOGY

Head of Department: Professor R. E. Ford

Department Office: N-519 Turner Hall, 1102 S. Goodwin, Urbana

- 204. Introductory Plant Pathology.** Concepts relating to causal agents of representative plant diseases, symptoms, and diagnosis, modes of infection and spread, effects of environment on disease development, and methods of control; designed for students in other departments which require or recommend an introductory plant pathology course; lecture and laboratory- discussion. Prerequisite: Plant Biology 100 or equivalent. 3 hours.
- 300. Special Problems.** For students desiring to study specific problems not assigned in other courses. Prerequisite: For undergraduates only, a minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. Specific approval of the associate dean in advance of registration is required for a second and/or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 301. Principles of Plant Pathology.** Basic principles concerning the nature, cause, development and control of plant diseases; intensive study of important diseases and their causal agents; designed for graduate students in plant pathology; lecture and discussion. Prerequisite: An introductory course in plant biology and consent of instructor. 4 hours or 1 unit. Students may not receive credit for both Plant Pathology 204 and 301.
- 305. Principles of Plant Disease Control.** Basic concepts of chemical, cultural, physical, regulatory, and biological methods for the management of plant diseases. Prerequisite: Plant Pathology 204 or 301; a course in organic chemistry. 3 hours or $\frac{1}{4}$ unit.
- 308. Plant Disease Diagnosis.** Field and laboratory techniques in plant disease diagnosis and appraisal: identification of diseases of small grains, turf, corn, soybeans, forage crops, vegetables, fruit, forest and shade trees, and ornamentals, both on field trips and in laboratory exercises. 2 hours or $\frac{1}{2}$ unit. Offered during summer session only.
- 311. Diseases of Herbaceous Ornamentals.** One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of herbaceous ornamental plants. Offered in the second or third five weeks of spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 312. Diseases of Urban Trees.** Same as Forestry 312. One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, causal agents, effects of environment on disease development, and control of diseases of urban trees. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 313. Diseases of Shrubs.** One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of shrubs. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 314. Diseases of Forest Trees.** Same as Forestry 314. One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of forest trees. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 315. Diseases of Turfgrasses.** One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of turfgrasses. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.

- 377. Diseases of Field Crops.** Same as Agronomy 377. Studies the symptoms of major field crop diseases, life histories of causal organisms, and methods of control. Lecture and laboratory. Prerequisite: Plant Pathology 204 or 301. 3 hours or $\frac{3}{4}$ unit.
- 401. Plant Pathogenic Fungi.** Studies pathogenic fungi and their roles in disease cycles in vascular plants; morphology, classification, life histories, ecology and evolution; methods for isolation, culture, and identification. Prerequisite: Plant Biology 372. 1 unit. Offered in alternate years.
- 402. Phyto bacteriology.** Studies pathogenic bacteria and their role in plant disease; history, morphology, reproduction, identification, and classification; emphasizes arrival, invasion, symptoms, and control. Prerequisite: Plant Pathology 301. $\frac{3}{4}$ unit. Offered in alternate years.
- 403. Plant Nematology.** Comprehensive study of plant-feeding nematodes with emphasis on economically important groups; nematode morphology, identification, classification, developmental biology, ecology, and host-parasite relationships; interaction with fungi, bacteria, and viruses in plant disease development; experimental and diagnostic techniques; symptomatology and control. Prerequisite: Plant Pathology 204 or 301; an introductory course in animal biology. 1 unit. Offered in alternate years.
- 404. Plant Virology.** Comprehensive study of plant viruses and virus diseases; includes symptomatology, structure, transmission, characterization, purification, classification, assay methods, replication, epidemiology, and control. Prerequisite: Plant Pathology 301 and Biochemistry 350. 1 unit. Offered in alternate years.
- 406. Genetics of Plant-Pathogen Interactions.** The genetics and expression of resistance in plants to fungi, bacteria, viruses, nematodes, and other pathogens; variation and genetic systems in pathogens with particular emphasis on pathogenicity; complementary genetic systems; and theory and practice of breeding disease-resistant plants. Lecture and discussion. Prerequisite: Plant Pathology 204 or 301; and Agronomy 323 or Genetics and Development 210; or equivalent. 1 unit. Offered in alternate years.
- 407. Physiology of Plant-Parasite Interactions.** Current concepts on physiological and biochemical bases of plant diseases; mechanisms of infection and disease development; theories of resistance and susceptibility; and interrelationships of physiological and biochemical activities that occur during the interaction of plants and their parasites. Prerequisite: One course each in plant pathology, biochemistry, and plant physiology, or consent of instructor. $\frac{1}{2}$ unit. Offered in alternate years.
- 408. Plant Disease Epidemiology.** Fundamental concepts and principles of plant disease epidemics; includes pathometry, crop loss assessment, pathogen and host dynamics, quantification of pathosystem components, pathosystem management, disease forecasting, and decision analysis. Prerequisite: Plant Pathology 301 and Agronomy 440, or equivalent. 1 unit. Offered in alternate years.
- 417. Plant Pathology Seminar.** Current research, literature, and other topics pertaining to plant pathology and related fields. $\frac{1}{4}$ unit.
- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Horticulture 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Horticulture 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Horticulture 433. See Biology 433.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Forestry, and Horticulture 434. See Biology 434.
- 472. Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Biology 472. See Plant Biology 472.
- 499. Thesis Research.** Individual study and basic and/or applied research related to plant disease; required of all students working toward the Master of Science or Doctor of Philosophy in plant pathology. 0 to 4 units.

POLITICAL SCIENCE

Head of Department: Professor Roger E. Kanet

Department Office: 361 Lincoln Hall, 702 S. Wright, Urbana

- 100. Introduction to Political Science.** Survey of major concepts and approaches employed in political science. 3 hours.
- 150. American Government: Organization and Powers.** Historical development and organization of national, state, and local governments; the federal system; national and state constitutions; civil and political rights; party system; and nature, structure, powers, and procedure of legislative, executive, and judicial departments in state and nation. 3 hours.
- 198. Freshman Seminar.** Current topics in political science in the context of the scope and method of political science. Participants are required to do independent library research and present a report on a topic of their choice which is related to the subject of the seminar. Prerequisite: Consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Sociology 222. See African Studies 222.
- 235. Women in Politics.** Same as Women's Studies 235. An introduction to the political status and roles of women. Topics include women's political socialization, voting behavior, and political participation; feminist and anti-feminist politics; and contemporary legislative and public policy issues, such as educational equity, equal rights legislation, and health care delivery for women. 3 hours.
- 240. Introduction to Comparative Politics.** Basic concepts and principles of political analysis from a comparative perspective. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 241. The Emerging Nations.** An introductory comparative consideration of the patterns of political development and of the policies and problems of the emerging nations of Asia, Africa, and Latin America; emphasis on the special characteristics of countries beginning their independent nationhood and the effects of these characteristics on the political systems of these lands and their role in the community of nations. Prerequisite: Three hours of political science or consent of instructor. 3 hours.
- 250. Introduction to Public Policy.** Surveys the policy process including adoption, implementation, and evaluation; each student prepares a research paper; topics include reviews of substantive policy issues such as crime, energy, environment, poverty, foreign policy, civil liberties, or economic regulation. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 260. Introduction to Political Theory.** The nature, structure, and purposes of political theory; uses major works on the problems of political order, obedience, justice, liberty, and representation to distinguish and clarify different theoretical approaches; designed to be an introduction to ideas, not a historical survey. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 270. Introduction to Political Research.** Principles of empirical research in political science; emphasizes definition of research problems, principles and practices of measurement, use of data as evidence, and data analysis; data-based analysis is conducted in the Social Science Quantitative Laboratory. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 280. Introduction to International Relations.** The structure and processes of international relations, trends in international politics, and the future of the international system in a setting of conflict and crisis. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 281. Introduction to International Security and Arms Control.** An introduction designed for all students to major issues of arms control, disarmament and international security. The military, socio-economic, and political effects of nuclear and conventional weapons, military strategy, the ethics of modern warfare, nuclear proliferation, and regional security issues will be studied. 3 hours.

- 290. Individual Study.** Readings and reports in selected fields chosen in consultation with the instructor. Prerequisite: Written consent of instructor. 1 to 4 hours. May be repeated.
- 292. Senior Thesis in International Relations.** Prerequisite: Written consent of instructor; senior standing; field of concentration in Political Science; studying international relations. 3 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Prerequisite: Written consent of instructor; open only to seniors whose field of concentration is political science and who have a general University average of at least 4.0. 2 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
- 295. Special Topics in Contemporary Issues and Problems.** Study of a contemporary problem in public policy, domestic or international. See Timetable for current topics. Prerequisite: Sophomore standing, 3 hours of political science, or consent of instructor. 3 hours. May be repeated for credit.
- 296. Special Topics in Political Science.** Selected reading and research in political science. See Timetable for current topics. Prerequisite: Junior or senior standing; 6 hours of political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 297. (Counts for advanced hours in LAS.)
- 297. Honors Seminar.** Research, reading, and discussion in selected topics and works in literature of political science. Prerequisite: Junior or senior standing; 6 hours of political science; 4.0 average or James Scholar designation; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 296.
- 299. Government Internship.** Selected Government Internship participants together with faculty sponsor develop a program of study and research related to internship assignment. Consult departmental undergraduate advisor. Prerequisite: Junior standing; 4.0 grade average for most internships; Political Science 150 and one 300-level political science American government course; acceptance by faculty sponsor. 0 to 6 hours. May be repeated to a maximum of 12 hours.
- 300. Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Social Science 300. Examination of performance-oriented approaches to administration of public sector organizations; private sector accountability principles applied to governmental agencies; means of improving the performance of governmental agencies; corporate social responsibility; public policy implications of computer usage and individual privacy; and actual cases reviewed and discussed. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 305. Municipal Government.** Growth of cities; their legal status; and municipal politics and organization in the United States. 3 hours, or ½ or 1 unit.
- 306. Municipal Problems.** Municipal administration in the United States: administrative organization; personnel problems; financial problems; city planning and housing; police and fire administration; public health; and public utilities. Prerequisite: Senior standing, or junior standing with Political Science 305 or Economics 101, or 6 hours of political science. 3 hours, or ½ or 1 unit.
- 312. State Government.** The states in the federal system; state constitutions and problems of revision; organization, powers, and functions of the legislative, administrative, and judicial branches of state government; state functions; reorganization problems in the states; state-local relations; and state finance, trends, and prospects. Prerequisite: Political Science 150. 3 hours, or ½ or 1 unit.
- 314. The Presidency.** Determinants and growth of presidential influence; presidential decision making; the president's role in the formulation and implementation of public policy; the president and constituencies; and the president's roles as legislator, party leader, and chief executive. Prerequisite: Political Science 100 or 150. 3 hours, or ½ or 1 unit.
- 315. Legislatures and Legislation.** The legislative function in government: structure and organization of American legislatures (national, state, and local); party organization in legislatures; legislative procedure; pressure groups and lobbying; relation of legislature to other branches of government; and problems of legislative reorganization. Prerequisite: 6 hours of political science. 3 hours, or ½ or 1 unit.

- 317. The American Federal System.** The nature, justification, and problems of federalism; coordination of governmental efforts by contract, subsidies, and grants; and comparison of federal systems. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Government and the Economic Order.** Interplay of political and economic phenomena at various domestic, foreign, and international levels and applicability of certain generalized models. Prerequisite: Any two courses in political science or a combination of political science and economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 322. Politics and the Media.** Same as Communications 322. See Communications 322.
- 326. American Political Parties.** Organization and operation of the American party system; relations between national, state, and local organizations; state and national committees; the convention systems; the primary; and campaign methods and finance. Prerequisite: Political Science 150 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 327. Black Political Participation in the American Political Process.** Same as Afro-American Studies 327. Exposes students to the variety of literature on black people in American politics; political participation is the major theme. Since black and white scholars address themselves to the study of political behavior of blacks, it is necessary to compare not only their views but also to discuss the underlined message, or meaning, of their work to understanding American politics in general. Prerequisite: Political Science 150, or 6 hours of social science, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 328. An Introduction to the Study of Political Behavior.** An analysis of the interrelations of political attitudes and public formation; special attention to the substantive areas of voting behavior, political leadership, and the rise of political mass movements; and also a review of the literature on democratic and authoritarian personality types. Prerequisite: Political Science 150 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Electoral Behavior.** Study of the social and psychological motivations behind the individual voting decision, with special emphasis on the relationships between the voting decision and social stability. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 331. British Government.** Nature of the British Constitution; the Crown, Ministry, and Cabinet; Parliament and elections; the party system; law and the courts; local government; and the British Commonwealth. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. African Independence and Underdevelopment: 1945 to the Present.** Same as History 385. See History 385.
- 333. Southern Africa: Race and Power.** Same as African Studies 325 and History 325. See African Studies 325.
- 335. Government and Politics of the Soviet Union.** Evolution, structure, and functioning of the Soviet system of government; the theories, structure, and functioning of the Communist party of the Soviet Union. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Governments and Politics in Western Continental Europe.** An analysis of the major governmental systems of continental Europe; the evolution, structure, and functioning of the political institutions of France, Germany, Italy, Spain, Switzerland, and the Scandinavian countries as illustrations of multiparty and dictatorial types of governments. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Government and Politics of China.** Same as Asian Studies 337. An introduction to the governments and politics of modern China. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 338. Governments and Politics in the Middle East.** Same as Asian Studies 338. An analysis of the transformation of Middle Eastern society from Morocco to Iran, as case studies in political modernization; study of politics of the area with special reference to causes and character of modernization, role of leadership, ideologies and institutions, methods and theories for analyzing political systems undergoing fundamental transformation, and implications for U.S. policy. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 339. Islam and Society in the Modern Middle East and North Africa.** Same as Religious Studies 308. See Religious Studies 308.

- 340. The German Political System.** Structures and processes of postwar German politics, with primary emphasis on West Germany; special attention to foreign policy formulation and problems (particularly defense), the Berlin issue, reunification, and relations with Eastern Europe. Knowledge of German helpful but not necessary. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 342. Government and Politics in Latin America.** A survey of the origin and development of Latin American political institutions; systems of government; public administrative systems; party government; and international policies of Latin American governments. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 343. Political Systems and Structures of Latin American Countries.** The political process, generally of selected Latin American countries at different levels of political development; stress on the interaction between political infrastructure and more formal agencies of government; and may include cross-national comparison of the function of such factors as political culture, party system, bureaucracy, or the military establishment. Prerequisite: Political Science 342. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 346. Comparative Communist Systems: Eastern Europe.** Analysis of the origins of modern communism and the development of its doctrines; applications of these doctrines in the practices of ruling Communist parties; emphasis on alternates between European and non-European Communist systems, depending on course instructor. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 347. Governments and Politics of Southeast Asia.** Same as Asian Studies 347. Comparative analysis of the political development of the countries of Southeast Asia, the lands to the east of India and south of China; emphasis on the differing approaches to the governing of man and the formation of public policy to be found in these countries; and consideration of economic, social, historical, and geographical influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 348. Government and Politics of Japan.** Same as Asian Studies 348. Introduction to the government and politics of modern Japan. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 349. Governments and Politics of South Asia.** Same as Asian Studies 349. A comparative analysis of the political development of India, Pakistan, Ceylon, and the lesser lands of South Asia; emphasis on the differing approaches to the governing of man and the formation of public policy to be found in these countries; and consideration of economic, social, historical, and geographical influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 350. Law and Society.** An introductory study from a social science perspective of the nature of law, law makers, and law appliers; the causes or inputs determining law; and the effects or outputs which law in general produces. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 351. American Constitutional System.** Judicial interpretation of constitution; separation of governmental powers; relation of state and national governments; control of interstate commerce; and jurisdiction of courts. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. The Judicial Process.** A systematic analysis of legal, evidentiary, environmental, and personal factors that influence judicial decision making, with particular emphasis on the application of the scientific method to the study of judicial behavior. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. The Constitution and Civil Liberties.** Study of free speech, loyalty in a democratic state, citizenship, freedom of religion, rights of persons accused of crime, and government's responsibility to protect persons from racial and religious discrimination; and special attention to the role of law and judges. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. Public Administration and the Judicial Process.** The scope of administrative powers and their relation to private rights; a comparison of the processes of decision in administrative agencies and in the courts; the interests served by each; the impact of judicial

review of administrative decisions upon administrative procedure and policy; the constitutional and statutory bases of review; and the legal accountability of public officers versus political accountability. Prerequisite: Political Science 305, 351, or 361, or consent of instructor. 3 hours, or ½ or 1 unit.

357. Human Rights. Same as Sociology 357. See Sociology 357.

358. Politics of Crime and the Criminal Process. Same as Sociology 358. Examination of crime as a political issue and as a social problem; includes political aspects of law enforcement, the nature of the judicial process in criminal cases, and criminal justice reform; and emphasizes the legal system at the local level. Prerequisite: Political Science 150 and junior standing. 3 hours, or ½ or 1 unit.

359. Contemporary Supreme Court Policy Making. Studies how the modern Supreme Court has resolved major issues in American constitutional politics. Prerequisite: Consent of instructor; Political Science 351 or 355 or 358. 3 hours or 1 unit.

361. Introduction to Public Administration. Development of administrative organization; administration and the executive, legislature, and judiciary; principles of organization, including line and staff relationships; the staff services of finance and personnel; and formal and informal control. Prerequisite: Political Science 150. 3 hours, or ½ or 1 unit.

362. Administrative Organization and Policy Development. Dynamics of policy formulation in public administrative agencies; current developments in organizational theory and their significance for public administration; origin of public administrative organizations; interpersonal behavior; large-scale organizations and centralization; external support and opposition; and policy formation and problems of compliance. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or ½ or 1 unit.

363. Comparative Administration. Study of modern bureaucratic organization by means of the comparative method; special reference to the bureaucracies of various countries in different stages of industrialization; and the cultural bases of administrative behavior. Prerequisite: Junior standing. 3 hours, or ½ or 1 unit.

366. Tools of Public Management. A critical survey of the tools of analysis available to overhead functions of public management in key areas of decision; emphasis on personnel administration and manpower utilization; budgetary processes and fiscal controls; and several methods of administrative analysis: organizational studies, procedures engineering, information processing, and operations research. Prerequisite: Political Science 361 or consent of instructor. 3 hours, or ½ or 1 unit.

370. Selected Topics on Women and Politics. Same as Women's Studies 370. Variable topics relating to the political roles and status of women, emphasizing the areas of comparative politics, political theory, political behavior, and international politics. See Timetable for current topics. Prerequisite: Political Science 235 or consent of instructor. 3 hours or 1 unit. May be repeated once for credit.

371. World International Organization. General development and basic principles of world organization; principles, structure, methods, and actual operation of international governmental institutions; and special attention to the United Nations and related agencies and to their evolution from the League of Nations system. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.

375. Politics of the Global Economy. Examines the interaction between politics and economics; locates their ideologies and practices in the context of international economic relations. Considers such topics as international trade, the global monetary order, multinational corporations, economic aid relationships, and food and energy politics. Prerequisite: Political Science 240 or 280. 3 hours or 1 unit.

377. International Communications. Same as Communications 377. An interdisciplinary approach to international communications; its structure and content; the role of international communications in conflict and conflict resolution; the semantics of international communication; the technical and economic aspects of international mass communications; and government-industry relations in communications. Prerequisite: Political Science 280 or 6 hours of social science, or consent of instructor. 3 hours, or ½ or 1 unit.

380. Comparative Foreign Policies. An analysis of the formulation and substance of the

foreign policies of select nations of the world. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.

- 381. American Foreign Relations.** Participation in international affairs; presidential initiative; development and organization of the Department of State; diplomatic intercourse; consular service; treaty-making power; and development of foreign policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 382. Contemporary American Foreign Policies.** Study of the major foreign policy decisions currently confronting the United States government: analysis of background, principal issues, and alternative actions; formulation of policies. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 383. Soviet Foreign Policy.** Survey of Soviet foreign policy from 1917 to the present, with emphasis upon the forces shaping this policy; special attention to the interplay of ideology and national interest in policy formulation. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 384. International Relations.** Examination of contemporary international systems in terms of the types of actors and their goals, various structures of power, and the mechanisms of allocating resources and containing conflict. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 387. National Security Policy.** Examination of the organization and formulation of current American defense policy; the theory and practice of deterrence, with special reference to American and Soviet military strategy; and the problems of disarmament and arms control. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 388. The Military and Politics.** The role of the military in national and international policies, with special attention given to theories of war and peace, civil-military relations, the military and the political development of Western and non-Western states, and the nonmilitary uses of the military. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 389. Chinese Foreign Policy.** Same as Asian Studies 385. An analysis of the formulation, substance, and conduct of Chinese foreign policy, with emphasis on the period since 1949; special attention to the forces shaping Chinese policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or ½ or 1 unit.
- 390. Methods of Political Analysis.** Presentation of the analytic processes in the development of concepts, hypothesis, and theories; discussion of the derivation, formulation, and specification of research problems to be related to basic methodologies and modes of analysis; and applications to political science. Prerequisite: Political Science 270, or consent of instructor. 3 hours, or ½ or 1 unit.
- 391. Topics in non-Western Political Thought.** Considers political thought outside of the Greco-Roman, European, and North American tradition; each semester focuses on the political thought of a specific region. Despite the geographical inaccuracy, Latin America may be included under "non-Western" for purposes of the non-Western LAS General Education requirement. 3 hours or 1 unit. May be repeated as topics vary.
- 392. Socialist Political Theory.** Origins, development, and recent modifications of socialist theory from the late eighteenth century to the present; examination of each contribution in terms of its goals, efficacy, and subsequent influence; and discussion including Rousseau, Hegel, the Utopians, Marx and Engels, Anarcho-syndicalists, Lenin, Luxemburg, Trotsky, Mao, Guevara, and Garaudy. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or ½ or 1 unit.
- 393. Classical Political Theory.** A consideration of major works of Greek and Roman political theory, and especially of their relevance to modern political analysis and action. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or ½ or 1 unit.
- 395. Modern Political Theory.** A critical analysis of political theories from the sixteenth century to the present; focus on the development of such concepts as the nature of man, the role of the state, justice, legitimacy, obligation, individual rights, equality, and mechanisms of maintenance and change. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or ½ or 1 unit.

- 396. Contemporary Political Theory.** Major tendencies in Western political theory since 1850; conservatism and constitutionalism; the religious interpretation of the state and economic institutions; Marxism, socialism, and communism; and antidemocratic thought and totalitarian regimes. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 397. American Political Theory.** Survey of American political thought from colonial times to the present. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 398. Theory and Practice of Democratic Government.** Theories of the nature and conditions of democracy; comparison and analysis of contemporary democratic institutions. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 400. Selected Topics in Political Theory.** Reading, analysis, and discussion of selected topics of political theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 401. History of Political Theories.** Reading and analysis of the leading political thinkers from the Greeks to the middle of the seventeenth century. 1 unit.
- 402. History of Political Theories.** Readings and analysis of the leading political thinkers from the middle of the seventeenth century to the present. 1 unit.
- 406. Municipal Administration.** Position of cities in American governmental systems; governmental interrelationships; powers; services; and current municipal problems. 1 unit.
- 420. Formation of Public Policy.** Same as Labor and Industrial Relations 420. An examination of the institutional and dynamic forces that shape the making of policy and its administration in the United States; separation of powers, pressure groups, administrative and legislative procedures, and judicial activity. 1 unit.
- 423. Proseminar in American Politics.** An intensive analysis of major institutions and processes of American politics (national, state, and local); research on selected topics in American government. 1 unit.
- 428. Multivariate Analysis for Political Scientists.** Applied use of extended analysis of variance; multiple classification analysis, factor and small-space analysis, causal analysis, multiple regression, and selected topics for research. Prerequisite: Sociology 387 and Political Science 497, or consent of instructor. 1 unit.
- 430. Proseminar in Comparative Politics.** Comparative political analysis in the context of the evolution of the social sciences and modern political science, with emphasis on theories of political action and their function in contemporary comparative studies. This course is designed as an introduction to area-oriented seminars and generally is a prerequisite for them. 1 unit.
- 440. Comparative Politics and the Political Process.** The comparative study of selected national political systems or of specific institutional forces that influence the making and application of public policy in several countries. The countries studied and the legal and extralegal political agencies considered vary according to the person conducting the seminar. 1 unit. May be repeated to a maximum of 3 units.
- 450. Contemporary Governmental Problems.** Special problems of current importance designed especially for students not majoring in political science. 1 unit. May be repeated to a maximum of 3 units.
- 453. Law, Policy, and Social Science.** The application of social science research techniques to improving legal procedure and legal substance; emphasis on constitutional law and other public law subjects, but also consideration of other fields of law. 1 unit.
- 460. Organizational Sciences, I.** Same as Business Administration 410, Psychology 453, and Sociology 456. See Business Administration 410.
- 465. Problems in Administrative Management.** Analysis of methods of applying administrative principles and procedures to operating problems in government agencies, such as methods of administrative coordination and control, intergovernmental cooperation, legislative-administrative relations, the organization of regulatory functions, and review of administrative decisions. Prerequisite: Political Science 361 or consent of instructor. 1 unit.

- 466. Current Administrative Theory.** A discussion of some recent trends in administrative opinion and practice on such questions as agency structure and functional activities; field and regional organization and relations; the role and functions of the executive; the process of decision making; the relations of line and staff activities; the communication and execution of policies and programs; and employee relations. 1 unit.
- 469. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations, Social Work, and Administration, Higher, and Continuing Education 497. See Labor and Industrial Relations 497.
- 480. Scope and Theory in International Relations.** Deals with the field of international relations, its relationship to political science and the other social sciences; treats the development of the field by examining major theories and approaches that have characterized it in the past, but with emphasis on contemporary theories and concepts. 1 unit.
- 481. Methodology in International Relations.** Deals with major research methodologies in contemporary international relations; includes case studies, aggregate data, content analysis, survey research, gaming and simulations, and causal modelling; and presumes knowledge of basic international relations theory. Prerequisite: Political Science 480. 1 unit.
- 484. International Relations: Special Problems in Theory and Research.** Advanced seminar on special topics in international relations. Prerequisite: Political Science 480 or 481, or consent of instructor. 1 unit. May be repeated under different instructors for a maximum of 3 units.
- 490. Proseminar in Political Behavior, I.** Interdisciplinary approaches to the analysis of political behavior; formation of opinions, interests, roles, and personality; applications of organization theory to political institutions; applications of conflict and bargaining theory to political processes; and systematic studies of the distribution of values. 1 unit.
- 491. Proseminar in Political Behavior, II.** Continuation of Political Science 490. Prerequisite: Political Science 490. 1 unit.
- 492. Problems of Explanation in Social Science.** Special topics in the methodology of social sciences, especially theory formation and theory testing. 1 unit.
- 493. Research in Selected Topics.** Research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 3 units.
- 495. The Philosophy of Political Science.** Definitions of the scope and subject matter of political science; methodological issues in political science; major conceptions of methodology as embodied in current leading studies of politics; and the present state of research in political science. 1 unit.
- 496. Political Concepts: Formulation and Measurement.** Indicates the relevance of certain research techniques for answering questions of concern in political science; indicates the range of tools available to the student; and includes discussion of problems in concept formation. Current methods of concept measurement are presented to the student in the context of political research problems. Prerequisite: Consent of instructor. 1 unit.
- 497. Research Design and Techniques.** Introduction to problems of research design, data collection, data analysis and interpretation, sampling, and some simple measures of statistical association and significance. Prerequisite: Political Science 496. 1 unit.
- 498. The Logic of Political Inquiry: Selected Topics.** Application of analytic principles and procedures developed in Political Science 495 to such topics as patterns of explanation; current theoretical perspectives; group theory, functionalism, systems theory, decision making, simulation, etc; the logic of judicial decisions; and justifications of political ideologies. This list is not exhaustive, nor will all of these topics be included each semester. Prerequisite: Political Science 495. 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

PRINTMAKING

(See Art and Design)

PSYCHOLOGY

Head of Department: Professor Emanuel Donchin

Department Office: 308 Psychology Building, 902 South Sixth, Champaign

- 100. Introduction to Psychology.** Study of human behavior with special reference to perception, learning, memory, thinking, emotional life, and individual differences in intelligence, aptitude, and personality; emphasis on the scientific nature of psychological investigations; and discussion of research methods and the relation of their results to daily life and everyday problems. Lectures, discussions, and five hours of participation as a subject in psychological experiments. *Not open to students electing Psychology 103 or 105.* 3 hours.
- 102. Psychology Orientation.** Lectures designed to acquaint the psychology concentrator with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to psychology students. Recommended for freshmen in psychology. No credit.
- 103. Introduction to Experimental Psychology.** Surveys basic topics in experimental psychology; emphasizes perception, learning, memory, motivation, emotion, cognition, language development, and decision-making. Uses simple laboratory experiments to investigate these topics. *Not open to students electing Psychology 100 or 105.* 4 hours.
- 105. Elements of Psychology.** Description and explanation of the psychological principles of everyday living, with emphasis on how behavior is motivated, how individuals learn intelligent behavior, personality, and applications of psychology to various social issues. Lectures, discussions, and five hours of participation as a subject in psychological experiments. This course may be substituted for Psychology 100 when the latter is listed as a prerequisite or a recommended elective. For placement purposes, enrollment is limited to students whose ACT composite score is 21 and below. *Not open to students electing Psychology 100 or 103.* 4 hours.
- 158. Personal and Social Implications of Machines.** Examines human interaction with modern machines; topics include a comparison of the capabilities of humans and machines, effects of automation, characteristics of good machines and workplaces, selection and training of effective users of machines, and research, including new machines, for handicapped populations. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Introduction to Social Psychology.** Systematic study of social factors in individual and group behavior; attention to social perception, motivation, and learning; attitudes, norms, and social influence processes; the development and dynamics of groups; and the effects of social and cultural factors on the individual. Credit is not given for both Psychology 201 and Sociology 201. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 205. Individual Differences in Intelligence.** Discussion of the nature of psychological tests; theories of intelligence; the nature-nurture problem in human abilities; sex, socioeconomic, and race differences; testing and social policies; and policy implications of individual and group differences. Lecture and discussion. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
- 210. The Brain and the Mind.** A survey of current knowledge and speculation regarding the brain's role in perception, motivation, sexual behavior, thinking, memory, and learning, based upon human clinical data and research in animal models. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
- 211. Techniques of Biological Psychology.** Introduction to research techniques used in the physiological study of mental processes; includes recording "brain waves," behavioral analysis of drug and lesion effects, anatomy of the brain, hormones and behavior, and related topics. Prerequisite: Credit or concurrent registration in Psychology 210, or consent of instructor. 2 or 3 hours.
- 214. Introduction to Aging.** Same as Human Development and Family Ecology 214. See Human Development and Family Ecology 214.
- 216. Child Psychology.** Study of the psychological development of the child. Prerequisite: Psychology 100, 103, or 105. 3 hours.

- 217. Comparative Development.** Survey of phylogenetic and ontogenetic development of behavior. The first part of the course considers the comparative psychology of representative phyla, with special emphasis on the development of sensorimotor coordination, motivation, and learning. The second half of the course is concerned with development of behavior in the individual organism, with most attention devoted to behavioral changes during the life span of vertebrate organisms. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 224. Cognitive Psychology.** Introduction to the psychological study of human information processing and memory; acquisition, retrieval, and forgetting; and general knowledge, concepts, reasoning, and related issues in cognition. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 230. Perception and Sensory Processes.** Survey of the experimental psychology of sensory and perceptual processes and behavior; emphasis on the contribution of behavior science to understanding subjective experience of the physical and social environment. Prerequisite: An introductory course in psychology, physiology, or animal biology. 3 hours.
- 231. Research Methods in Experimental Psychology.** Studies experimental laboratory methods as related to applied and basic psychological questions; material includes: research methodology, scientific problem solving, literature search, scientific writing, experimental design, basic data analysis, and research laboratory experience. Prerequisite: Psychology 100, 103, or 105. 4 hours.
- 233. Descriptive Statistics.** Descriptive statistics, including measures of central tendency and dispersion, correlation, probability, transformations, and basic distribution theory; basic principles of sampling and research design. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 3 hours. Students may not receive credit for Psychology 233 and Psychology 235, Economics 171 or 172, Sociology 185 or 385, Statistics 100 or Educational Psychology 390. (Offered by correspondence only.)
- 234. Inferential Statistics.** Inferential statistics, including sampling distributions estimation, hypothesis testing, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 233. 2 or 3 hours. Students who have earned credit in Economics 171 or 173, Statistics 100, Sociology 185, or Educational Psychology 390 receive 2 hours credit in Psychology 234. Students may not receive credit for both Psychology 234 and 235. (Offered by correspondence only.)
- 235. Introduction to Statistics.** Development of skill and understanding in the application of statistical methods to problems in psychological research; topics include descriptive statistics, probability, estimation, basic inferential methods, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 2 or 5 hours. Students who have earned credit in Economics 171, 172, or 173, Statistics 100, Sociology 185 or 385, or Educational Psychology 390 receive 2 hours credit in Psychology 235. Students may not receive credit for both Psychology 235 and either Psychology 233 or 234.
- 238. Abnormal Psychology.** Conceptions and facts about disordered behavior, including psychoses, neuroses, and other patterns of psychological disturbance. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 239. Community Psychology.** Redefines human and social problems and the implications for social programs and policies; reviews the historical antecedents, conceptual models, strategies and tactics of social and community programs; and employs examples from selected social systems (e.g., criminal justice, education, employment, and mental health). Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 245. Industrial Organizational Psychology.** A systematic study of the application of psychological methods and principles in business and industry; emphasis on personnel selection

and factors influencing efficiency. Prerequisite: Psychology 100, 103, or 105; credit or concurrent registration in a statistics course. 3 hours.

- 246. Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 248. Psychology of Learning and Memory.** Survey of basic phenomena in learning and memory emphasizing experimental data from animal and human research. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 250. Psychology of Personality.** The study of personality from various points of view: biological, experimental, social, and humanistic; surveys theory and empirical research in the study of personality. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 258. Human Factors in Human-Machine Systems.** Examines equipment and training variables that influence the human operator in human-machine systems; includes the nature of human-machine systems, the capabilities of humans and machines, and simulation for design decision; and research and principles for the design and use of symbolic and pictorial displays, control systems, and simulators for training. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 260. American Sign Language.** Same as Linguistics and Speech and Hearing Science 260. A beginning course in American Sign Language (ASL), the language developed and used by the deaf community of North America; consists of a preparatory phase to attune students to communication in the manual-visual mode, followed by instruction and extensive practice in basic sign vocabulary, sentence structure, elementary conversation, and the literature of the ASL community. 3 hours.
- 261. Sign Language and Nonverbal Communication in Man and Animals.** Surveys non-verbal communication systems: natural animal communication, human sign languages (especially American Sign Language), human facial expression, gesture and body language; examines organization of animal and of human communication, and considers communication by animals tutored in human sign language. Prerequisite: A course in introductory psychology, linguistics, or speech communication; or consent of instructor. 3 hours.
- 290. Special Topics.** Supervised participation in research and scholarly activities usually as an assistant to an investigator. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours.
- 291. Honors Individual Study.** Prerequisite: Junior standing; admission to psychology honors program. 2 to 4 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Planning, researching, and writing of an undergraduate honors thesis, under supervision of a faculty member, on a problem of appropriate scope and character. Prerequisite: Psychology 297. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 294. Individual Topics.** Supervised independent investigation of special topics in psychology; requires a written report with a final copy submitted for departmental records. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours. (Counts for advanced hours in LAS.)
- 297. Junior Honors Seminar.** Seminar on experimental methods and contemporary psychological research. Prerequisite: Junior standing and admission to departmental honors program. 0 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Honors Seminar.** Continuation of Psychology 297. Prerequisite: Psychology 297. 0 to 4 hours. (Counts for advanced hours in LAS.)
- 300. Psychology for Medical Students and Health Professionals.** An advanced treatment of psychological concepts with an emphasis on their interaction with medicine. Topics include: perception, learning, memory, thinking, emotions, and individual differences; psychological theories and data relevant to the analysis of illness and disease; decision making and medical problem solving. Prerequisite: 12 hours of psychology and a 4.0 grade point average; and senior, graduate, or professional standing; or consent of instructor. 3 hours or 1 unit.

- 301. The Computer as a Laboratory Instrument.** The computer as a control device in bio-behavioral experiments; data acquisition using computer-controlled devices; and includes introduction to computer architecture and application language programming, study of recent experimental literature for which the computer was an indispensable tool, and practicum utilizing laboratory computers available at the Department of Psychology. Prerequisite: Computer Science 103 or equivalent; two 200-level psychology courses or consent of instructor. 4 hours or 1 unit.
- 306. Statistical Methods, I.** Techniques in applied statistics used in psychological research, including simple linear regression, partial and multiple correlation, and nonparametric methods; thorough review of statistical estimation and significance tests; emphasizes applied statistics and statistical computing. Introduces experimental design; one-way ANOVA. Prerequisite: Twelve hours in psychology and Psychology 235, or equivalent. 4 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
- 307. Statistical Methods, II.** Continuation of Psychology 306. Experimental design, including Latin Squares, factorials, and nested designs; expected Mean Squares, Analysis of Covariance; emphasizes the general linear model; introduces multivariate methods, such as factor analysis, scaling, classification, and clustering. Discrete multivariate analysis—multiway contingency tables. Prerequisite: Psychology 306. 4 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
- 311. Laboratory in Physiological Psychology.** Research on classical and current problems; emphasis on the nervous and endocrine systems in information processing and in the regulation of behavioral adaptation; and examples from sensation, perception, motivation, emotion, and learning. Laboratory. Prerequisite: Psychology 211. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 312. Movement Notation.** Same as Dance 349 and Physical Education 365. Scientific symbolic system for notation of movements of the human body. Prerequisite: Physical Education 150 or 255, or Dance 160. 3 hours or 1 unit.
- 313. Drugs and Behavior.** Behavioral and physiological effects of chemicals either used therapeutically to treat psychological disorders or that may be abused for their psychotropic effects; emphasizes mechanisms and models for the study of drug action. Prerequisite: Psychology 210, Ecology, Ethology, and Evolution 353, or Biology 303; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Brain, Learning, and Memory.** Conveys a knowledge of current research on the physiological bases of learning and memory; considers a wide range of topics from molecular (e.g., cellular morphological and functional plasticity) to relatively molar (e.g., effects of clinical and experimental brain damage on learning and memory processes). Prerequisite: Psychology 210 or Biology 303; or Psychology 248 or 348; or consent of instructor. 3 hours or 1 unit.
- 318. Psychology of the Infant.** Early infant behavior, emphasizing critical evaluation of the various research techniques; prenatal and perinatal influences, ontogeny of psychological processes, environmental determinants, and infant assessment. Prerequisite: Psychology 216. 3 hours or 1 unit.
- 319. Day Care Practicum.** Same as Human Development and Family Ecology 319. Application of psychological theory in day care settings; supervised experiences focusing on the relation between aspects of child development and the planning and carrying out of effective day care programs. Typical sections offered include experience with infants, preschool, handicapped, hospitalized, and maltreated children. Prerequisite: Psychology 216 or Human Development and Family Ecology 105; Human Development and Family Ecology 202; acceptance into the Development Child Care Program; consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated.
- 320. Principles of Psychophysiology.** Theoretical and practical aspects of human psychophysiology; measurement techniques and the application of psychophysiological principles to problems in developmental, clinical, social, and experimental psychology. Prerequisite: Psychology 234 or 235, 6 hours of psychology, and an introductory course in physiology. 3 hours or 1 unit.

- 323. Language Acquisition.** Same as Linguistics 323 and Communications 323. Survey of theory and research on the acquisition of language, concentrating on the acquisition of a first language by the young child. Prerequisite: 6 hours of psychology or linguistics above the 100-level, or consent of instructor. 3 hours or 1 unit.
- 324. Psychology of Thinking.** Survey of problems, experimental methods, and research findings in human thinking; emphasis on concept formation, problem solving and decision making, and creativity. Prerequisite: Psychology 235. 3 hours or 1 unit.
- 325. Psychology of Language.** Survey of theory and research in the psychology of language; topics include relation of linguistics and psychology, language development, and influence of language on perception, memory, and thought. Prerequisite: 6 hours of psychology or consent of instructor. 3 hours or 1 unit. Credit not given for both Psychology 325 and Linguistics 325.
- 326. Motivation and Emotion.** The nature and development of emotion, attitude, and motive, and the role of these processes in social adjustment. Prerequisite: 6 hours of psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Human-Computer Interaction Laboratory.** Examines basic concepts, methodology, and critical skills needed in conducting research, evaluating and designing human-computer interfaces. Laboratory includes performing experiments in human-computer interaction. Prerequisite: Psychology 224, 258, or 356; and a course in computer science; or consent of instructor. 4 hours or 1 unit.
- 330. Current Topics in Experimental Psychology.** Discusses current research problems in experimental psychology; students perform a detailed research project on a current research problem in experimental psychology. Prerequisite: Psychology 231 and 235, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 331. Advanced Experimental Laboratory Methods.** A lecture-laboratory course concentrating on perception, cognition, learning, and performance; includes psychophysical procedures, workload assessment, reaction time measurement, skill acquisition, problem solving, computerized testing, statistical evaluation, and scientific writing. Prerequisite: Psychology 231 and 235, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Research Methods in Social Psychology: Laboratory Methods.** Same as Sociology 332. Lecture and laboratory in the methods and techniques of social psychological research in laboratory settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235 or Sociology 184 and 185. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 333. Research Methods in Social Psychology: Natural Settings.** Methods and techniques of social psychological research in natural settings. Students formulate and carry out research problems using procedures appropriate for research in natural settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235, or Sociology 185. 4 hours or 1 unit.
- 335. Mathematical Formulations in Psychological Theory.** Illustration of mathematical formulations by studying quantitative treatments of various psychological processes; emphasis on learning theory, psychophysical laws, and other selected topics; and the development of simple mathematical tools as required. Prerequisite: Elementary statistics of probability, elementary calculus, and 6 hours of psychology, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Clinical Psychology.** Survey of methods in clinical psychology; description, demonstration, and critical review of procedures used by clinical psychologists in the analysis and modification of disordered behavior. Prerequisite: Psychology 238. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Behavior Modification.** Introduction to the principles and application of behavior modification; includes methods of behavioral assessment, positive and negative reinforcement, punishment and extinction, token economics, programmed instruction, and desensitization; and emphasizes establishing behavioral objectives in the modification of child and adult clinical problems. Prerequisite: Psychology 248. 3 hours or 1 unit.
- 340. Community Projects.** Principles of psychology applied to service problems in the community; students serve as nonprofessional mental health workers in supervised experiences in schools, hospitals, and other nontraditional settings. Prerequisite: Psychology 100 and 239; junior or senior standing; and consent of instructor. 4 hours or 1 unit.

- 341. Advanced Community Projects.** Advanced discussion and practicum on principles of psychology which may supplement mental health and other human services in a community. Students serve as nonprofessional mental health workers in supervised experiences in school hospitals and other nontraditional settings. Prerequisite: Psychology 340 and consent of instructor. 4 hours or 1 unit.
- 342. Behavior-Genetic Analysis.** Same as Anthropology 342 and Ecology, Ethology, and Evolution 350. Concepts, methods, and problems in the analysis of relations between genetic systems and animal behavior. Prerequisite: Anthropology 240 or Genetics and Development 106 or 210. 3 hours or $\frac{1}{2}$ unit.
- 343. Hormones and Behavior.** Same as Ecology, Ethology, and Evolution 353. See Ecology, Ethology, and Evolution 353.
- 345. Laboratory in Comparative Psychology.** Animal behavior with particular reference to the behavior of vertebrates. Prerequisite: 6 hours of psychology and an introductory course in biology, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 347. Behavior Genetics Laboratory.** Same as Anthropology 337 and Ecology, Ethology, and Evolution 352. Examination of the relations between genetic mechanisms, population structure, and individual differences in behavior; laboratory work on techniques of behavior study and genetic analysis. Prerequisite: Concurrent registration in Psychology 342. 2 hours or $\frac{1}{2}$ unit.
- 348. Theories of Learning.** A critical analysis of selected theories of learning; consideration of problems of theory construction in the context of past controversies in learning as well as recent theories of animal and human learning. Prerequisite: Psychology 248 or Educational Psychology 211. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 349. Social Psychology of Sport.** Same as Physical Education 347. See Physical Education 347.
- 350. Laboratory in Personality.** The study of personality emphasizing active participation in designing, conducting, analyzing, and presenting of research; lectures concern the practical aspects of research methodology and the philosophy of personality research; and laboratory involves conducting original research in small groups. Prerequisite: Psychology 235 or equivalent; and Psychology 250 or consent of instructor. 4 hours or 1 unit.
- 352. Attitude Theory and Change.** Same as Communications 352 and Sociology 352. Comprehensive analysis of theories of attitude acquisition, organization, and change; emphasis on attitude change through communication and effects of persuasive communication on public opinion. Prerequisite: Psychology 201 or Sociology 201, or a comparable course of introduction to social psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 353. Social Perception.** Analysis of theory and research on problems related to the manner in which persons judge themselves and others on the basis of information received; topics include impression formation integration, determinants of interpersonal attractions, and attribution processes. Prerequisite: Psychology 201 and 235, or graduate standing, or consent of instructor. 3 hours or 1 unit.
- 354. Small Group Behavior.** The nature of interpersonal transactions; theories and methods for their investigation; and consideration of both individual and social determinants of such transactions. Prerequisite: Psychology 201. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. Industrial Social Psychology.** Same as Labor and Industrial Relations 355. Social psychological research and theory applied to industrial problems; emphasis on interaction and communication theory, role theory, leadership theory, motivational and perceptual theory, and group structure theory as an aid in understanding and analyzing industrial problems. Prerequisite: Psychology 201 or 357. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. Human Performance and Engineering Psychology.** Human capabilities and limitations in processing information; models and theories of signal detection, stimulus analysis, short-term memory, choice reaction time, decision-making, attention, and motor performance are evaluated with respect to experimental data; emphasizes theory, although implications for design of man-machine systems are considered. Prerequisite: Psychology 100, 103, or 105 or consent of instructor. 3 hours or 1 unit.
- 357. Psychology of Industrial Relations.** Same as Labor and Industrial Relations 357. An analysis, in terms of the behavior of individuals, of the causes and possible solutions of

- industrial conflict. Offered in the special interest of industrial relations, commerce, and engineering students. Prerequisite: Psychology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 358. Psychology and Law: Social and Cognitive Factors.** Surveys topics in psychology and law with particular emphasis on contributions from social and cognitive psychology; reviews research and theory on behavior in the courtroom and other legal settings. Prerequisite: 6 hours of psychology, including Psychology 201 or its equivalent; or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 359. The Social Psychology of Organization.** Same as Sociology 359. Analysis of the interrelationships between social and psychological factors, and organizational structure and process; emphasis on sources, consequences, and modes of resolution of intraindividual, intraorganizational, and interorganizational conflict. Prerequisite: Psychology 201. 3 hours or 1 unit.
- 360. Modern Viewpoints in Psychology.** Examines modern behaviorism, psychoanalysis, and cognitive psychology, viewed as conceptions of man, styles of theorizing and investigative strategies; critically evaluates the more influential theories and research. Prerequisite: 6 hours of psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 362. Cognitive Development.** Survey of theory and research on the development of problem-solving skills, memorial and metamemorial processes, logical thinking, and language. Prerequisite: Psychology 216 and 235. 3 hours or 1 unit.
- 363. Laboratory in Developmental Psychology.** Experience in designing, carrying out, and reporting an original research project. Prerequisite: Psychology 216 and 235, or equivalent. 4 hours or 1 unit.
- 365. Personality and Social Development.** Same as Educational Psychology 315. Major theories of personality and social development, with attention to processes of social learning, individual differences in personality development, and outcomes of social development; applications to school, home, and other field settings. Prerequisite: Psychology 216 or Educational Psychology 236, or equivalent. 3 hours or 1 unit.
- 368. Psychology and Law: Civil Liberties and Constitutional Issues in the Mental Health, Educational, and Criminal Justice Systems.** Examines relationship of the administrative, civil, and criminal justice systems to educational and mental health institutions; individual rights, social issues, and psychological well being. Prerequisite: 6 hours of social science. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 371. The Psychology of Voting Behavior.** An application of psychological methods and theories to the study of political behavior; attention to research methods and to content problems in voting behavior and national security policy. Prerequisite: 6 hours beyond 100-level courses in psychology, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 373. Theory and Method in the Cross-Cultural Study of Individual Social Behavior.** Same as Anthropology 373. Centers on cross-cultural study of substantive areas such as personality, motivation, socialization, interpersonal behavior, psychological environments, cognition and cognitive development, ethnocentrism and stereotypes, and visual perception; emphasis on methodological limitations and contributions of cross-cultural study; and discussion of current problems and research. Prerequisite: 6 hours of psychology or anthropology, or consent of instructor. 3 hours or 1 unit.
- 380. Introduction to Mental Health Programs.** Historical foundations, schema for classification of mental health delivery systems, contemporary treatment strategies, ethical and legal issues, and alternatives to institutional treatment; includes field trips to a variety of treatment facilities. Prerequisite: Credit or concurrent registration in Psychology 336 and 337. 3 hours or 1 unit.
- 381. Beginning Practicum in Mental Health.** Didactic instruction and supervised practicum experience in a community treatment agency; self-report, observational, and physiological approaches to client assessment; and lecture-discussion and direct agency experience each week. Prerequisite: Psychology 380. 4 hours or 1 unit.
- 382. Issues in Mental Health Work, I.** Basic behavioral principles useful in formulating, carrying out, and evaluating a treatment plan; focuses on the training of nonprofessionals (e.g., parents) or staff members in treatment roles. Prerequisite: Psychology 381 and concurrent registration in Psychology 383. 2 hours or $\frac{1}{2}$ unit.

- 383. Advanced Practicum in Mental Health, I.** Supervised practicum experiences in a community agency which correspond to didactic material presented in the companion course, Psychology 382. Prerequisite: Concurrent registration in Psychology 382. 4 hours or 1 unit.
- 384. Issues in Mental Health Work, II.** Procedural alternatives to the operant approaches presented in Psychology 382 and 383; students are encouraged to focus their interests on a particular client population; and lecture-discussion with individualized reading programs. Prerequisite: Concurrent registration in Psychology 385. 2 hours or ½ unit.
- 385. Advanced Practicum in Mental Health, II.** Supervised practicum experiences in a community agency corresponding to didactic material presented in the companion course, Psychology 384; twelve-hour-per-week assignments reflect student interests in specific population. Prerequisite: Psychology 382 and 383, and concurrent registration in Psychology 384. 4 hours or 1 unit.
- 390. Laboratory in Psychological Measurement and Test Development.** The measurement of human behavior in psychological studies; the construction and use of psychological tests; introduction to tests of intelligence, achievement, personality, and interest; and practice in test construction, administration, and validation. Lectures and laboratory. Prerequisite: A knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1 unit.
- 396. Seminar in Psychology.** Special topics in the field of psychology. Prerequisite: Junior standing and consent of instructor. 2 to 4 hours, or ½ to 1 unit. May be repeated to a maximum of 12 hours or 3 units.

Note: The prerequisites stated below apply to graduate majors in psychology. Students minor-ing in psychology may, by special permission of instructors, enroll in certain of these courses without having met all the prerequisites.

- 402. Systematic Psychology.** Analysis of methodological problems, including forms and roles of models and theories, status of unobservable organismic events, validation of measures and manipulations, possible forms of laws, forms of data language, and status of private reports; evaluation of the approaches to these problems provided by several varieties of behaviorism, standard and omnitheoretic views in the philosophy of science, and network methods. Prerequisite: 12 hours of psychology. 1 unit.
- 405. Neurochemistry.** Same as Physiology 405. The fundamentals of neurochemistry and topics of current interest; detailed study of chemical transmission, including metabolism, neuroanatomical distribution, pharmacology, and functions of neurotransmitters. Lecture-seminar. Prerequisite: Biochemistry 350, Psychology 210 or 407, or consent of instructor. ¾ unit.
- 406. Psychological Scaling: Unidimensional Methods.** Same as Sociology 406. Measurement of psychological values; centrally concerned with how subjective values of multiple physical dimensions combine to produce unidimensional subjective values; and includes conjoint and functional measurement theory and methods, theoretical models of judgment and the analysis of empirical structures, and applications of scaling models to problems in social, personality, perception, and cognitive psychology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. 1 unit.
- 407. Functional Neuroanatomy.** Same as Anatomical Sciences 407. See Anatomical Sciences 407.
- 408. Design of Experiments in Psychology.** Advanced experimental designs in psychological research; special methods of data analysis. Prerequisite: Psychology 307. 1 unit.
- 409. Psychological Scaling: Multidimensional Methods.** Same as Sociology 409. Basic scaling theory; metric, non-metric, and individual differences multidimensional scaling models and methodology, emphasizing underlying assumptions and interpretation; and applications of scaling methods to measurement problems in social and personality psychology, perception, cognition, and sociology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. Psychology 406 is recommended but not required. 1 unit.

- 410. Advances in Psychobiology: Introduction for Graduate Students.** Deals with the relevance of biological psychology to the subdisciplines of psychology; topics include current theory and treatment of psychosis, neuropsychology of movement disorders, human memory models and the brain, hormones and sexuality, biorhythms in normal and abnormal behavior, physiology of sensing and perceiving, selective attention, and others. Prerequisite: Psychology 210 or consent of instructor. $\frac{1}{2}$ to 1 unit. Consent of instructor is required for more than $\frac{1}{2}$ unit (e.g., $\frac{3}{4}$ or 1 unit).
- 411. Advanced Physiological Psychology.** Detailed examination of the physiological mechanisms in behavior; emphasis on research methodology and contemporary literature in the physiology of motivation, learning, perception, and emotion; and includes laboratory demonstrations and problems. Prerequisite: 12 hours of psychology, including Psychology 311 or equivalent. $\frac{1}{2}$ or 1 unit.
- 415. Experimental Sensory Psychology.** A systematic study of sensory processes, including vision, audition, gustation, olfaction, and somesthesia; emphasis on experimental methods, research findings, and theory. Prerequisite: 12 hours of psychology, including a laboratory course in experimental psychology. 1 unit.
- 416. Perception.** Systematic study of methods and research findings in the field of human perception, together with an evaluation of theoretical interpretations. Prerequisite: 12 hours of psychology. 1 unit.
- 417. Experimental Psychology of Learning, I: Basic Processes.** Study of experimental investigation of basic learning processes; emphasis on the nature of the problems, experimental procedures, and theoretical significance. Prerequisite: 12 hours of psychology. 1 unit.
- 418. Experimental Psychology of Learning, II: Human Learning.** Data and theories of verbal learning; verbal mediators and their functions in learning and retention; transfer of training; short-term and long-term memory; and conceptualizations of the forgetting process. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
- 419. Advanced Comparative Psychology.** A critical survey of techniques, results, and problems in the study of animal behavior and human behavior from the comparative-evolutionary point of view; laboratory demonstrations and individual research problems. Prerequisite: 12 hours of psychology or biology. 1 unit.
- 424. Developmental Psycholinguistics.** Same as Communications and Linguistics 424. Examination of empirical and theoretical literature on the acquisition of language; emphasis on universal patterns in the acquisition of a first language and on a consideration of explanations, both psychological and linguistic, for these patterns. Prerequisite: Linguistics 325, Psychology 325 or 362, or consent of instructor. 1 unit.
- 425. Psycholinguistics.** Same as Communications 425 and Linguistics 425. A critical survey of methods and theories in the psychological study of the communication process; emphasis on linguistic, information-theory, and learning-theory approaches; psycholinguistic analysis of language decoding and encoding; and the development and measurement of symbolic processes, including meaning. Prerequisite: Consent of instructor. 1 unit.
- 427. Engineering Psychology.** Experimental psychology applied to the study of man-machine systems; considers research issues, methodological matters, and principles of design and training in terms of contemporary aircraft, highway, industrial, and health-care systems. Prerequisite: Psychology 258 or 356, or consent of instructor. 1 unit.
- 428. Cognitive Determinants of Behavior.** Theoretical and experimental analyses of the role of decision processes and causal attributions in the control of behavior; examines a variety of subparadigms from several areas of psychology. Prerequisite: 12 hours of psychology. 1 unit.
- 429. Second Language Acquisition and Bilingualism.** Same as Linguistics 429. See Linguistics 429.
- 430. Foundations of Industrial-Organizational Psychology.** Same as Labor and Industrial Relations 430. Theoretical and empirical foundations of various content areas in industrial-organizational psychology; sample topics include employee selection and placement, training, human factors engineering, work motivation, employee attitudes, leadership,

- and organizational theory. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
- 431. Psychological Measurement in Industry.** Application of psychometric methods and the finding of differential psychology to the selection, classification, and performance evaluation of industrial personnel. Prerequisite: Psychology 307 or equivalent. 1 unit.
- 432. Introduction to Clinical Psychology Practicum.** Supervised practice in mental health delivery services; includes assessment and modification of problem behaviors in short-term treatment programs and beginning experience in school and community consultation; and emphasizes the development of skills in interviewing, conceptualization of problem behaviors, report writing, and effective staff interactions. Prerequisite: First-year graduate standing in clinical psychology and credit or concurrent registration in Psychology 438. 1 unit.
- 433. Internship in Industrial/Organization Psychology.** Supervised practice in organizational practice and research, implementation of programs, evaluation, feedback of survey results, applied assessments, assistance in EAP programs, and development of personnel guidelines; emphasizes applications of principles and procedures. Offered in special interest of graduate students in I/O psychology program. Prerequisite: Graduate standing in Psychology, credit or concurrent registration in Psychology 430, and consent of instructor. 1 unit.
- 435. Motivation and Morale in Industry.** Same as Labor and Industrial Relations 435. Concepts and methods in the study of motivation of employees; determinants of employee attitudes and job satisfaction; and modification of attitudes and morale. Prerequisite: 4 units of graduate credit in psychology or consent of instructor. 1 unit.
- 436. Mathematical Models in Psychology.** Recent developments in mathematical models in psychology; special emphasis on human learning, higher processes, and modern psychophysics. Prerequisite: One year of calculus and Psychology 306 and 307, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 438. Introduction to Clinical Psychology, I.** Introduction to clinical psychology as a science and profession. Considers psychodynamic, behavioral, and community perspectives; emphasizes the conceptual foundations of each approach. Required of all entering graduate students in clinical psychology. Prerequisite: Consent of instructor required for all students not admitted to graduate program in clinical psychology. 1 unit.
- 439. Introduction to Clinical Psychology, II.** Considers critical issues in the assessment and study of psychological and social dysfunction, as manifested in adult psychopathology, childhood disorders, and community problems. Required of all entering graduate students in clinical psychology. Prerequisite: Credit or concurrent registration in Psychology 438; consent of instructor required for students not admitted to graduate program in clinical psychology. 1 unit.
- 441. Personality and Behavior Dynamics.** Theory and research in personality, emphasizing personality as individual differences among persons and personality as attributed to persons by others; explores the measurement, antecedents, and consequences of such differences and attributions. Prerequisite: 12 hours of psychology. $\frac{1}{2}$ or 1 unit.
- 443. Clinical Assessment.** Instruction and practice in the administration and interpretation of individual tests of general intelligence, special abilities, and achievement. Prerequisite: 12 hours of psychology, including Psychology 390 or equivalent; Psychology 432 and 439. 1 unit.
- 445. Strategies of Clinical Intervention.** A critical survey of issues, principles, practice, and research related to modifying human behavior; covers psychotherapeutic and somatic approaches; symptomatic relief and personality-restructuring; goal-orientations; and individual family, group, milieu, and preventive community intervention. Prerequisite: Concurrent registration in Psychology 447 strongly recommended. 1 unit.
- 446. Laboratories in Clinical Psychology.** Intensive practice in techniques of clinical assessment and behavior modification with emphasis on recent innovations; small sections of the course formed according to the specialized interests of students and staff. Prerequisite: Psychology 432 and 445, or consent of instructor. $\frac{1}{2}$ to 1 unit.

- 447. Internship.** Supervised field experience in clinical psychology. Prerequisite: Consent of instructor. 0 to 4 units.
- 450. Community Psychology and Social System Change.** Intensive examination of the historical antecedents, conceptual models, strategic tactics, and evaluation methods of planned social and ecological change; focuses on the role of the community psychologist in such endeavors; and reviews interventions in several social systems, such as criminal justice education, employment, and mental health. Prerequisite: Psychology 239 or equivalent; graduate standing in psychology or consent of instructor. ½ or 1 unit.
- 451. Theory and Method in Social Psychology, I.** First of two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
- 452. Theory and Method in Social Psychology, II.** Second of a two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Each student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
- 453. Organizational Sciences, I.** Same as Business Administration 410. Political Science 460, and Sociology 456. See Business Administration 410.
- 454. Psychology and the Legal Process.** Analyzes selected topics in the application of psychological methods and theory to legal issues and problems. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 456. Attitude Measurement and Behavioral Prediction.** Same as Communications 456. Comprehensive examination of the theory and method of attitude measurement and its implications for behavioral prediction; emphasis on the attitude concept and the validity of behavioral criteria. Prerequisite: Consent of instructor. 1 unit.
- 457. Theory and Research in Organizational Psychology.** Theory and research on the psychological processes involving the demands of organizations on the behavior of individuals; emphasis on the processes of power, authority, influence, leadership, communications, decision making, and organizational change. Prerequisite: Psychology 455 or consent of instructor. 1 unit.
- 458. Advanced Problems in Attitude Research.** Intensive analyses of recent developments in attitude theory and research; emphasis on the attitude-behavior relationship; and examination of theories of attitude and attitude change with respect to their utility in predicting and changing social behavior. Prerequisite: Consent of instructor. 1 unit.
- 459. Advanced Problems in Research on Groups.** Intensive examination of current research and theory on structure, process, and performance of groups; critical examination of recent research and theoretical literature; and development of research designs for related issues in the field. Prerequisite: Consent of instructor. 1 unit.
- 460. Motivation and Personality Development in Children.** Theory, method, and research on the interaction of motivational, personality, and learning processes and development in children; emphasis on experimental studies and a social learning theory approach. Class projects involve some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
- 462. Human Abilities.** Analysis of individual differences in human abilities, including historical background, measurement methodology, and functional correlates of abilities; consideration of the use of ability measures in both experimental and applied research. Prerequisite: Psychology 307 or equivalent. 1 unit.
- 463. Research Methods in Clinical Psychology and Personality.** The logical analysis of clinical inferences and their role in research; problems and methods in the investigation of the development, dynamics, and structure of personality; and research in psychotherapy. Prerequisite: Psychology 306. 1 unit.

- 464. Advanced Problems in the Study of Individual Social Behavior.** An intensive examination of current research into one or more of the following areas: social perception and cognition, social motivation, social learning, and environmental factors in social behavior; critical examination of recent research and theoretical literature, and development of research designs for selected current issues. Prerequisite: Consent of instructor. 1 unit.
- 467. Personality Assessment.** Methods and theory in the quantitative assessment of personality; review of research findings and trends. Prerequisite: Psychology 307 or equivalent. 1 unit.
- 468. Contemporary Behavior Theory.** Analysis of contemporary issues in animal and human learning; specific topics vary. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 1 unit.
- 469. Cognitive Development.** Examination of laboratory investigations of cognitive development in children; emphasis on current theories of cognition and language; and class projects involving some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
- 470. Principles and Methods of Teaching Psychology.** Designed for graduate students in psychology; areas considered include developing course objectives and content; developing and presenting teaching-learning situations; evaluating the attainment of course objectives; advising and counseling students; ethics in teaching; and research problems on the teaching of psychology. Prerequisite: Second-year graduate standing in psychology or consent of instructor. 0 to 1 unit.
- 483. Psychology of Speech and Hearing Disorders, I.** Same as Speech and Hearing Science 483. See Speech and Hearing Science 483.
- 484. Psychology of Speech and Hearing Disorders, II.** Same as Speech and Hearing Science 484. See Speech and Hearing Science 484.
- 485. The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Sociology 485. See Business Administration 435.
- 486. Multivariate Correlational Techniques in Educational Research.** Same as Educational Psychology 485. See Educational Psychology 485.
- 489. Doctor of Psychology Report.** Limited to students pursuing the Psy.D. degree. Prerequisite: Credit or concurrent registration in Psychology 447. 0 to 4 units (summer session, 0 to 2 units). May be repeated.
- 490. Individual Research.** For graduate students who wish to conduct research on special problems not included in graduate theses. Prerequisite: Consent of instructor. 0 to 4 units.
- 492. Psychology of Learning and Instruction.** Same as Educational Psychology 492. See Educational Psychology 492.
- 493. Seminar.** Discussion of current topics in their historical setting, with special emphasis on research problems. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 0 to 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Educational Psychology 494 and Sociology 494. Examines the principal methods of descriptive and inferential statistics used in the analysis of multiple measurements, emphasizing linear transformations, multiple regression, principal components, multivariate analysis of variance, canonical correlation and variates, discriminant functions and variates, and conventional procedures of factor analysis; involves both theory and applications. Prerequisite: Psychology 307 or Educational Psychology 496; consent of instructor. 1 unit.
- 495. Theories of Measurement.** Same as Educational Psychology 495. See Educational Psychology 495.
- 499. Thesis Research.** 0 to 4 units.

RADIO AND TELEVISION

Acting Head of Department: Professor J. W. Carey

Department Office: 119 Gregory Hall, 810 S. Wright, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
291. **Special Problems.** Special projects, research, and independent reading in radio and television for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of department. 2 or 3 hours.
366. **Advanced Radio and Television Practices, I.** Project work for advanced students in selected areas of radio and television, including news, advertising, announcing, production and direction, and writing. Prerequisite: All courses in area of specialization; consent of department. 2 hours or $\frac{1}{2}$ unit.
368. **Legal and Policy Issues in Telecommunications.** Same as Communications 368. See Communications 368.
450. **Special Problems in Television.** Project work for advanced students in specific areas of television, including news, advertising, directing, writing, etc. Prerequisite: A television course in the area of specialization; consent of department. $\frac{1}{2}$ to 3 units. A maximum of 3 units permitted toward degree.
462. **Seminar in Radio and Television.** Same as Communications 462. Studies the performance of radio and television in terms of content, government and industry controls, social responsibility, economic bases, and psychological and social effects. Prerequisite: Consent of department. 1 unit.
463. **World Broadcasting.** Same as Communications 463. Studies the broadcast systems used by the nations of the world; alternative and mixed systems; international organizations, agreements, exchanges, and problems; broadcasts to and from other countries; implications of such new developments as satellites; and mass and nonmass uses. Prerequisite: Consent of department. 1 unit.
490. **Special Topics in Radio and Television.** Prerequisite: Consent of department. $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Prerequisite: Graduate standing in radio and television. 1 or 2 units.

RELIGIOUS STUDIES

Director of Program: Professor G. G. Porton

Office: 3014 Foreign Languages Building, 707 S. Mathews, Urbana

101. **The Bible as Literature.** Same as English 114. Themes and literary genres in the Bible, emphasizing content important in Western culture. 3 hours.
102. **Religion and Science.** Same as History 147 and Sociology 102. A study of changes brought about by the rise of modern science; focuses on historical conflicts (e.g., Copernicus and Darwin) and theological reflection regarding the significance of natural and social sciences for religious belief and practice. 3 hours.
104. **Asian Mythology.** Same as Asian Studies 104. An introductory survey of the mythologies of India, China, and Japan. 3 hours.
106. **Archaeology and the Bible.** Examination of archaeological evidence, especially from Syria-Palestine, and discussion of its use in the interpretation of Biblical literature. 3 hours.
110. **World Religions.** Same as Philosophy 110. See Philosophy 110.
111. **Elementary Koine Greek.** Same as Greek 111. See Greek 111.
112. **Elementary Koine Greek.** Same as Greek 112. See Greek 112.
120. **A History of Judaism.** Examines the social, political, economic, and intellectual history of the Jews from Abraham to the present-day, with particular attention to Jewish thought and society. 3 hours.

121. **Christianity: An Introduction.** Typological and historical approaches to major forms of Christianity: Eastern Orthodoxy, Catholicism, and Protestantism. 3 hours.
122. **History of East Asian Religions.** Same as Asian Studies 122. Introduction to East Asian religious traditions from classical to modern times; emphasizes the ideas of Confucianism, Taoism, Shinto, and Buddhism in China and Japan and their historical interactions. 3 hours.
123. **Islam: An Introduction.** History of Islamic thought from the time of Muhammad to the present, including the prophethood of Muhammad, the Qur'an, theology and law, mysticism and philosophy, sectarian movements, modernism and legal reform, and contemporary resurgence. 3 hours.
125. **Religious Ethics.** Investigates the structure of ethical arguments in religious contexts; gives special attention to the influence of religious beliefs on the formulation of ethics; brings a variety of religious traditions into the discussion; and uses a number of contemporary issues to illustrate the various modes of argument. 3 hours.
130. **Jewish Practices: A Religio-historical Approach.** The major festivals and life-cycle rituals of Judaism; focuses on sacred time, interaction of external and internal factors producing change and conservatism, relationship of ritual and theology, and the thematic development inherent in the rituals. 3 hours.
132. **Zen.** Same as Asian Studies 132. Introduces the history, teachings, and practice of Zen Buddhism in China and Japan. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Intermediate Koine Greek.** Same as Greek 200. See Greek 200.
201. **Hebrew Bible in English.** Analyzes the critical issues in the interpretation of the literature of the Hebrew Bible/Old Testament; surveys the history and religion of Ancient Israel with special reference to Israel's setting in the ancient Near East. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
202. **New Testament in English.** Analyzes the literature of the New Testament in its social and religious setting, with special reference to the ministry and teaching of Jesus, the emergence of the church as a sect within ancient Judaism, and the development of Christian institutions in the Graeco-Roman world. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
205. **Introduction to Classical Hebrew, I.** Same as Hebrew 205. See Hebrew 205.
206. **Introduction to Classical Hebrew, II.** Same as Hebrew 206. See Hebrew 206.
210. **Biblical Prose.** Same as Hebrew 210. See Hebrew 210.
221. **American Judaism.** Forms of Judaism in America: Reform, Conservative, Reconstructionist, Orthodox, and Hasidic Judaism; the American rabbi; Zionism in American Jewish communal life; national Jewish organizations; the American synagogue; and the secular Jew. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as History 224. See History 224.
228. **Social Theories of Religion.** Same as Sociology 228. See Sociology 228.
229. **Sociology of Religion.** Same as Sociology 229. See Sociology 229.
230. **Philosophy of Religion: Introduction.** Same as Philosophy 230. See Philosophy 230.
232. **Ancient Greek Sanctuaries.** Same as History of Art 218 and Classical Civilization 232. See Classical Civilization 232.
237. **Ancient Greek Religion.** Same as Classical Civilization 237. See Classical Civilization 237.
242. **The Holocaust: Religious Responses.** The theoretical foundation for ideas of national and racial superiority which attended the holocaust and responses to this phenomenon by major Jewish and Christian thinkers, including Rubenstein, Buber, Fackenheim, Berkowitz, Reuther, and Wiesel. 3 hours.
260. **Mystics and Saints in Islam.** Examines mystical concepts and practices in Islam through the ages, through the lives and writings of important mystics and Sufi holy men and women, as well as the integration of mysticism and the Sufi Orders into Muslim society and Islamic orthodoxy. No knowledge of Islam or foreign language is required. 3 hours.

- 268. Religious Rebellions and Messianic Movements in History.** Same as History 268. See History 268.
- 283. Jewish Sacred Literature.** Same as Comparative Literature and English 283. Literary study of the major post-biblical sacred texts of Judaism; includes readings in translation from Mishnah, Tosefta, Talmudim, midrashim, piyyutim, and mystical treatises. Emphasizes nature, history, function, and development of literary patterns and forms and the relationships between form and content in these texts. 3 hours.
- 284. Jewish Experience in Literature.** Same as Comparative Literature and English 284. See English 284.
- 286. Introduction to Hinduism.** Elements of Hindu thought and practice; selected topics presented in historical order and in the context of Indian cultural history (including the present). 3 hours.
- 287. Introduction to Buddhism.** Same as Asian Studies 287. A thematic approach to the history of Buddhism from its origin in India to its spread throughout China and Japan; explores how the doctrinal and social development of Buddhism in East Asia is related to the process of cultural adaptation. 3 hours.
- 288. Religion in Asian Society.** Same as Asian Studies 288 and Sociology 288. See Asian Studies 288.
- 290. Independent Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of staff member supervising the work. 2 to 6 hours. May be repeated.
- 293. Honors Senior Thesis.** Two-semester research project. Prerequisite: Senior concentrators in religious studies who are eligible for graduating with distinction from the program. 3 hours. Must be taken for two semesters for a total of 6 hours. (Counts for advanced hours in LAS.)
- 294. Topics in Religious Thought.** Topics in contemporary theological problems. 3 hours.
- 295. Topics in Asian Religions.** Same as Asian Studies 295. Topics in Hinduism, Buddhism, Taoism, and other Asian religious traditions. Prerequisite: Sophomore standing or consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours.
- 296. Special Topics in the History of Judaism.** 3 hours. May be repeated for a maximum of 6 hours.
- 298. Special Topics in Biblical Interpretation.** Detailed interpretation of selected books of the Bible. 3 hours.
- 301. Introductory Coptic, I.** Same as Coptic 301 and Linguistics 314. See Coptic 301.
- 302. Introductory Coptic, II.** Same as Coptic 302 and Linguistics 315. See Coptic 302.
- 304. Medieval Civilization.** Same as History 304. See History 304.
- 305. The Age of the Renaissance.** Same as History 305. See History 305.
- 306. The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as History 306. See History 306.
- 307. Islam and the Near and Middle East from Mohammed to 1258.** Same as History 307. See History 307.
- 308. Islam and Society in the Modern Middle East and North Africa.** Same as Political Science 339. Examines the role of Islam in contemporary politics, the contemporary resurgence of Islam, and the articulation of Islamic approaches to the new economic order, nationalism, and the changing role of women. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 311. Hebrew Poetry.** Same as Hebrew 311. See Hebrew 311.
- 328. Sociology of Asian Religions.** Same as Asian Studies and Sociology 328. See Sociology 328.
- 340. The Formation of Christian Thought.** Study of major developments in early Christian thought (first four centuries) through discussion of primary texts in translation. Prerequisite: Religious Studies 201 and 202, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Martin Luther.** Same as German 341. See German 341.
- 342. History of Early Judaism.** The history of Judaism from Ezra to the rise of Islam: Hellenism and Judaism, varieties of Judaism, Palestinian Judaism and its documents,

Babylonian Judaism, the rabbis, and popular Jewish culture. Prerequisite: Credit in one course in religious studies at the 200- or 300-level, or consent of instructor. 3 hours or ¾ unit.

362. Philosophy of Religion. Same as Philosophy 324. See Philosophy 324.

363. Religion in Anthropological Perspective. Same as Anthropology 363. See Anthropology 363.

371. The Gospels. Same as Greek 371. See Greek 371.

381. American Intellectual and Cultural History to 1865. Same as History 371. See History 371.

382. American Intellectual and Cultural History since 1859. Same as History 372. See History 372.

384. Buddhist Meditation. Same as Asian Studies 380. Examines classical systems of Buddhist meditation and their relation to Buddhist psychology and world view. Prerequisite: Religious Studies 287, or consent of instructor. 3 hours or ¾ unit.

388. History and Thought of Chinese Buddhism. Survey of the history of Chinese Buddhism since its introduction; analysis of Buddhological trends and styles; and the sociocultural milieu of Chinese Buddhism and its place in the total history of ideas and lifestyles. Prerequisite: Religious Studies 287 and 288, or consent of instructor. 3 hours, or ¾ or 1 unit.

484. Narrative Semiotics. Same as Comparative Literature, English and French 484. See French 484.

490. Independent Study. Special topics not treated in regularly scheduled courses; for graduates. Prerequisite: Evidence of adequate preparation for such study and consent of staff member supervising the work. ½ to 1 ½ units. May be repeated.

RHETORIC AND COMPOSITION

(See English)

SCULPTURE

(See Art and Design)

SCIENCE, TECHNOLOGY, AND SOCIETY

Director of Program: Professor Gary Gladding

Department Office: 912 West Illinois, Urbana

180. Nuclear Weapons, Nuclear War, and Arms Control. Same as Physics 180. See Physics 180.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

201. Technology and Human Values. Same as Philosophy 275. Interaction of technologies and human values, goals, and beliefs; social and individual decision making and responsibilities concerning the applications of technologies; evaluation and constructive criticism of particular technologies and the assessment of benefits and harms. Prerequisite: Rhetoric 105 or equivalent. 3 hours.

202. Management and Control of Technology. A survey of models, methods, and techniques used in the public and private sectors for the planning, assessment, and regulation of technology. Includes a semester-long project in modeling the impacts, costs, risks, and benefits of a specific technological innovation, with special attention to the role of assumptions and implicit values. 3 hours.

- 260. Science and Technology in Contemporary Literature.** Same as Comparative Literature 260. Discusses the "Two Cultures" controversy and the literary response to the infusion of science and technology into modern life. 3 hours.

SECONDARY EDUCATION

Chairperson of Department: Professor C. B. Cox

Department Office: 395 Education Building, 1310 South Sixth, Champaign

- 101. Introduction to the Teaching of Secondary School Subjects.** A survey of recent developments in the teaching of secondary school subjects; assesses standard and new programs; and explores research and empirical evidence as they relate to effective teaching of secondary school subjects. Special sections are provided in English, mathematics, science, social studies, speech, and computer science. Experiences in school settings are provided in Secondary Education 219. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 209. Preliminary Field Experience in Secondary Teaching.** To be taken during the sophomore year by continuing students at the University of Illinois in secondary education curricula of English, mathematics, science, social studies, and speech. For students transferring into these programs at the 60 or near 60-hour level from other colleges, universities, or junior colleges, the course may be taken during the first semester of their work on this campus. Includes at least 8 hours of visitation in public school classrooms, at least one microteaching lesson in the Teaching Techniques Laboratory, and one or more conferences with an advisor in teacher education. Students amass up to 10 hours of early field experiences toward the required total of 100 hours. 0 hours.
- 219. Field Experience in Secondary Teaching.** Offered in conjunction with Secondary Education 101 in the secondary teacher education program in English, mathematics, science, social studies, speech, and computer science. Meets in subject area discussion sections one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in a school for at least two hours per week for the entire semester. Students amass at least 32 hours of early field experiences toward the required total of 100 hours. Prerequisite: Concurrent registration in Secondary Education 101. 0 to 2 hours.
- 229. Field Experience in Secondary Education.** Offered in conjunction with Secondary Education 240 for students in secondary teacher education programs adopting this means of fulfilling early field experience requirements. Meets in discussion sections paralleling Secondary Education 240 sections for one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in school and community settings for at least two hours per week for the entire semester, thereby amassing at least 32 hours of early field experiences toward the required total of 100 hours. Registration is required in secondary teacher education programs adopting this means of fulfilling early field experiences requirements. Prerequisite: Concurrent registration in Secondary Education 240. 0 to 2 hours.
- 239. Microteaching: Practice in Teaching Techniques.** Instruction and practice in basic teaching techniques; consideration of both teacher-centered and learner-centered techniques; systematic examination of each technique in terms of basic descriptive and evaluative procedures; and application of techniques to specific instructional situations. Students amass 32 hours of early field experiences (laboratory component) toward the required total of 100 hours. Prerequisite: Junior standing. 2 hours.
- 240. Secondary Education in the United States.** Provides each specialized educational worker with a common orientation to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the

- framework of the total educational enterprise. Experiences in school settings, required in some curricula, are provided in Secondary Education 229. Prerequisite: Secondary Education 101; Psychology 100; concurrent registration in Educational Policy Studies 201. 2 hours.
- 241. Techniques of Teaching in the Secondary Schools.** Methods of teaching specific subject matter fields in the secondary school; special sections provided in the usual high school subjects. Prerequisite: Educational Policy Studies 201; Secondary Education 240; concurrent registration in Educational Practice 242; consent of instructor. This course meets only during the first eight weeks of the semester. 3 to 5 hours.
- 247. Teaching of Speech.** Same as Speech Communication 247. A study of methods and materials used in teaching speech in the high school. Prerequisite: Senior standing; 3.5 grade-point average. 3 hours.
- 249. Independent Study.** Permits study of problems not considered in other courses; for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 or 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 317. Computer-Assisted Instruction.** Same as Computer Science 317. Computer-assisted instruction (CAI) and its relation to classroom teaching; the teacher's role in development, management, and criticism of CAI lessons; treatment of topics including instructional capabilities of CAI systems, instructional programming, and the design of CAI lessons. Prerequisite: Any computer science 100-level programming course, or consent of instructor. 4 hours or 1 unit.
- 327. Alternative Approaches to Classroom Instruction.** Improvement of classroom instruction through a study of alternative approaches to teaching with emphasis on demonstration teaching and the development of skill in observing and analyzing teaching. Prerequisite: Secondary Education 241 and Educational Psychology 211, or equivalents; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Fundamentals of Reading Techniques.** Same as Elementary and Early Childhood Education 370. See Elementary and Early Childhood Education 370.
- 338. Teaching of Reading in Grades Four Through Twelve.** Developmental reading programs beyond the primary grades; factors related to reading speed and comprehension; vocabulary development, specific comprehension skills, study skills, and reading interests and tastes. Prerequisite: Elementary and Early Childhood Education 336 or Educational Psychology 211; junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Audio-Visual Communication.** Same as Elementary and Early Childhood Education 354. See Elementary and Early Childhood Education 354.
- 356. The Computer and Mathematics Education.** Examines the role of the computer as an instructional tool in the secondary school mathematics classroom; reviews curricular materials and develops sample classroom projects in computer mathematics; analyzes computational problems and develops algorithms for their solution; and includes iteration, Monte Carlo methods, and simulation. Prerequisite: Computer Science 101 or 400, or consent of instructor. 4 hours or 1 unit.
- 359. Workshop and Laboratory in Curriculum and Methodology.** Teaches practitioner-oriented skills in specialized areas of secondary education not covered in the basic certification courses. Prerequisite: Secondary Education 241 or equivalent or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 399. Issues and Developments in Secondary Education.** A seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 417. Theory and Design of Instructional Simulations.** Introduces theory and design of

interactive simulations for teaching decision making in schooling training situations; includes introduction to models of simulation, a process of simulation construction, identification and interpretation of learning outcomes, computer implementation of selected simulations. Prerequisite: Secondary Education 317; Computer Science 300 or equivalent. 1 unit.

- 433. Clinical Supervision of Instruction.** Same as Administration, Higher, and Continuing Education 433. Designed for persons concerned with supervision of classroom instruction. Principally concerned with strategies for helping teachers realize their full professional potential; considers techniques of classroom observation, analysis of observations, and interaction skills; and uses video, audio, and printed protocols to develop observation and analytic skills, and role playing techniques to foster interaction skills. Prerequisite: Practice teaching. 1 unit.
- 435. Interventions Used in Programs of Teacher Education.** Considers several teacher education programs, including conventional, humanistic, reinforcement, technical skills, and teacher competencies programs, in terms of selection and retention of candidates, professional preparation, general education and governance. Prerequisite: Satisfaction of college foundations requirements Educational Psychology 311 and 312, and two ½ unit courses in social and philosophical foundations within Educational Policy Studies. 1 unit.
- 438. Curriculum Research.** Reviews the principle methodologies used in research on curriculum problems; emphasizes subject-analytical, large-scale survey, experimental, case methods, and clinical studies; emphasizes the conceptual and practical problems in such research. Prerequisite: Education 400 or equivalent. 1 unit.
- 439. Fundamentals of Curriculum Development.** Explores the several theoretical bases of curriculum planning and the implications of these approaches for practice. 1 unit.
- 441. Linguistic and Logical Analysis of Teaching.** An analysis of teaching from the standpoint of semantic and logical factors; discussion of topics such as theories of meaning, definition, explanation, and justification as employed by a teacher. 1 unit.
- 448. Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Vocational and Technical Education 448. See Administration, Higher, and Continuing Education 448.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. ½ or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 456. Problems and Trends in Specialized Fields of Secondary Education.** An intensive examination of problems and trends in the subject fields of the secondary school. Sections are usually offered in the following areas: English language and literature, mathematics, physical and biological sciences, social studies, bilingual-bicultural education, and computer-assisted instruction. 1 unit.
- 483. Seminar in Literary Criticism and the Teaching of English.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 490. Seminar for Advanced Students of Education.** Intensive examination of theoretical and policy issues in secondary education. Sections are usually offered in the following areas: curriculum policy and research, teacher education, English language and literature, mathematics, physical and biological sciences, social studies, music, bilingual-bicultural education, and instructional applications of computers. Prerequisite: Admission to doctoral study in secondary education. 0 to 1 unit. May be repeated to a maximum of 2 units.
- 491. Field Study and Thesis Seminar.** Explores the identification and evaluation of research topics and problems in secondary education. Prerequisite: Admission to doctoral study. 1 to 2 units. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

SLAVIC LANGUAGES AND LITERATURES

(Including Bulgarian, Czech, Polish, Russian, Serbo-Croatian, Slavic, and Ukrainian)

Head of Department: Professor M. Friedberg

Department Office: 3092 Foreign Languages Building, 707 South Mathews, Urbana

Bulgarian

- 381. Structure of Modern Bulgarian.** Analysis of the sound system and grammar of the contemporary Bulgarian language. Prerequisite: Russian 212 or 214, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 382. Readings in Bulgarian Literature.** Reading, analysis, and discussion of selected excerpts from Bulgarian literature, scientific prose, and the press. Prerequisite: Bulgarian 381 or consent of department. 3 hours or $\frac{3}{4}$ unit.

Czech

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 383. The Structure of Modern Czech.** Analysis of the sound system and grammar of the contemporary Czech language with some reference to its historical development. Prerequisite: Knowledge of another Slavic language, preferably Russian, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 384. Readings in Czech.** Reading and analysis of selected texts. Prerequisite: Czech 383 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Polish

- 101. Elementary Polish, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no prior work in Polish. 4 hours.
- 102. Elementary Polish, II.** Continuation of Polish 101. Prerequisite: Polish 101. 4 hours.
- 103. Intermediate Polish, I.** Grammar review, conversation practice, written exercises, and selected readings. Prerequisite: Polish 102 or equivalent. 4 hours.
- 104. Intermediate Polish, II.** Continuation of Polish 103. Prerequisite: Polish 103. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 345. Polish Literature in Translation, I.** Same as Comparative Literature 335. A critical survey, in translation, of Polish literature from the Middle Ages to the end of the nineteenth century; special attention given to the works in their cultural context. 3 hours or 1 unit.
- 346. Polish Literature in Translation, II.** Same as Comparative Literature 336. A critical study, in translation, of modern Polish fiction, drama, poetry and essay, from Young Poland to the "New Wave"; their contribution to literary styles and genres in Poland and abroad; special emphasis on Wyspianski, Witkiewicz, and Gombrowicz. 3 hours or 1 unit.
- 385. The Structure of Modern Polish.** Analysis of the sound system and grammar of the contemporary Polish language. Prerequisite: Knowledge of another Slavic language or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 386. Readings in Polish.** Reading and analysis of selected texts. Prerequisite: Polish 385 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Russian

Courses taught in Russian are 211, 212, 213, 214, 215, 216, 303, 304, 313, and 314.

101. **First-Year Russian, I.** Oral-aural practice and elements of grammar, reading, and writing. For students who have no credit in Russian. 4 hours. Students may not receive credit for both Russian 101 and 121.
102. **First-Year Russian, II.** Continuation of Russian 101. Oral-aural practice and elements of grammar, reading, and writing. Prerequisite: Russian 101. 4 hours.
103. **Second-Year Russian, I.** Oral-aural practice, systematic functional grammar, reading, and writing. Prerequisite: Russian 102 or equivalent. 4 hours.
104. **Second-Year Russian, II.** Systematic review of the structure of Russian covered in Russian 101-103 through class lectures, drills, and homework exercises. Prerequisite: Russian 103. 4 hours.
113. **Russian Civilization Through Literature.** The civilization of pre-Soviet Russia as reflected in Russian literature of the time. 3 hours.
114. **Soviet Society Through Literature.** The political, cultural, social and economic realities of the Soviet Union as reflected in Soviet literature. 3 hours.
115. **Russian Masterpieces in Translation, I.** Introduction to major works from the medieval period to 1880 in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
116. **Russian Masterpieces in Translation, II.** Introduction to major works from 1880 to the present in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
121. **Beginning Russian for Reading.** Survey of all grammar and basic vocabulary in one semester, in preparation for the reading of Russian prose in Russian 200. No emphasis on speaking or writing; all exercises and tests are from Russian to English. 3 hours. Students may not receive credit for both Russian 121 and 101.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Intermediate Reading and Translation.** Development of rapid reading comprehension and vocabulary acquisition; includes unadapted non-fiction texts in various humanities and science fields. Class discussion entirely in English. Prerequisite: Russian 104 or 121. 3 hours.
211. **Russian Conversation, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 104 or consent of instructor. 3 hours.
212. **Russian Conversation, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 211 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
213. **Russian Composition, I.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 104 or consent of instructor. 3 hours.
214. **Russian Composition, II.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 213 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
215. **Introduction to Russian Literature, I.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours.
216. **Introduction to Russian Literature, II.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
217. **Women in Russian Literature.** Same as Comparative Literature 217. The portrayal of women and issues of special concern to women in Russian literature of the nineteenth and

- twentieth centuries; among subjects discussed will be the clash of traditional roles of women in Russian society with the aspirations engendered by secularization and modernization and progress in education, changes in patriarchal family structure, the entry of women into the labor force and their formal political emancipation. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
- 222. Dostoevsky and Tolstoy.** Same as Comparative Literature 248. The art and thought of Russia's two greatest novelists; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
- 225. Soviet Russian Literature.** Same as Comparative Literature 249. Major works since 1917 by Mayakovsky, Babel, Olesha, Bulgakov, Sholokhov, and others; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
- 270. Parateaching.** Same as French, German, Latin, and Spanish 270. See French 270.
- 279. Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Spanish 279. See Humanities 279.
- 280. Teachers Course.** An introduction to the problems of the teaching of Russian and a study of textbooks. Prerequisite: Three years of college Russian or equivalent. 4 hours.
- 290. Readings in Russian.** Individual topics or projects chosen in consultation with a Slavic Department representative. Prerequisite: Russian 104 or equivalent proficiency. 1 to 4 hours. May be repeated to a maximum of 8 hours.
- 293. Honors Senior Thesis.** Intended primarily for candidates for honors in Russian but open to other seniors. Prerequisite: Senior standing. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
- 303. Advanced Reading and Conversation, I.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Three years of college-level Russian. 3 hours or ½ unit.
- 304. Advanced Reading and Conversation, II.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Russian 303 or equivalent. 3 hours or ½ unit.
- 307. Structure of Russian.** The syntax and morphology of modern Russian. Prerequisite: Russian 214 or consent of instructor. 3 hours or ¾ unit.
- 308. Russian Phonetics and Pronunciation.** Study of the Russian sound system; training in the improvement of pronunciation and intonation. Prerequisite: Russian 212 or consent of instructor. 3 hours or ¾ unit.
- 313. Advanced Composition and Usage, I.** Practice in advanced composition and study of advanced problems of grammatical structure; emphasis on morphological categories in Russian grammar. Prerequisite: Three years of college Russian, including Russian 214, or consent of department. 3 hours or ½ unit.
- 314. Advanced Composition and Usage, II.** Further practice in advanced composition and study of advanced problems of grammatical structure; emphasis on syntax, usage, and style. Prerequisite: Russian 313 or consent of department. 3 hours or ½ unit.
- 315. Nineteenth-Century Literature in Translation.** Same as Comparative Literature 337. A study of major Russian writers from Pushkin through Chekhov; no knowledge of Russian required. 3 hours or ¾ unit.
- 317. Twentieth-Century Literature in Translation.** Same as Comparative Literature 338. A study of major Russian writers from 1900 to the present; no knowledge of Russian required. 3 hours or ¾ unit.
- 324. Russian Modernism.** Same as Comparative Literature 357. Representative works of the period 1880 to 1917, with emphasis on Chekhov, Gorky, and Blok; readings for nonconcentrators and class discussions in English. Prerequisite: Junior standing or consent of instructor. 3 hours or ¾ unit.
- 335. Russian Drama.** Same as Comparative Literature 368. Historical survey of Russian dramatists and their works, from the origins in folk and liturgical playlets through classicism, Gogol, Ostrovsky, Chekhov, and Stanislavsky to Meierhold and the Soviet drama. Prerequisite: Junior standing or consent of instructor. 3 hours or ¾ unit.
- 337. Nineteenth Century Russian Poetry.** A study of major Russian poets and their works

from Zhukovsky through the end of the nineteenth century. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.

- 338. Twentieth Century Russian Poetry.** A study of major Russian poets and their works from Blok to the present. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
- 360. Studies in Russian Literature and Society.** Same as Comparative Literature 340. The role of Russian literature in the social, political, and intellectual life of Russia from the 1840s to the present. Prerequisite: Junior standing. 3 hours or $\frac{3}{4}$ unit.
- 370. Nabokov and the Emigre Literature.** Same as Comparative Literature 370. Twentieth-century non-Soviet Russian authors, including Nabokov, Bunin, Tsvetaeva, Gippius, and Adamovich; no knowledge of Russian required. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 375. Russian Literary Translation.** Theory and practice of literary translation in Russia from the eighteenth century to the present; "literal" versus "creative" translation; and practical work in translation into English of various Russian literary texts. Prerequisite: Russian 214 or 216, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 400. Beginning Russian for Graduate Students.** Basic grammar and vocabulary; introduction to the reading of Russian texts in the sciences and the humanities. Designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. 4 hours. No graduate credit.
- 401. Readings in Russian for Graduate Students.** Reading and translation of general and individually specialized materials, to increase speed, accuracy, and vocabulary; designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. Prerequisite: Russian 400 or equivalent. 3 hours or 0 units.
- 406. Russian Morphology.** Survey of the various parts of speech of modern standard literary Russian with special emphasis on the nominal and verbal systems. 1 unit.
- 408. Russian Phonology.** Same as Linguistics 408. The sound pattern of Russian in its synchronic and diachronic aspects. Prerequisite: Consent of instructor. 1 unit.
- 410. Old Russian Literature.** Reading and analysis of texts with historical and literary commentary. Prerequisite: Slavic 405. 1 unit.
- 412. Literature of the Eighteenth Century.** Reading of texts; historical and literary background of the period. 1 unit.
- 414. Pushkin.** The age of Pushkin; Pushkin's works in historical and comparative perspective; textual criticism, linguistic and structural analysis, intellectual interpretation, and aesthetic evaluation. 1 unit.
- 415. Dostoevsky.** Same as Comparative Literature 415. Dostoevsky: historical background, textual analysis, structure, philosophy, artistic evaluation, and influence on French, English, American, and German literatures. 1 unit.
- 416. The Early Realists: Turgenev, Aksakov and Goncharov.** Intensive study of the three representative nineteenth century Russian novelists; aspects considered include historical perspective, textual criticism, structural analysis, and aesthetic evolution. 1 unit.
- 417. History of the Russian Language.** Historical grammar, origin, and development of the literary language. Prerequisite: Slavic 405 or consent of instructor. 1 unit.
- 419. Tolstoy.** Same as Comparative Literature 419. Tolstoy: historical background, textual analysis, structure, philosophy, aesthetic evaluation, and influence on French, English, American, and German literatures. 1 unit.
- 420. Chekhov.** Same as Comparative Literature 420. Chekhov: historical background, textual criticism, structural analysis, philosophy, artistic evaluation, and interrelationship with English, French, German, Scandinavian, and American literatures. 1 unit.
- 424. Gogol.** Historical background, textual criticism, structural analysis, philosophy and ideology, and aesthetic evaluation. 1 unit.
- 425. Seminar in Russian Literature.** Selected subjects in Russian prose, poetry, drama, and literary criticism. Topics vary. 1 unit. May be repeated to a maximum of 3 units.
- 463. College Teaching of Foreign Languages.** Same as English as a Second Language, French, German, and Spanish 463. See French 463.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, French, German, and Spanish 481. See French 481.

Serbo-Croatian

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 392. Structure of Modern Serbo-Croatian.** Analysis of the sound system and grammar of the contemporary Serbo-Croatian language. Prerequisite: Knowledge of another Slavic language or consent of department. 3 hours or $\frac{1}{4}$ unit.
- 393. Readings in Serbo-Croatian.** Reading and analysis of selected texts. Prerequisite: Serbo-Croatian 392 or consent of department. 3 hours or $\frac{1}{4}$ unit.

Slavic

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 319. Russian and East European Cinema.** Same as Communications and Speech Communication 319. Artistic, literary, and social aspects of cinema history, particularly Russian, Czech, Polish, and Yugoslav. No reading knowledge of Russian is required, except for Department of Slavic Languages and Literatures concentrators. 3 hours or $\frac{1}{4}$ unit.
- 380. Introduction to Slavic Linguistics.** Same as Linguistics 380. The development of Common Slavic from Indo-European and its relationship to contemporary Slavic languages. Prerequisite: Reading knowledge of one Slavic language. 3 hours or $\frac{1}{4}$ unit.
- 381. Introduction to Study and Research in Slavic Languages and Literatures.** Introduction to methods and resources for study and research in Slavic languages, Russian literature, and Russian language teaching. 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, and Spanish 382, and Linguistics 386. See Humanities 382.
- 387. Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Speech Communication 387. See English 387.
- 405. Old Church Slavonic.** Analysis of grammar and reading of texts. Prerequisite: Slavic 380 or consent of instructor. 1 unit.
- 460. Seminar in Slavic Linguistics.** Selected topics in the analysis of Slavic languages. Prerequisite: Slavic 380. 1 unit. May be repeated to a maximum of 3 units.
- 491. Individual Topics.** Prerequisite: Graduate standing with a major or minor in Russian; consent of department. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

Ukrainian

- 101. Basic Ukrainian, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no previous study of Ukrainian. 4 hours.
- 102. Basic Ukrainian, II.** Continuation of Ukrainian 101. Prerequisite: Ukrainian 101 or equivalent proficiency. 4 hours.
- 103. Intermediate Ukrainian, I.** Completion of grammar, oral drills, and written exercises. Prerequisite: Ukrainian 102 or equivalent. 4 hours.
- 104. Intermediate Ukrainian, II.** Selected readings in contemporary Ukrainian literature. Prerequisite: Ukrainian 103 or equivalent. 4 hours.
- 118. Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 398. Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours or $\frac{1}{4}$ unit.

SOCIAL SCIENCE

Office: College of Liberal Arts and Sciences

Office Address: 294 Lincoln Hall, 702 S. Wright, Urbana

- 300. Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Political Science 300. See Political Science 300.
- 499. Thesis Research.** Prerequisite: Completion of 8 units of course work in the Master of Arts in the Social Sciences program and a passing grade on the comprehensive oral examination. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units.

SOCIAL WORK

Dean of School: Professor R. O. Washington

School Office: 1207 West Oregon Street, Urbana

- 100. Contemporary Social Work.** A broad survey of the field of social welfare; introduction to social services, social welfare organizations, major social problems and target population groups, and the methods employed in service to individuals, groups, and communities; and includes the range of personnel and skills in social work agencies, and the means of education and training for social work. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Honors Seminar.** Lectures, student presentations, and discussions on selected topics in social work. Prerequisite: Twelve hours in social work courses; senior standing; 4.0 grade-point average in social work courses; and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.
- 298. Practice Seminar.** Critical examination of the application of knowledge to social work practice; emphasis on reciprocal relationships between personal problems and needs, social environment, agency services, and helping methods; and consideration of new trends in practice and empirical knowledge. Prerequisite: Social work major; consent of undergraduate field instruction coordinator; concurrent registration in Social Work 299. 3 hours.
- 299. Field Instruction.** The student is assigned to field instructors for learning experiences in social agencies and communities; experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele and communities. Prerequisite: Social work major; consent of undergraduate field instruction coordinator. 4 to 12 hours.
- 300. Methods of Social Work Intervention, I.** Examination of the methods of social work intervention (casework, group work, and community organization) utilized in various social work agencies and social welfare settings; emphasis on understanding of the values, knowledge, principles, and processes of social work practice. Prerequisite: Admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
- 301. Methods of Social Work Intervention, II.** An introduction to social work practice in groups, organizations, and communities; emphasizes understanding the values, principles, and processes of social work practice as well as developing skills for service delivery to groups, organizations, and communities. Prerequisite: Social Work 300; admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
- 303. Delivery of Health Care: Problems and Perspectives.** Same as Health and Safety Studies 303. The wide range of factors—ecological, social, cultural, medical, organizational, economic, and political—which influence health care in a complex nation like the United States; attention to perspectives from various fields of study. Prerequisite: Junior standing and consent of instructor. 3 hours or 1 unit.
- 310. Social Welfare Policy and Services, I.** Critical study of the income maintenance system

in the United States as a response to the problems of inequality of opportunity and income, poverty, and income security; consideration of alternative approaches with discussion of the social worker's role in the system. 3 hours or 1 unit.

- 311. Social Services Policy and Services, II.** Critical evaluation of social policy and services in selected problem areas; includes the process of social policy analysis, current issues in funding and monitoring of personal social services, and strategies for dealing effectively with social problems. Prerequisite: Credit or concurrent registration in Social Work 310. 3 hours or 1 unit.
- 313. Social Services for Health and Rehabilitation.** The psychological and sociological impact of illness and disability on the individual, the family, and the community, emphasizing the social worker's role in medical and rehabilitation settings. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 314. Social Services in Mental Health and Retardation.** Examination of comprehensive community mental health services as they evolve from definitions of the problems and changes in federal and state social policy; the concept of normalization and its criteria for program evaluation; and changing roles of mental health professionals, paraprofessionals, and consumers in policy making and service delivery. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 315. Social Work Services for the Aged.** The social needs of older people in the context of developing services and income transfer benefits; identifies major issues in social service delivery; and reviews methods of intervention on behalf of older people in terms of both skill required and policy implications. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 316. Social Services for Children and Families.** Child and family welfare policies and practice in relation to social services which support, supplement, or substitute for parental care of children; practice and policy issues in relation to the state's responsibility for guardianship, juvenile court, employment of children and young persons, and regulation of child-care facilities; and consideration of trends and issues in family and child welfare planning. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 318. Special Problems.** A small group seminar for independent study of a topic or topics of special interest in the field of social welfare; emphasis on examination and discussion of significant and current social welfare issues and problems. Prerequisite: Credit or concurrent registration in Social Work 300; consent of instructor. 3 hours or 1 unit.
- 319. Social Work and the Public School.** Social work services in schools as a process in school-community-pupil relations; focuses on the school as a social system; and includes education as a continuum from preschool to adulthood, financing and other major problem areas, sociolegal issues which affect equality of education and pupil welfare, and some current educational innovations. Prerequisite: Graduate standing in social work or consent of instructor. 3 hours or 1 unit.
- 327. Research Methods in Social Work Practice.** Objectives of research pertaining to social work practice; design of experiments; measurement and methods of collecting data; design of questionnaires and schedules; methods of data analysis including statistical hypothesis testing and applications of inferential techniques; interpretation of results; and preparation of reports. Prerequisite: An introductory course in statistics and admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
- 345. Family Planning and Population Policy.** Same as Health and Safety Studies and Sociology 345. Background information for professionals involved in the field of family planning; includes historical and current trends in developing and developed nations, with emphasis on the United States; and examines family planning and population policies, and programs and contraceptive methods as related to service delivery and to professional roles. Prerequisite: Six hours in the social sciences, or consent of instructor. 3 hours or 1 unit.
- 346. Sexism: Social Service and Social Welfare.** Same as Women's Studies 346. Explores and analyzes the effects of sexism on individual behavior and operations of societal institu-

tions, especially as it affects professionals in their work with women; includes emphasis on sex roles and human behavior, analysis of the psychological perspective on women, woman's place in the economic and political spheres with special emphasis on social work practice, social welfare laws and policies, minority women, and women as educators, students, counselors and clients. 3 hours or 1 unit.

- 351. Human Behavior and Social Environment, I.** Current research and theory concerning the environmental influences on individual behavior; the family, small group, community, and social organization and the social and cultural causes and effects of discrimination. The social work practice context of each unit of content is a central focus. Prerequisite: Admission to B.S.W. or M.S.W. program and a course in human development. 3 hours or 1 unit.
- 400. Comparative Analysis of Approaches to Casework.** Systematic and critical examination of selected approaches, conceptualizations, procedures, and techniques in casework theory and practice; includes the employment of a framework for the analysis and assessment of the various approaches, study of research related to process and outcome, and identification of practice issues. Prerequisite: Social Work 300. 1 unit.
- 401. Comparative Approaches to Social Group Work Practice.** Social work practice theory in social group work through comparative study of various practice approaches; includes the utilization of the group work method in contemporary social work practice, practice principles, and the use of group process. Prerequisite: Social Work 300. 1 unit.
- 402. Comparative Approaches in Community Organization Practice.** Principles and methods which characterize identifiable approaches used in community organization practice at neighborhood, community, state, and other levels. Prerequisite: Graduate standing in social work; Social Work 300 or consent of instructor. 1 unit.
- 404. Seminar and Practicum in Clinical Group Work.** Exploration of concepts and issues related to integrity and encounter groups, self-help groups, and group psychotherapy; provides experience in an intensive encounter based on a structured, contractual integrity group; and emphasizes development of self-awareness, interpersonal skill, and leadership in facilitating clinical groups. Prerequisite: Social Work 401 or equivalent. 1 unit.
- 405. Behavior Modification in Social Work.** Examination of conceptual ideas about behavior modification and their usefulness in working with clinical problems of concern to the social worker; focuses on intervention with individuals and families and the application of behavioral principles in working with groups, institutions, and communities; and emphasizes the development of a systematic approach for applying behavior modification principles in actual practice situations. Prerequisite: Social Work 300. 1 unit.
- 407. Intervention Strategies for Institutional Change.** Generic social work strategies used for institutional change, emphasizing problems and issues in the public schools. Prerequisite: Social Work 319 or consent of instructor. 1 unit.
- 420. Social Welfare Planning.** Examination of the interactional, interpersonal, and political aspects of social welfare planning in a variety of settings and under a number of auspices; formulation of models for social welfare planning. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 426. Social Welfare Administration.** Principles and process of administration and management of social welfare organizations, including review of organization theory, policy formulation, agency structure and staff organization, and budgeting. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 427. Service Accounting in Social Welfare.** Examines different types of services, to whom they are provided at what costs and with what results; within a systems perspective, considers methods of describing, reporting, and measuring client and target population characteristics, services, and resources; and includes allocation of scarce resources among competing demands and practice in specific methods. Prerequisite: Social Work 327 or equivalent. 1 unit.
- 428. Family Therapy Seminar and Practicum.** The principles, issues, and practices of family therapy; examines and compares major theoretical concepts; and enables students to learn how to do family therapy by studying theory and applying it in an actual practice experience. Prerequisite: Social Work 400 or consent of instructor. 1 unit.

- 431. Practice in Organizational Settings.** Critical analysis of social work practice: the agency's target population and clientele, task environment, structure, functions, task definitions, monitoring and planning mechanisms; methods of service delivery; ethical and legal considerations in service delivery; and the impact of racism, ethnocentrism, and sexism on social work practice. Prerequisite: Concurrent registration in Social Work 468. 1 unit.
- 432. Practice Evaluation.** Evaluation of social work practice: defining practice problems; operationalizing goals and objectives; developing hypotheses; designing evaluation plans to test hypotheses; describing interventions; collecting, analyzing, and interpreting data; and presenting results. Students complete an evaluation of some aspect of their own practice or their agency's program. Prerequisite: Social Work 431; concurrent registration in Social Work 469. 1 unit.
- 435. Supervision/Consultation/Staff Development.** The philosophy, objectives, principles, and methods of social work supervision, consultation, and training for staff development; analysis of similarities and differences in roles, knowledge, and skills required with emphasis on the teaching-learning-evaluating components; and issues arising from agency setting, changing legislation and program provisions, and relationships to social welfare administration. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
- 439. Theory of Social Work Interventions.** Presents theory for social work interventions with individuals, families, groups, and communities and organizations; critically analyzes different theoretical frameworks for such interventions; and examines the conceptual links between theory, process, outcome, and evaluations. Prerequisite: Social Work 400, 401, and 402. 1 unit.
- 452. Human Growth and Behavior and the Social Environment, II: Psychosocial Disorders.** Interrelationship of physical, emotional, learning, and social aspects of behavior disorders, and implications for the patient, family, and community; psychopathology, including neuroses, psychoses, character disorders, organic conditions, psychophysiologic disorders, and mental retardation; and diagnosis and treatment methods, including psychotherapy, somatic and drug therapies, and social work. Prerequisite: Social Work 351 or equivalent. 1 unit.
- 461. Special Studies in Social Work, I.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. ½ to 2 units.
- 462. Special Studies in Social Work, II.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. ½ to 2 units.
- 468. Field Instruction, II.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Consent of instructor. 1 to 2 units.
- 469. Field Instruction, III.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Social Work 468. 1 to 2 units.
- 484. National Social Welfare Policy, I.** Analyzes alternative concepts of social policy, the policy formulation process, and constraints on policy development in the United States; examines approaches to assessment of social policies. 1 unit.
- 485. National Social Welfare Policy, II.** Emphasis on the case approach within the context of basic political and governmental processes which influence the development, enactment, and application of national policy; analytical study of the background, legislative history, amendments, judicial interpretations, and operation of major national acts comprising our national social welfare policy, or bearing directly on social welfare such as the Social Security Act, the Employment Act, the Civil Rights Acts, and the Economic Opportunity Act. Prerequisite: Social Work 484 or consent of instructor. ½ to 2 units.
- 489. Social Work and the Law.** Legal procedures and issues of special relevance to social work

practice; includes legal provisions related to poverty, family development and crises, racial and ethnic minorities, institutionalized persons, crime and delinquency, legal authority of social agencies, and regulation of the profession. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.

- 491. **Research Seminar.** Seminar for students preparing research projects, either in groups or individually; experience in the application of research methods to current social work problems. Prerequisite: Social Work 327 or equivalent. 1 to 2 units.
- 492. **Seminar on Models for Directed Change.** Same as Sociology 492. See Sociology 492.
- 493. **Seminar: Design of Social Work Research.** Issues and problems in social work research; includes proof and verification, generalizability, and use of scaling and of judgments; and design of original research study. Prerequisite: Admission to Ph.D. program and Social Work 327, or consent of instructor. 1 unit.
- 497. **Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497. Administration, Higher, and Continuing Education 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. **Thesis Research.** Research and writing of doctoral thesis. 0 to 4 units.

SOCIOLOGY

Head of Department: Professor James R. Kluegel

Department Office: 326 Lincoln Hall, 702 S. Wright, Urbana

- 100. **Introduction to Sociology.** Examination of how societies grow and change; reciprocal effects of economic, political, community, familial, and scientific institutions on each other and on individual life changes; and social conflict, problems of bureaucratic growth and planned and unplanned social change. 3 hours.
- 102. **Religion and Science.** Same as History 147 and Religious Studies 102. See Religious Studies 102.
- 131. **Social Problems.** Origin of problems; consequences of ameliorative strategies. Typical topics include crime, mental illness, drug use, suicide, sexual behavior, violence, and intergroup conflict. 3 hours.
- 145. **Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Ecology 145 and Women's Studies 112. See Women's Studies 112.
- 185. **Introduction to Social Statistics.** Same as Geography 185. A first course in social statistics for students without mathematics beyond the high school level; topics include the role of statistics in social science inquiry, measures of central tendency and dispersion, simple correlation techniques, contingency analysis, and introduction to statistical inference. Prerequisite: Sociology 100 or consent of instructor, or 6 hours in sociology, political science, anthropology, or geography. 3 hours. Students may not receive credit for Sociology 185 if they have already received credit for an equivalent college level introductory statistics course.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. **Introduction to Sociological Theory.** Analysis of such classical theorists as Marx, Weber, Durkheim, and Mead and such contemporary theorists as Parsons, Merton, and Blau. 3 hours.
- 201. **Introduction to Social Psychology.** The social context of individual and interpersonal behavior. Observation, experimental and survey studies of: socialization; language acquisition and use; sources and changes of self concept; social interaction; emotions; coordination of interpersonal behavior; individual and interpersonal aggression, violence, and control; and adoption or rejection of innovations through social networks. 3 hours. Credit is not given for both Sociology 201 and Psychology 201.
- 205. **Young Children with Special Needs.** Same as Human Development and Family Ecology 205. Examines family and personal problems of children, birth to five years, with special

needs owing to mental and physical handicaps, hospitalization, abuse, and emotional disturbance; studies social environmental effects on the classification of such children: parental needs; program development. 3 hours.

- 206. Political Sociology.** A study of power relations within and between the state, bureaucracy, community, social classes, and elites in the United States and other countries. 3 hours.
- 208. Collective Political Violence.** The study of the causes, processes, and effects of collective violence, particularly of riots, coups, and revolution. 3 hours. (Counts for advanced hours in LAS.)
- 218. Technology and Society.** Examines the social and cultural origins of modern technology and technological innovation; the effects of technology and its change on society. Topics include the impact of technology on beliefs and values, accommodation and resistance to change, and technology and the Third World. 3 hours.
- 219. Comparative Study of Societies.** Theories of the development and interdependence of social, economic, and political institutions; consequences of change. 3 hours.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Political Science 222. See African Studies 222.
- 223. Social Stratification.** Inequities in power, prestige, income, privilege, and lifestyles in the United States and other countries; class and status as determinants of group interests, ideologies, and interaction; and effects of social change and mobility. 3 hours.
- 224. Women in Society.** Same as Women's Studies 224. Examines the place of women in society; how society shapes women's opportunities, behavior, values, power, roles, and well-being; how women, in turn, shape social changes in the home and at work. 3 hours.
- 225. Racial and Cultural Minorities.** A sociological and social-psychological analysis of minority groups: illustrative material drawn from representative racial, ethnic, and status groups. 3 hours.
- 226. Ethnicity in America.** Presents theories of ethnicity: assimilation-Melting Pot, pluralism, competition-conflict. Examines relationships among groups, accommodation among groups as a challenge in national unification, group versus national identification, methods of studying ethnicity, comparisons between United States and other multi-ethnic societies, and immigration as a social problem and policy issue. Prerequisite: One sociology course at the 100-level. 3 hours.
- 228. Social Theories of Religion.** Same as Religious Studies 228. Introduces major theories in the scientific study of religion, with emphasis on works of Hume, Feuerbach, Marx, Weber, Troeltsch, Frazer, Durkheim, Freud, Malinowski, Erikson, Levi-Strauss, Bellah, and Berger. 3 hours.
- 229. Sociology of Religion.** Same as Religious Studies 229. The functions of religious institutions in societies; religious leaders and leadership; religious groups in American society; and adaptations of religious institutions to modern needs and conditions. 3 hours.
- 231. Juvenile Delinquency.** Historical change in definitions of delinquency, its causes and control; gangs; the juvenile justice system; treatment of offenders; and preventive programs. 3 hours.
- 240. Crowds, Social Movements, and Violence.** Crowd formation and participation; recurring forms of individual and social behavior in crowds; routine and problematic crowd dispersal; social movement origins and participation; growth and organization; strategies, tactics, and consequences for participants and society; origins and consequences of racial, prison, sports and festival riots, and of violent confrontations between protest movements and the police. 3 hours.
- 241. Alcohol and Society.** Examines social psychology of alcohol use, patterning and abuse; etiology and epidemiology of alcoholism; politics of social control and treatment; history of prohibition, reform movements, social and cultural comparisons. 3 hours.
- 242. Family Violence.** Same as Human Development and Family Ecology 242. Examines the sociology of conjugal and intrafamily violence from comparative, historical, and social psychological perspectives; abuse of family members; the violent situation; interpersonal violence. 3 hours.
- 243. Social Perspectives on the Family.** Examines the societal forces shaping aspects of stable

and changing family relations in the U.S. and other countries; focuses on social-structural factors affecting marriage, divorce, co-habitation, child-bearing, the division of work and authority, and other features of life. 3 hours.

- 246. Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 246. See Ecology, Ethology, and Evolution 246.
- 249. Sport and Modern Society.** Same as Physical Education 249. See Physical Education 249.
- 251. Social Aspects of Mass Communications.** Same as Communications and Journalism 251. See Journalism 251.
- 259. Organizations.** Conflict, communication, coordination, and leadership in the bureaucracies that characterize modern society; relations of individuals, organizations, and society; how organizations are intended to work and how they do work, emphasizing business firms, unions, schools, public agencies, hospitals, and prisons. 3 hours. Credit is not given for both Sociology 259 and 322.
- 260. Work and Occupations.** The meaning of work and leisure in modern society; job satisfaction, alienation, and the work ethic; occupational conflicts over money, status, and authority; impact of occupational segregation by sex and race on earnings, unemployment, and politics; job and career mobility; and improvement of work life and leisure. 3 hours.
- 264. Introduction to Medical Sociology.** The sociology of health and illness behavior and the social structure of systems which deliver health care services; includes social constraints on illness, the illness role, medical organizations and professions, and the application of the illness model to deviant forms of behavior. 3 hours.
- 265. Contemporary Korean Society.** Same as Asian Studies 265. See Asian Studies 265.
- 270. Population Issues.** Same as Rural Sociology 270. Examines the current world population situation; the historical and current patterns of birth, death, migration, marriage, contraception, and abortion; and the world food and energy resources, crowding, and problems of overpopulation. 3 hours.
- 275. Community.** Structure and function of communities in mass society; ecological and social psychological perspectives; social networks; ethnographic case studies of small towns and neighborhoods; and community types. 3 hours.
- 276. Cities and Suburbs.** Metropolitan communities in modern society; neighborhoods, suburbs, ghettos, and slums as subcommunities; demographic, ecological, and technological aspects of urban change; and urban social networks. 3 hours.
- 277. Rural Social Change.** Same as Rural Sociology 277. See Rural Sociology 277.
- 281. Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185 or equivalent. 3 hours.
- 288. Religion in Asian Society.** Same as Asian Studies 288 and Religious Studies 288. See Asian Studies 288.
- 290. Individual Study.** Individual study or research project. Prerequisite: Six hours of sociology; written consent of instructor on form available in 326 Lincoln Hall. 1 to 6 hours. May be repeated.
- 291. Honors Individual Study.** Prerequisite: Open only to seniors in the sociology field of concentration who are eligible for departmental distinction; written consent of instructor on form available in 326 Lincoln Hall. 3 hours.
- 293. Honors Senior Thesis.** Open only to seniors in the sociology field of concentration who are eligible for departmental distinction. Prerequisite: Sociology 291 and written consent of instructor on form available in 342 Lincoln Hall. 3 hours. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Prerequisite: Sociology 100 and consent of instructor. 3 hours. May be repeated as topics vary.
- 301. European Working-Class History: 1750 to the Present.** Same as History 301 and Labor and Industrial Relations 301. See History 301.

- 302. Sex Roles.** Same as Human Development and Family Ecology 302. Examines social institutions that affect sex differences in power and prestige, especially market labor, household labor, and fertility; social, emotional, and cognitive developmental differences over the life span. Prerequisite: Sociology 100 or Human Development and Family Ecology 105; or 6 hours of anthropology, geography, political science, or sociology. 3 hours or 1 unit.
- 315. Sociology of Education.** Same as Educational Policy Studies 315. See Educational Policy Studies 315.
- 316. Sociology of Adolescence.** Effects of social class, ethnic and minority status of modern adolescence; problems such as sex, identity, generational conflict, academic and social failure, and delinquency; effects of family, education, peer culture, politics, religion, welfare, work, and leisure. Prerequisite: Sociology 100 or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 317. Sociology of Law.** Social origins and consequences of law and legal process, emphasizing problems of legal change and structure and function of legal sanctions. Law and law-like phenomena in primitive and modern societies. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 318. Industry and Society.** Same as Labor and Industrial Relations 318. Selected problems in industrialization and technological change, labor force, meanings of work, the factory as a work place, corporate organization and corporate society, and alienation and authority. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 320. Social Roles.** Contemporary role theory and related concepts such as social status and social interaction; age, sex, vocational, social class, and other role types; applications of this theory to the study of the socialization process and personal adjustment; and the analysis of critical group situations and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Family and Kinship in Industrialized Societies.** Mate selection, marriage and consensual unions, separation and divorce, interaction and authority patterns, family crisis and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 323. The Small Social Group.** Theory, observation, and analysis of face-to-face social groups, such as friendships, cliques, clubs, committees, and experimental groups; characteristics, functions and forms of small group interaction. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 324. Penology.** History of punishment and treatment of offenders; social organization of prison life, male and female inmate cultures, prison race relations, and violence; reform, parole, community correctional facilities, and effectiveness of treatment. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 325. The Philosophy of Social Science.** Same as Anthropology 329 and Philosophy 375. See Philosophy 375.
- 327. Japanese Society.** Same as Asian Studies 303. The institutions of contemporary Japan and their historical roots; the Japanese approach to modernization and development and social change; and implications of the Japanese experience for applied social change in developing areas and for social science theory and methodology. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science or sociology. 3 hours or 1 unit.
- 331. Criminology.** Nature and extent of crime; past and present theories of crime causation; criminal behavior in the United States and its relation to personal, structural, and cultural conditions. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Research Methods in Social Psychology: Laboratory Methods.** Same as Psychology 332. See Psychology 332.
- 333. Sociology of Mental Illness.** Mental health issues from organizational, demographic, and

social-psychological perspectives; emphasizes the sociological implications of mental problems, the organization of treatment and confinement, and the role of the therapist. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 337. Social Causes of Health and Illness.** Examines social correlates of illness (e.g., heart disease, cancer, obesity, alcoholism), methods of social epidemiology, stressors in the social environment, and factors that lessen the impact of stress. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety studies, psychology, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 338. Sociology of Health Care.** Discusses the relationship of lifestyles and health; reasons for variations in patient recognition and acceptance of disease and its treatment (e.g., for chronic, terminal, or debilitating disease); variations in seeking health care; the patient-provider relationship; and coping with aging and death. Prerequisite: Sociology 264. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 339. The Organization of Health Care.** Examines becoming a health professional, relationships among health workers, health care organizations (e.g., doctor's offices, clinics, hospitals, and nursing homes), networks of health services, evaluation of health care, and social policy issues. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety studies, psychology, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 340. Social Movements.** Origins and development of groups in promoting and resisting change, resource mobilization, strategies and tactics, individual and social consequences. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 343. Social Change in Developing Areas.** Same as Rural Sociology 343. See Rural Sociology 343.
- 345. Family Planning and Population Policy.** Same as Health and Safety Studies and Social Work 345. See Social Work 345.
- 346. Sociology of Sport.** Same as Physical Education 346. See Physical Education 346.
- 350. Soviet Social Institutions.** Structural consequences of Communist ideology and industrialism, social stratification and mobility, nationalities, family and education communications and public opinion, and socialized medicine. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 352. Attitude Theory and Change.** Same as Communications 352 and Psychology 352. See Psychology 352.
- 356. Economics of Population and Resources.** Same as Economics 356. See Economics 356.
- 357. Human Rights.** Same as Political Science 357. Examines the idea of human rights: human rights in liberal democracies, especially in the United States; in pre-industrial societies; in totalitarian states. Studies human rights and cultural evolution; justification of human rights. Prerequisite: Sociology 100 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 358. Politics of Crime and the Criminal Process.** Same as Political Science 358. See Political Science 358.
- 359. The Social Psychology of Organization.** Same as Psychology 359. See Psychology 359.
- 364. Population Trends and Patterns.** Introduction to contemporary demographic patterns and their historical development; transition theory and other models of demographic change; components of population growth and distribution; and trends and differentials in mortality and fertility. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
- 371. Comparative Social Institutions.** Same as Asian Studies 371. Structural systems such as family, kinship, occupations, political institutions, social stratification and mobility, using materials from less-developed and advanced industrial societies; consequences of different institutional systems on modernization and development. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 373. Latin American Social Institutions.** Class structures, family, kinships, religious, economic, and political institutions; trends in urbanization, ecological organization, and

population. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 380. Methods of Field Research.** Instruction, training, and supervised practice in methods of field research as a basic tool of sociology; emphasis on the role of the field researcher as participant, observer, and interviewer in various kinds of research settings, and on approaches to and applications of field data. Prerequisite: Sociology 100 and 185. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 381. Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185; Sociology 100 or 6 hours in social geography, anthropology, or political science. 3 hours or $\frac{3}{4}$ unit. (May be offered on a temporary basis. See also Sociology 281 and 415.)
- 385. Social Statistics, I.** Introduces statistical methods as applied to sociology and other social sciences: probability concepts, binomial and normal distributions; statistical inference, t-test and F-test, bivariate correlation and regression, multiple regression, dummy variables and analysis of variance, contingency tables; reliability and simple index construction; types of sampling and their effects on analysis. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 185, or Mathematics 111 or 112; or equivalent. 3 hours or 1 unit. Students may not receive credit for Sociology 385 if they have received credit for any one of the following: Statistics 100, 210, 310, or 311; Psychology 233, 234, or 235; Economics 171 and 172; Agronomy 340; Educational Psychology 390; Biology 371, 372, or 373; Forestry 321; Social Work 327.
- 386. Social Statistics, II.** Examines social science applications of the general linear model and its extensions; topics include: model specification; ordinary and generalized least squares; multicollinearity; selection of predictors; interaction of variables and non-linear regression; panel and time-series data; measurement error; path analysis; recursive and non-recursive structural equation models. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 385 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
- 387. Social Statistics, III.** Examines social science applications of discrete and continuous multivariate analysis; topics include: analysis of categorical data (loglinear modelling, probit analysis, etc); geometric interpretation of matrices; factor analysis and index construction; canonical analysis; discriminant analysis; unobserved variables and structural equation models; issues in model specification and estimation. Applies statistical computing programs such as ECTA and LISREL to social science data. Prerequisite: Sociology 386 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
- 388. Basic Methods of Demographic Analysis.** Introduction to statistical and mathematical procedures in population analysis; the gathering, processing, and evaluating of registration and census data; the life table model; and procedures of mortality and fertility analysis and population projections. Prerequisite: Mathematics 111 or 112, or equivalent. 3 hours or 1 unit.
- 396. Special Topics.** Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit. May be repeated as topics vary.
- 400. Classical Sociological Theory.** Analysis of major classical sociological theorists of the nineteenth and early twentieth centuries, stressing the social, historical, and philosophic foundations of sociological theory; primary emphasis on Marx, Durkheim, and Weber. Prerequisite: Sociology 200 or equivalent. 1 unit.
- 401. Contemporary Sociological Theory.** Major theorists and schools of thought since World War I with emphasis on the contemporary period; includes functionalism, exchange theory, conflict theory, symbolic interaction, and phenomenology. Prerequisite: Sociology 400 or equivalent. 1 unit.
- 402. Social Stratification.** Theory and data concerning structured social inequality in industrialized societies, with special focus on the United States. 1 unit.

- 406. Psychological Scaling: Unidimensional Methods.** Same as Psychology 406. See Psychology 406.
- 407. Techniques in Demographic Analysis.** Same as Rural Sociology 407. The analysis of family formation and dissolution; measures of population movement and distribution; and introduction to the stable population model and to applications in the estimation of demographic measures. Prerequisite: Sociology 388. 1 unit.
- 409. Psychological Scaling: Multidimensional Methods.** Same as Psychology 409. See Psychology 409.
- 410. Crowd Behavior.** An examination of classic and contemporary theory and research bearing on crowd formation, form, relocation, and dispersal; the production, maintenance, and alteration of various behaviors within crowds; and emphasis on direct observation of, and the design of field and laboratory research bearing on these phenomena. 1 unit.
- 411. Methods in Comparative Sociology.** Examines problems in the design and conduct of research in cross-cultural and cross-national comparative sociology; levels of analysis and observation; the problem of equivalence and that of investigator ethnocentrism; qualitative and quantitative approaches; the ethics and politics of such research. Prerequisite: 1 unit of graduate credit in sociology, or consent of instructor. 1 unit.
- 412. Demography of Human Mortality.** Historical trends and patterns in human mortality and their social implications; international differentials in mortality levels and cause-of-death patterns; the measurement of mortality; age, sex, ethnic, marital, and socioeconomic mortality patterns; and some consequences of mortality declines. Prerequisite: Sociology 270 or 364, and Sociology 388. 1 unit.
- 414. Seminar on Social Interaction.** Same as Communications 414. An analysis of social interaction based on the social psychology of C. H. Cooley, G. H. Mead, and W. I. Thomas; presentation of problems of theory, concepts, and method. Prerequisite: 1 unit of graduate credit in sociology. 1 unit.
- 415. Survey Research Methods, I.** A laboratory course in survey research methods to provide students with advanced training and experience in survey design, data collection, and quality control; students and staff design and collect data for a sample survey on a specific topic which varies year to year. Three to ten hours of laboratory time per week. 1 unit.
- 416. Survey Research Methods, II.** A laboratory course in survey research methods to provide students with advanced training and experience in problem formulation and computerized data analysis using statistical packages, e.g. SPSS; under staff guidance, a student will select a topic and write a professional-level paper using data collected in Sociology 415. Three to ten hours of laboratory time per week. 1 unit.
- 417. Seminar in the Sociology of Law.** Selected areas of theory and research (varying from year to year); possible topics include civil litigation and the civil courts, police operations and the sociology of law and order, sociological theories of justice, and the operations of legal agencies. Prerequisite: Sociology 317. 1 unit.
- 418. Seminar in Industrial and Economic Sociology.** Same as Labor and Industrial Relations 418. See Labor and Industrial Relations 418.
- 420. Social Organization.** Major issues and perspectives on the structure and dynamics of social organization; stratification, elites, formal organizations, and social change; contemporary theoretical and methodological developments in selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
- 421. Demography and Human Ecology.** Classic and contemporary issues and perspectives in demography and human ecology, emphasizing the relationship between demographic phenomena and social life and on the ecological approach to social organization; demographic change, analytic methods in demography, fertility, mortality, and migration; new research developments. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
- 422. Theory of Social Groups.** A survey of selected conceptual systems used to analyze human groups to determine the origins and referents of the concepts, their interrelations, and their utility as sources of testable generalizations relevant to the solution of empirical problems in group analysis. 1 unit.

- 423. Social Psychology.** Development of social psychology; contemporary theoretical and methodological perspectives; selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
- 424. Sociology of Human Service Delivery Systems.** Intensive analysis of service delivery systems; focuses on delivery of health-care, educational, mental health, welfare, rehabilitation, and/or correctional services; and includes structure, access, quality, innovation, and modelling of the systems. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 432. Special Problems in Theory and Research on Deviant Behavior.** A seminar concerned with the critique of recent theory and research on selected problems in the study of delinquency, crime, mental disorder, and the collaborative development of new theory and research designs. Prerequisite: Sociology 331 or consent of instructor. 1 unit.
- 444. Seminar in Public Opinion.** Same as Communications 444. Development and theory of public opinion process in society; censorship, interest groups, and propaganda; and mass media and public opinion. 1 unit.
- 445. Sociology of Leisure.** Same as Leisure Studies 445. See Leisure Studies 445.
- 449. The Sociology of Sport.** Same as Physical Education 449. See Physical Education 449.
- 456. Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Psychology 453. See Business Administration 410.
- 474. Survey Methods in Marketing Research.** Same as Business Administration 431. See Business Administration 431.
- 476. Urban Communities and Urbanization.** Intensive study of special aspects of the urbanization process as it affects the life of communities in this and in other countries. 1 unit.
- 477. Seminar on Community Organization.** Same as Rural Sociology 477. Theories relating to the community concept and the analysis of community organization; the process of community change as applied to societies in various parts of the world. Prerequisite: Sociology 275 or consent of instructor. 1 unit.
- 482. Recent Developments in Sociology.** Intensive study of selected topics based on contemporary works of major importance in the development of sociological theory. 1 unit. May be repeated as topics vary.
- 485. The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Psychology 485. See Business Administration 435.
- 487. Special Problems in Rural Sociology.** Same as Rural Sociology 487. See Rural Sociology 487.
- 490. Individual Topics in Sociology.** Supervised individual investigation or study of a topic not covered by regular courses; topic selected by the student and the proposed plan of study must be approved by the adviser and the staff member who supervises the work. $\frac{1}{2}$ to 2 units.
- 494. Multivariate Analysis in Psychology and Education.** Same as Educational Psychology and Psychology 494. See Psychology 494.
- 499. Thesis Research.** 0 to 4 units.

SPANISH, ITALIAN, AND PORTUGUESE

(Including Catalan and Romance Linguistics)

Chairperson of Department: Professor Spurgeon Baldwin

Department Office: 4080 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Catalan

- 301. Studies in Catalan Language.** An introductory study of the Catalan language. Prerequisite: Eight hours of Latin or any Romance language. 2 hours or $\frac{1}{2}$ unit.

- 302. Studies in Catalan Literature.** Introduces Catalan literature through study of major works. Prerequisite: Catalan 301 or consent of instructor. 2 hours or ½ unit.

Italian

- 101. Elementary Italian.** For students who have no credit in Italian. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. 4 hours.
- 102. Elementary Italian.** Continuation of Italian 101. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. Prerequisite: Italian 101 or one year of high school Italian. 4 hours.
- 103. Intermediate Italian.** Rapid reading, review of grammar, composition, and conversation. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. Prerequisite: Italian 102 or two years of high school Italian. 4 hours.
- 104. Intermediate Italian.** Continuation of Italian 103. Prerequisite: Italian 103 or three years of high school Italian. 4 hours.
- 105. Intensive Beginning Italian.** Equivalent to Italian 101 and 102; for students with no prior Italian credit who wish to learn at a rapid rate; speaking, reading, writing and aural comprehension. Students are encouraged to attend the language laboratory and/or use the recorded tapes through the Community Access Telephone System. 8 hours. Students may not receive credit for both Italian 105 and either 101, 102, or equivalent.
- 130. Italian Medieval Literature and Civilization.** Same as Comparative Literature 130. The development of Medieval Italian civilization in a literary context from the Sicilian School of love poetry to the early Renaissance in Florence; lectures and readings are in English. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 209. Italian Syntax and Phonetics.** Italian composition and conversation; syntax and phonetics. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 211. Composition and Conversation, I.** Training in oral-aural skill and in writing; practice in the language laboratory required. Prerequisite: Italian 209 or consent of instructor. 3 hours.
- 212. Composition and Conversation, II.** Continuation of Italian 211. Prerequisite: Italian 211 or consent of instructor. 3 hours.
- 221. Introduction to Italian Literature, I.** Introduction to representative works and movements of Italian literature since the Renaissance. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 222. Introduction to Italian Literature, II.** Introduction to representative works and movements of Italian literature in the Middle Ages and the Renaissance. Prerequisite: Italian 221 or consent of instructor. 3 hours.
- 290. Readings in Italian.** Readings chosen in consultation with an adviser. Prerequisite: Italian 104 or consent of instructor. 2 to 4 hours. May be repeated.
- 293. Honors Senior Thesis.** For candidates for honors in Italian. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
- 309. Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Comparative Literature 353. Studies in Petrarch and Boccaccio; nonconcentrators in Italian may read the works in translation; lectures are in English. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or ¾ unit.
- 313. The Divine Comedy.** Same as Comparative Literature 313. An interpretation of Dante's *Divine Comedy* with special attention to its position in the medieval world; a knowledge of Italian not required. 3 hours or 1 unit.
- 321. Modern Italian Literature, I.** Prerequisite: Italian 222 or consent of instructor. 3 hours or ¾ unit.
- 322. Modern Italian Literature, II.** Prerequisite: Italian 321 or 222, or consent of instructor. 3 hours or ¾ unit.

- 331. Italian Culture.** Introduction to factors that have shaped present-day Italy; basic concepts contributing to understanding its present social and cultural development. Prerequisite: Italian 211 or 221, or consent of instructor. 3 hours or ½ unit.
- 333. Masterpieces of Italian Renaissance Literature.** Same as Comparative Literature 354. A reading of masterpieces of the 1400 and 1500s and a study of their predecessors and influence; nonconcentrators in Italian may read the works in translation; lectures are in English. Content rotates. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or ¾ unit. May be repeated to a maximum of 6 hours or 1 ½ units with consent of instructor.
- 362. Introduction to Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 400. Beginning Course for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
- 401. Readings in Italian for Graduate Students.** An intensive language course designed to teach reading skills to graduate students; a continuation of Italian 400. Prerequisite: Italian 400 or consent of instructor. 4 hours. No graduate credit.
- 447. Introduction to Romance Stylistics.** Same as French, Portuguese and Spanish 447. See Spanish 447.
- 451. History of the Italian Language.** 1 unit.
- 452. Seminar in Italian Linguistics.** 1 unit.
- 462. Seminar in Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
- 491. Special Topics in Italian.** ½ or 1 unit.
- 499. Thesis Research.** 0 to 4 units.

Portuguese

- 101. Elementary Portuguese, I.** For students who have no credit in Portuguese. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. 4 hours.
- 102. Elementary Portuguese, II.** Continuation of Portuguese 101. Prerequisite: Portuguese 101. All students in this course are required to attend two twenty-minute laboratory sessions per week in the language laboratory. 4 hours.
- 103. Intermediate Portuguese.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Portuguese 102 or two years of high school Portuguese. 4 hours.
- 104. Intermediate Portuguese.** Continuation of Portuguese 103. Prerequisite: Portuguese 103 or three years of high school Portuguese. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Composition and Conversation, I.** Prerequisite: Portuguese 104 or consent of instructor. 3 hours.
- 212. Composition and Conversation, II.** Prerequisite: Portuguese 211 or consent of instructor. 3 hours.
- 222. Introduction to Brazilian Literature.** Survey of the most representative works from the sixteenth century to the present with emphasis on the evolution of the country's literary history. Prerequisite: Portuguese 221 or consent of instructor. 3 hours.
- 290. Readings in Portuguese.** Readings chosen in consultation with a departmental adviser. Prerequisite: Portuguese 104 or consent of instructor. 2 to 4 hours.
- 301. Brazilian Literature.** Prerequisite: Portuguese 222 or consent of instructor. 3 hours or ¾ unit.
- 302. Portuguese Literature.** Prerequisite: Portuguese 222 or consent of instructor. 3 hours or ¾ unit.
- 303. Luso-Brazilian Culture.** Affords a broad understanding of the origins of Luso-Brazilian civilization and culture. Prerequisite: Portuguese 211 or 221, or consent of instructor. 3 hours, or ½ or 1 unit.

304. **Brazilian Culture.** Affords a broad understanding of contemporary Brazilian civilization and culture. Prerequisite: Portuguese 211 or 221, or consent of instructor. 3 hours, or 1/2 or 1 unit.
305. **Intensive Portuguese for Spanish Speakers.** An accelerated course based on Portuguese-Spanish contrastive analysis; designed to enable students who can already read Spanish to read nonliterary and literary works in Portuguese and to develop a modicum of listening comprehension. Prerequisite: Spanish 104 or equivalent, or consent of instructor. 3 hours or 1/2 unit.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 362. See Spanish 362.
407. **Studies in Brazilian Literature.** Advanced study of literary movements, major writers, and intellectual and cultural ideas in Brazilian literature; subject matter varies each time the course is offered. Prerequisite: Portuguese 301 or consent of instructor. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
447. **Introduction to Romance Stylistics.** Same as French, Italian, and Spanish 447. See Spanish 447.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 462. See Spanish 462.
491. **Special Topics in Portuguese.** 1/2 or 1 unit.
499. **Thesis Research.** 0 to 4 units.

Romance Linguistics

362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 362. See Spanish 362.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 462. See Spanish 462.

Spanish

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

101. **Elementary Spanish.** For students who have no university credit in Spanish. 4 hours.
102. **Elementary Spanish.** Continuation of Spanish 101. Prerequisite: Spanish 101 at the University of Illinois at Urbana-Champaign. All other second semester Spanish students should enroll in Spanish 122. 4 hours. Credit is not given for both Spanish 142 and 102.
103. **Intermediate Spanish, I.** Continued development of reading, writing, and conversational skills for students who may be interested in pursuing Spanish in more advanced courses. Unlike Spanish 123, Spanish 103 places considerable emphasis on written expression in Spanish. Followed by Spanish 104, 114, or 124, this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
104. **Intermediate Spanish, II.** Continuation of Spanish 103 for students who may be interested in pursuing Spanish in more advanced courses; continued emphasis on written and oral expression and on the reading of advanced texts. Completion of this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 103 or equivalent placement score. 4 hours.
114. **Conversational Spanish.** Conversation in Spanish on topics of current interest; brief grammar review as necessary to improve oral skills; and reading required in preparation for classroom discussions. Fulfills the foreign language requirement but does not serve as

prerequisite for advanced courses in Spanish without departmental approval. Background readings in Spanish and English. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.

122. **Elementary Spanish.** Second-semester Spanish course for all students who did not take Spanish 101 at this University. Prerequisite: Spanish 101 elsewhere or assignment by placement exam. 4 hours.
123. **Reading and Speaking Spanish, I.** Readings of Spanish literary and cultural texts with discussion in Spanish; review and development of grammar essential to competence in reading and speaking. Followed by Spanish 114 or 124, this course fulfills the LAS foreign language requirement. Students completing Spanish 123 may not enroll in Spanish 104 without departmental approval. Students planning to take advanced courses in Spanish should enroll in Spanish 103. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
124. **Reading and Speaking Spanish, II.** Continuation of Spanish 123. Readings of Spanish literary and cultural texts with discussion in Spanish; continued development of conversational skills. This course fulfills the LAS foreign language requirement, but does not serve as a prerequisite for more advanced courses in Spanish without departmental approval. Students planning to take additional courses in Spanish should enroll in Spanish 104. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
125. **Beginning Spanish for Near-Native Speakers.** Introduction to Spanish orthography, syntax and vocabulary for students of Hispanic background who have had little or no formal training in the Spanish language. Prerequisite: Consent of instructor. 4 hours.
141. **Elementary Spanish for Agriculture and Related Fields, I.** Introductory course for students in agriculture and related disciplines interested in acquiring Spanish-language competency for use in the fields of agriculture, foods and nutrition, and rural development; presents basic grammar and vocabulary, scientific terminology, and agricultural and cultural information on the Spanish-speaking areas of the world. 4 hours. Not open to students who have received credit for Spanish 101.
142. **Elementary Spanish for Agriculture and Related Fields, II.** Emphasizes conversation and focuses on Latin America; for students in agriculture, foods and nutrition, and rural development. Prerequisite: Spanish 141 or consent of instructor. 4 hours. Credit is not given for both Spanish 102 and 142.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
200. **Introduction to the Study of Hispanic Literature.** Basic terminology and techniques for the study of the major literary genres; should be taken prior to any Spanish literature course. Prerequisite: Spanish 209 and 211, or equivalent; or concurrent registration in Spanish 209 and 211 with consent of advisor and instructor. 2 hours.
209. **Spanish Language.** A practical course on Spanish phonology and morphology; intensive drill in Spanish sound and verb systems, and analysis of sentence structure. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
211. **Oral Spanish.** Practice in speaking Spanish; to be taken concurrently with or subsequent to Spanish 209. Meets four hours per week. Prerequisite: Spanish 104. 2 hours.
215. **Intensive Spoken Spanish.** Intensive oral contact with Spanish; meets five hours per week. Prerequisite: Spanish 211 or consent of instructor. 2 hours. May be repeated.
217. **Spanish Composition.** Basic composition course; problems of written Spanish and principles of Spanish rhetorical patterns; weekly written exercises. Prerequisite: Spanish 209 and junior standing, or consent of instructor. 3 hours.
225. **Intermediate Spanish for Near-Native Speakers.** Review at the intermediate level of Spanish orthography, syntax, and vocabulary for students of Hispanic background who have little or no formal training in the Spanish language and an introduction to the study of U.S. Hispanic minority literature. This course fulfills the LAS foreign language requirement. Prerequisite: Spanish 125 or consent of instructor. 3 hours.

226. **Survey of Hispanic Minority Literature.** A survey of literature in English by and about people of Mexican, Puerto Rican, and Cuban descent in the United States. 3 hours.
232. **Culture of Spain.** Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
233. **Culture of Spanish America.** Designed for concentrators in Spanish; offered in Spanish. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
240. **Spanish Literature: Medieval and Golden Age.** Introduction to major works and movements of the Middle Ages and the Golden Age. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
241. **Spanish Literature: Eighteenth Century to the Present.** Study of representative masterpieces within the context of major periods and trends. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
242. **Spanish-American Literature.** Introduction to major literary movements and works in Spanish America. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
250. **Spanish American Culture Through Its Literature.** Same as Comparative Literature 244. Studies major aspects of Spanish American culture as portrayed in its literature; readings and discussion, in English, of writers' views of socio-political issues, and of cultural characteristics and change. 3 hours.
260. **Spanish for Industry and Commerce, I.** Introduction to vocabulary of Hispanic commerce; composition of business letters and similar texts. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
261. **Spanish for Industry and Commerce, II.** Advanced study of Hispanic commercial vocabulary; composition of commercial correspondence and documentation. Prerequisite: Spanish 260. 3 hours.
270. **Parateaching.** Same as French, German, Latin, and Russian 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Russian 279. See Humanities 279.
280. **Teachers Course.** Required for teacher-training majors in Spanish. Prerequisite: Spanish 209 or 211, or consent of instructor. 4 hours.
293. **Honors Senior Thesis.** For candidates for honors in Spanish. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
298. **Senior Seminar.** Intensive study of Hispanic linguistics or literature. Prerequisite: Senior standing. 2 hours. May be repeated for credit with adviser's consent. (Counts for advanced hours in LAS.)
305. **Romanticism and Realism in Nineteenth-Century Spanish Literature.** A study of representative authors and genres of the nineteenth century; particular emphasis on the romantic drama and the realistic novel. Prerequisite: Spanish 241 or equivalent. 3 hours or $\frac{3}{4}$ unit.
306. **The Generation of 1898.** A study of representative works of Baroja, Azorin, Unamuno, Maeztu, Valle Inclán, Benavente, A. Machado, and others. Prerequisite: Spanish 241 or equivalent. 3 hours or $\frac{3}{4}$ unit.
307. **Spanish-American Literature to 1910.** Study of the development of Spanish-American literature from its sixteenth-century beginnings through modernismo. Graduate students read one additional major literary work and write an additional paper on that work. Prerequisite: Spanish 242 or equivalent. 3 hours or $\frac{3}{4}$ unit.
309. **Introduction to Medieval Spanish Literature.** Historical and cultural background for the Middle Ages; selected readings in medieval literature from the Jarchas to the Corbacho. Prerequisite: Spanish 240 or equivalent. 3 hours or $\frac{3}{4}$ unit.
310. **Contemporary Spanish-American Literature.** A study of Spanish-American literature from World War I to the present. Prerequisite: Spanish 242 or equivalent. 3 hours or $\frac{3}{4}$ unit.
311. **Don Quixote** and the Prose of the Golden Age. Introduction to *Don Quixote*, to its relationship to other selected masterpieces of the Golden Age, and to the main currents and forms of Golden Age prose. Prerequisite: Spanish 240 or equivalent. 3 hours or $\frac{3}{4}$ unit.

313. **Chicano Literature.** A survey of literature in Spanish by and about people of Mexican descent in the United States. Prerequisite: Spanish 233 and 242. 3 hours or $\frac{3}{4}$ unit.
314. **Spanish Drama and Poetry of the Golden Age.** Prerequisite: Spanish 240 or equivalent. 3 hours or $\frac{3}{4}$ unit. 315. **Puerto Rican Literature.** A study of representative authors and genres of Puerto Rican literature since World War II. Prerequisite: Spanish 242 or equivalent. 3 hours or $\frac{3}{4}$ unit.
351. **Phonetics.** Prerequisite: Spanish 209 or equivalent. 3 hours or $\frac{1}{2}$ unit.
352. **Syntax.** Required for teacher-training majors in Spanish. Prerequisite: Spanish 209 or equivalent. 3 hours or $\frac{1}{2}$ unit.
353. **Spanish Structure.** Same as Linguistics 353. Comprehensive analysis of Spanish phonology and syntax based on present-day linguistic theory. Prerequisite: Linguistics 300; Spanish 351; Spanish 352. 3 hours or $\frac{1}{2}$ unit.
360. **Principles of Language Testing.** Same as English as a Second Language, French, and German 360. See English as a Second Language 360.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 362. Comparative and historical analysis of the Romance languages. Prerequisite: Four semesters of a Romance language or Latin, or equivalent. 3 hours or $\frac{3}{4}$ unit.
371. **Spanish for Teachers.** A consideration of language problems suggested by teaching experience. Prerequisite: Spanish 209 or equivalent. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, and Slavic 382, and Linguistics 386. See Humanities 382.
399. **Study Abroad.** Lectures, seminars, and practical work in Spanish language, literature, and civilization in Spain. Prerequisite: Spanish 200 and 211, or equivalent. 0 to 18 hours, or 0 to 3 units.
400. **Beginning Spanish for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Spanish for Graduate Students.** Continuation of Spanish 400; special readings in the critical literature of several disciplines. Prerequisite: Spanish 400 or consent of instructor. 4 hours. No graduate credit.
405. **Spanish Bibliography.** An introduction to bibliographical method and to the principal bibliographical resources for the study of Spanish and Latin American literature. $\frac{1}{2}$ unit.
411. **Medieval Literature to 1300.** Survey of medieval Spanish literature to 1300; special attention to relationship with other medieval literatures of western Europe. Prerequisite: Spanish 309. 1 unit.
412. **Medieval Literature, 1300-1500.** Survey of medieval Spanish literature from 1300 to 1500; special attention to relationship with other medieval literatures of western Europe. Prerequisite: Spanish 309. 1 unit.
415. **Renaissance and Baroque Prose in Spain.** Prerequisite: Spanish 311 and 314, or equivalent. 1 unit.
417. **Renaissance and Baroque Drama in Spain.** Prerequisite: Spanish 311 or 314, or consent of instructor. 1 unit.
418. **Seminar in Renaissance and Baroque Literature.** Same as Comparative Literature 404. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
419. **Cervantes.** *Don Quixote* and representative minor works. Prerequisite: Spanish 311 or 314, or consent of instructor. 1 unit.
420. **Studies in Medieval Spanish Literature.** Advanced study of the major literary movements, genres, and authors in medieval Spanish literature. Topics vary. Prerequisite: Spanish 309 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
421. **Modern Spanish Novel and Essay.** 1 unit.
422. **Contemporary Spanish Novel and Essay.** 1 unit.
424. **Contemporary Spanish Drama.** Dramatic literature of Spain in the twentieth century. 1 unit.

- 425. Renaissance and Baroque Poetry in Spain.** 1 unit.
- 426. Spanish Poetry of the Nineteenth and Twentieth Centuries.** 1 unit.
- 427. Studies in Twentieth-Century Spanish Literature.** Advanced study of major literary movements, genres, or authors in twentieth-century Spanish literature; subject matter varies. Prerequisite: Spanish 306 or any survey of contemporary Spanish literature, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 428. Studies in Nineteenth-Century Spanish Literature.** Advanced study of major literary movements, genres, or authors in nineteenth-century Spanish literature; subject matter varies. Prerequisite: Spanish 305 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 429. Studies in Golden Age.** Advanced study of major literary movements, genres, or authors in sixteenth- and seventeenth-century Spanish literature; subject matter varies. Prerequisite: Spanish 311 or 314, or any survey of Spanish literature. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 430. Studies in Twentieth-Century Spanish-American Literature.** Advanced study of major literary movements, genres, or authors in twentieth-century Spanish-American literature; subject matter varies. Prerequisite: Spanish 307 or 310, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 432. Spanish-American Poetry.** The development and major exponents of Spanish-American poetry from the beginnings to the present. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
- 434. Spanish-American Novel.** Major movements and writers in the development of the Spanish-American novel from its beginnings to the present. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
- 435. Seminar in Spanish-American Poetry.** Prerequisite: Spanish 432. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 436. Seminar in Spanish-American Novel.** Same as Comparative Literature 462. Special problems in methodology and research; includes other prose fiction. Prerequisite: Spanish 434. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 437. Spanish-American Drama.** Prerequisite: Spanish 307 or 310. 1 unit.
- 438. Regional and National Literatures of Spanish America.** Advanced study of regional and national literatures in Spanish America; subject matter varies. Prerequisite: Spanish 307 or 310; or equivalent. 1 unit. May be repeated when different regional and national forms are examined.
- 439. The Spanish-American Short Story.** Intensive and analytical study of the principal cuentistas of Spanish America. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
- 442. Seminar in Modern Spanish Literature.** Study of problems in the works of a major writer or group of writers of the eighteenth or nineteenth centuries. Prerequisite: Spanish 305; Spanish 421 or 423, or equivalent. 1 unit. May be repeated to credit as topic varies for a maximum of 2 units.
- 445. Seminar in Twentieth-Century Spanish Literature.** Investigation of literary problems presented by the Spanish novel, drama, and/or essay since 1900. Prerequisite: Spanish 421, 422, 423, or 424, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 447. Introduction to Romance Stylistics.** Same as Italian, Portuguese and French 447. A brief history of the schools and theories of Romance stylistics, especially the French-Swiss *stylistique* (Bally, Marouzeau, and Cressot) and the German-Spanish *Stilforschungen* (Spitzer, Hatzfeld, Kayser, A. Alonso, and D. Alonso); includes a study of representative works and assigned topics for analysis. Prerequisite: Graduate standing in one of the Romance languages; reading knowledge of French and Spanish or consent of instructor. 1 unit.
- 451. Seminar in Spanish Descriptive Linguistics.** Selected topics of Spanish phonology and syntax in the light of present-day linguistic theory. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 452. Seminar in Spanish Historical Linguistics.** Selected topics on the development of Spanish and its dialects in the light of present-day historical methods. Prerequisite: Con-

sent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.

453. History of the Spanish Language. 1 unit.

454. Old Spanish. 1 unit.

460. Seminar in Medieval Spanish Literature. Research work in medieval Spanish literature; theory and practice. Topics vary. Prerequisite: Spanish 411 or 412, and 453 or 454. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.

462. Seminar in Romance Linguistics. Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 462. Selected topics in comparative Romance linguistics. Prerequisite: Spanish 362 and consent of instructor. 1 unit. May be repeated as topic varies.

463. College Teaching of Foreign Languages. Same as English as a Second Language, French, German, and Russian 463. See French 463.

471. Applied Linguistics and Teaching College Spanish. Study of the structure of Spanish with special emphasis on the teaching situation in elementary Spanish courses. 1 unit.

481. Seminar in Linguistic and Psychological Foundations of Language Teaching. Same as English as a Second Language, French, German, and Russian 481. See French 481.

491. Special Topics in Spanish. ½ or 1 unit.

499. Thesis Research. 0 to 4 units.

SPECIAL EDUCATION

Chairperson of Department: Professor R. A. Henderson

Department Office: 288 Education Building, 1310 South Sixth, Champaign

117. Exceptional Children. Introduction to the study of children who deviate from the average in mental, physical, and social characteristics, including a study of the characteristics of such children and the adaptation of educational procedures to their abilities and disabilities. Prerequisite: Sophomore standing or Psychology 100. 3 hours.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

249. Independent Study. Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.

291. Thesis. Prerequisite: Senior standing. 2 hours.

292. Thesis. Prerequisite: Senior standing. 2 hours.

306. Remediation of Academic Behavior Problems in the Regular Classroom. Examines the application of data-based instruction (DBI) techniques to assess and remediate academic behavior problems in the regular classroom; topics include: traditional educational assessment, curriculum-based assessment, application of DBI techniques to improve academic skills, and the role of the classroom teacher in educating students with mild learning and behavior problems. 3 hours or 1 unit.

307. Special Needs Students in Secondary Schools. Examines characteristics, assessment, and methodology of teaching handicapped students in regular classrooms of the secondary schools; major emphases include informal assessment procedures, modification of materials, and individualization of instruction. Prerequisite: Registration in a secondary education teacher certification program, or consent of instructor. 3 hours, or ½ or 1 unit.

308. Teaching Students with Learning and Behavior Problems in the Regular Classroom. Examines the role of the regular classroom teacher in educating students with mild learning and behavior problems; topics include: identifying and describing learning and behavior problems, classroom behavior management techniques, remediation of academic skill deficits, and measuring and evaluating pupil progress. 3 hours or 1 unit.

309. Vocational Education for Special Needs Learners. Same as Vocational and Technical Education 309. See Vocational and Technical Education 309.

- 316. The Gifted Child in School and Society.** A consideration of the gifted in society; who they are, their physical, psychological, social, and educational characteristics, and society's needs and provisions for them. The major portion of the course is devoted to the consideration and evaluation of instructional and administrative adjustments that should be made for the gifted in the educational structure. Prerequisite: Educational Psychology 211 or 236. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 322. Psychology and Education of the Mentally Handicapped.** Study of the social, emotional, physical, and learning characteristics and problems of mentally handicapped children; identification and diagnosis; available services and provisions; and educational programs and curriculum of the school. 3 hours or $\frac{1}{2}$ unit.
- 324. Tests and Measurements in Special Education.** Interpretation of norm- and criterion-referenced tests for special populations; examines selection and design of observation systems; applies measurement/assessment data to making instructional decisions for handicapped infants, youth, and young adults. 2 hours or $\frac{1}{2}$ unit.
- 332. Characteristics and Methods of Educating the Multiply Handicapped.** Studies the physical and developmental characteristics of multiply handicapped individuals; places special emphasis upon individuals with cerebral palsy and other physical handicaps; and reviews methods of educational interventions and requires demonstration of competencies in rudimentary physical management of multiply handicapped individuals. 3 hours or 1 unit.
- 335. Behavior Analysis for Teachers: Applications with Exceptional Individuals.** Prepares students to remediate behavior problems of exceptional students and adults using applied behavior analysis techniques; teaches students to define, observe, and record behavior, to chart and evaluate behavior, and to apply behavioral procedures to remediate classroom behavior problems. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Systematic Instruction for Students with Special Needs.** Elements of data-based instruction emphasizing educational planning for individuals with special needs; includes task and developmental analysis, writing instructional programs, and individualization of instruction. Covers infancy to young adults; mild to severe degrees of handicap. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 4 hours or 1 unit.
- 337. Curriculum Development and Classroom Organization for Students with Moderate and Severe Handicaps.** Studies curriculum design, development, and adaptation for students with moderate and severe handicaps; studies the following basic curriculum areas: domestic/home living, self-care, socialization, community living, leisure and recreation, and functional academics; and emphasizes throughout the course the evaluation of curriculum and program effectiveness. Prerequisite: Special Education 336. 4 hours or 1 unit.
- 338. Teaming with Parents and Staff: Communication, Training, and Cooperation.** Studies educational teams and the development, implementation, and evaluation of individualized educational programs for pupils with moderate, severe, and multiple handicaps; places special emphasis upon models of interactions, roles of team members, training of team members, and program coordination and evaluation of service delivery. 2 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Vocational and Technical Education 345. Provides students with an orientation to a behavioral approach to vocational training for handicapped adolescents and adults; topics include training, managing and evaluating vocational behavior, total service planning, and competitive employment placement and follow-up. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 3 hours or 1 unit.
- 347. Community Integration of the Handicapped.** Seminar for delivery of papers on topics related to the integration of handicapped adults into the community: residential alternatives, normalization, legal aspects, educational aspects, community aspects, etc.; examines ideological and empirical factors in community integration, including cost effectiveness analysis. 2 hours or $\frac{1}{2}$ unit.

- 359. Workshop and Laboratory in Curriculum and Methodology.** An intensive exploration of curriculum development in specialized areas of education. Requests for initiation of course sections are made by faculty or students. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 410. Law and the Handicapped.** Studies the legal rights of handicapped and disabled individuals with special emphasis on educational aspects; examines the inter-relationship of constitutional law, statute law, administrative law, and case law at the federal, state, and local levels. 1 unit.
- 411. Drugs in Special Education.** Psychoactive drugs are used extensively with children in special education; this course involves a general survey of reasons for the prescription, behavioral effects as observed in the classroom, effects on the child's behavior at home, issues concerning the use of the drugs, and litigation about these issues. 1 unit.
- 417. Programs for Special Students.** Introduces special education: characteristics, assessment, and teaching methodology for students with learning and other handicaps; methodology is directed to the regular classroom teacher of special students. Prerequisite: Provisional teaching certification or completion of student teaching; or consent of instructor. 1 unit.
- 420. The Social Psychology of the Handicapped.** Studies the social and emotional adjustment of handicapped children and adults, and of the somatopsychological significance of mental, sensory, and motor variations in the adjustive process; evaluation of effects of limitations imposed by the attitude of society, the attitude of the individual toward the handicap, and the handicap itself; and analysis of implications for current educational programs for the handicapped. Prerequisite: Special Education 117 or 417; Educational Psychology 312; or consent of instructor. 1 unit.
- 421. Administration and Supervision of Special Education.** Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs; examination of administrative and supervisory practices in educating exceptional children with emphasis on special education programs in the public schools; and application of administrative theory to special education programs. Field trips to observe and evaluate programs are required. Prerequisite: Special Education 417; Administration, Higher, and Continuing Education 450. 1 unit.
- 422. Theories of Academic Remediation.** Examines major theoretical approaches in the field of learning disabilities and critically evaluates them in light of research; topics include: definitions of learning disabilities, assessment and remediation strategies, critical evaluation of research, and issues in the field of learning disabilities. 1 unit.
- 424. Supervised Practice in Special Education.** Supervised practice in one or more settings in which either mildly or severely impaired students are served; practicum settings may include day, residential, special, and regular schools which serve handicapped students. Prerequisite: Admission to the graduate program in special education; consent of supervising faculty member. 1 or 2 units.
- 425. Principles and Practices of Resource/Consulting Teaching.** Sequel to Special Education 325 with continued emphasis upon data-based instruction in a direct service setting; in addition, emphasizes provision of indirect (consultation) services to regular classroom teachers. Prerequisite: Special Education 325 and one semester of Special Education 424. 1 unit.
- 426. Theories and Practice of Consultation for Special Educators.** Focuses on aspects of resource/consulting teacher services which go beyond direct instruction services; emphasizes training resource room teachers to work as consultants to regular classroom teachers, parents and paraprofessionals. Students complete a series of consultation projects. 1 unit.
- 446. Career Education for Mentally Retarded Adolescents and Adults.** Career education of mentally retarded populations emphasizing career awareness, exploration, and preparation; vocational, social, community, and daily skills training; and recent litigation and legislation. Prerequisite: Special Education 345. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and

the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.

- 456. Problems and Trends in Special Education.** Introduces significant problems, points of view, and trends in the field concerned; explores significant research related to organization, content, and techniques in the field in question. Students are encouraged to make special studies in approved areas. 1 to 2 units.
- 466. Early Childhood Handicapped: Organization for Noncategorical Educational Intervention.** Discusses program issues and research in relation to the efficacy of various program models for young children with special needs; draws practical implications for program organization variables such as space, personnel roles, and curriculum. Covers infancy through kindergarten age. Prerequisite: Special Education 336. 1 unit.
- 483. Single Subject Research Design.** Same as Educational Psychology 483. Studies research designs that require one or a few subjects; discusses issues of the validity of treatment comparisons and generalizability of results; and presents several statistical approaches for testing a priori hypotheses. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in the education of exceptional children: open only to persons who have been admitted for doctoral study. Sections may be offered in the following fields: (d) program planning and orientation; and (t) teacher education. 1 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 492. Concepts and Issues in Special Education, I.** Studies the delineation of roles and competencies for leadership positions; includes literature critique, and preparation and presentation of a major review paper in an area of research interest. Prerequisite: Admission to doctoral studies in Special Education, or consent of instructor. 1 unit.
- 493. Concepts and Issues in Special Education, II.** Seminar in current concepts and issues relating to all exceptional children; includes presentations by experts in sub-specialties of the field; requires critical review of key readings and preparation of papers synthesizing lectures, discussions and readings. Prerequisite: Special Education 492 or consent of instructor. 1 unit.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

SPEECH AND HEARING SCIENCE

Head of Department: Professor R. C. Bilger

Department Office: 901 South Sixth Street, Champaign

- 102. Human Communication: Systems, Processes, and Disorders.** Examines broad perspectives of theories and information regarding normal and abnormal communication: how speech and language develop, how people hear, how they produce speech and what can go wrong; addresses the impact of speech and hearing science on society, culture, and modern technologies. 3 hours.
- 105. Voice and Articulation.** Same as Speech Communication 105. Basic factors of voice and speech sound production; analysis of faults that result in minor speech deviations or inadequacies; and individual analysis and guided practice toward improvement of speech habits. 2 hours.
- 198. Freshman Seminar.** A special experimental seminar or independent study course intended to cover topics not treated by regular course offerings; open to undergraduates at any level. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the academic department concerned. While credit

toward graduation is normally granted, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. 0 to 9 hours. May be repeated.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
208. **Speech and Hearing Problems in the Classroom.** An orientation of prospective teachers to speech and hearing problems encountered in the elementary and secondary schools; emphasis on description of problems and types of classroom management. Prerequisite: Junior standing. 3 hours.
260. **American Sign Language.** Same as Linguistics and Psychology 260. See Psychology 260.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Ten hours of speech and hearing science, and written approval by the faculty members who will supervise the student's work. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
291. **Honors Course.** Individual study leading either to a thesis or to departmental honors. Prerequisite: Senior standing; a grade point of 4.0 or consent of the head of the department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
301. **General Phonetics.** Same as Speech Communication 301. Basic principles of phonetic study; includes observation and representation of pronunciation, ear training, and practice in transcription. 3 hours, or $\frac{1}{2}$ or 1 unit.
302. **Manual Communication, I.** Study of methods of manual communication with hearing impaired individuals; analysis of the language of signs and finger spelling in relation to origins, development, and structure; and extensive practice in manual communication. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
303. **Manual Communication, II.** Continuation of Speech and Hearing Science 302; an in-depth study of manual methods of communicating with hearing impaired individuals; particular emphasis on development of fluency in communicating with language-deficient deaf children and adults; and extensive practice in idiomatic language of signs. 2 hours or $\frac{1}{2}$ unit.
310. **Effects of Noise.** Presents the effects of noise (industrial, recreational, and transportation) on the individual and the community. Topics include methods of measuring noise, the physiological and psychological effects of noise; methods of abatement and hearing conservation; and legal aspects of noise damage and noise control. 3 hours or $\frac{1}{2}$ unit.
348. **Speech and Language Clinical Methods in the Schools.** Same as Elementary and Early Childhood Education 348. Study of methods and materials used in the schools by the speech and language clinician. Prerequisite: Speech and Hearing Science 388. 3 hours or $\frac{1}{2}$ unit.
375. **Speech Science, I.** Same as Speech Communication 375 and Linguistics 375. Introduction to the anatomical and physiological characteristics of the normal speech and hearing mechanisms, and to fundamental acoustics of speech. Prerequisite: Consent of instructor. 4 hours or 1 unit.
376. **Speech Science, II.** Same as Speech Communication 376 and Linguistics 376. Consideration of the physiology of the speaking act, the acoustical characteristics of voice and of speech sounds, and the hearing of speech. Prerequisite: Consent of instructor. 4 hours or 1 unit.
378. **Hearing Science.** Acoustics, anatomy, and physiology of the auditory system; psychophysical methods; and a consideration of auditory theories and mechanics. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
383. **Development of Spoken Language.** Same as Speech Communication 383. Study of the correlates of language development from the prelinguistic period to adulthood. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **Introduction to Stuttering.** Study of the theoretical and research literature concerning the causes, diagnosis, and treatment of stuttering and an analysis of clinical procedures in stuttering therapy. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **Speech Pathology, I.** A study of the symptoms, causes, and treatment of articulation disorders. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.

- 386. Language Disorders in Children.** Definition, etiology, and description of various types of language disorders in children; assessment and intervention of these clinical cases. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 387. Basic Principles in Speech Pathology.** Discussion, demonstration, and practice of clinical approaches used with speech and language disorders. Prerequisite: Speech and Hearing Science 385, 388, and 389. 5 hours or 1 unit.
- 388. Speech Pathology, II.** A study of the symptoms, causes, and treatment of voice disorders. Prerequisite: Speech and Hearing Science 385 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 389. Appraisal in Speech Pathology.** Introduction to principles of diagnosis; discussion of administration, scoring, and interpretation of tests utilized during speech and language evaluation. Prerequisite: Speech and Hearing Science 383 and 385, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 390. Introduction to Hearing Disorders and Audiometry.** Review of the history of audiology as a profession; study of symptoms, causes, and treatment of hearing losses; and principles and application of basic audiometry. 4 hours or 1 unit.
- 392. Diagnosis of Hearing Impairments in Infants and Young Children.** Symptoms and causes of hearing impairment in young children; practice in procedures used for the measurement of residual hearing; and the selection and use of hearing aids. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 393. Aural Habilitation and Rehabilitation.** Principles and methods of clinical and classroom retraining of the hard-of-hearing; includes lip reading, auditory training, speech disorders and conversation, and counseling. Required in curriculum of teacher training in speech and hearing science. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 398. Practicum in Audiology.** Observation, practice, and research in diagnosis and rehabilitation of auditory disorders. Students may repeat either Speech and Hearing Science 387 or 398, but not both, for 3 hours. Prerequisite: Speech and Hearing Science 389 and 393. 3 hours or $\frac{1}{2}$ unit.
- 399. Design and Analysis of Experiments in Speech and Hearing Science.** An introduction to experimental designs and methods of statistical analysis in speech and hearing research. Prerequisite: Graduate standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 401. Applied Phonology.** A survey of basic knowledge concerning normal and deviant phonological development, and principles for applying this knowledge to the assessment and remediation of phonological disorders. Prerequisite: Consent of instructor. 1 unit.
- 418. Communication and Language Problems of the Hearing Impaired, I.** An advanced course in the problems and procedures involved in the acquisition of language and communication by persons with severe hearing impairment, particularly those with profound prelingual deafness; emphasis on research and measurement in the development of speech, speechreading, residual hearing, reading, written language, and manual communication, including finger spelling and the language of signs; and stress on the applications of recent approaches in linguistics and psycholinguistics to language development. Prerequisite: Consent of instructor. 1 unit.
- 419. Communication and Language Problems of the Hearing Impaired, II.** Continuation of Speech and Hearing Science 418. Problems of language and communication of persons with hearing impairments ranging from mild to profound; research findings and measurement techniques for assessing the development of speech, speechreading, residual hearing, reading, written language, and manual communication. Prerequisite: Consent of instructor. 1 unit.
- 475. Experimental Phonetics, I.** Same as Linguistics 475. Theoretical consideration of speech as motor behavior; special reference to physiological investigations of normal respiration, phonation, and articulation; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
- 476. Experimental Phonetics, II.** Same as Linguistics 476. Theoretical consideration of speech as an acoustical phenomenon; special reference to acoustical investigations of voice and speech sounds; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.

- 481. Seminar in Neuropathologies of Speech and Language.** Advanced study of speech, vocal, and linguistics problems associated with cerebral palsy and aphasia; topics offered in rotation, one or two each semester, include neurological aspects, aphasia, and cerebral palsy. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
- 482. Seminar in Stuttering.** Advanced study of stuttering disorders; topics vary, but emphasis is placed on measurement, clinical evaluation, and therapeutic methods. Prerequisite: A course in stuttering. 1 unit.
- 483. Psychology of Speech and Hearing Disorders, I.** Same as Psychology 483. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to speech disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
- 484. Psychology of Speech and Hearing Disorders, II.** Same as Psychology 484. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to hearing disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
- 486. Advanced Clinical Techniques in Speech and Hearing.** Semi-independent management of complex cases; participation in examination and analysis; topics offered each semester include theory of clinical practice, speech pathology, audiology, language disorders, and field study. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.
- 489. Seminar in Orofacial Anomalies and Laryngeal Pathologies of Speech.** Advanced study of speech and vocal problems associated with cleft palate, laryngeal dysfunctions, and facial-maxillary disturbances; topics offered in rotation, one each semester, include cleft palate and vocal problems. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 490. Medical Aspects of Speech Disorders and Audiology.** Study of acute and chronic hearing and speech disorders traceable to disease of the ear and vocal mechanisms in relation to the techniques and philosophies utilized in a medically oriented environment. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
- 491. Seminar in Hearing Disorders.** Principles and methods of clinical management of all types of hearing disorders; survey of current literature and research. The following topics are offered in rotation, one or two each semester: automatic audiometry, aural rehabilitation, and hearing aids and amplification. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 492. Advanced Audiology.** Advanced study of rationale and development of principles associated with special techniques, procedures, and methods used in audiology. 1 unit.
- 495. Special Problems.** Investigation of speech projects not included in theses. Prerequisite: Consent of head of the department. $\frac{1}{2}$ to 2 units.
- 496. Proseminar in Speech and Hearing Science.** Required seminar for all graduate students; involves reporting of ongoing research of faculty, visiting researchers, and students. 0 units.
- 499. Thesis Research.** Individual research in the various areas of speech and hearing science. 0 to 4 units.

SPEECH COMMUNICATION

Head of Department: Professor J. G. Delia

Department Office: 244 Lincoln Hall, 702 S. Wright, Urbana

- 101. Principles of Effective Speaking.** Preparation and presentation of short informative and persuasive speeches; emphasis on the selection and organization of material, methods of securing interest and attention, and the elements of delivery. 3 hours. Credit is not given for both Speech Communication 101 and either 111 or 112.

- 102. Introduction to Speech Communication.** Survey of the questions probed, the methods employed, and the current status of knowledge in the speech communication discipline; provides opportunities to understand the range of concerns and to explore specific areas of interest of the field. 4 hours.
- 105. Voice and Articulation.** Same as Speech and Hearing Science 105. See Speech and Hearing Science 105.
- 107. Parliamentary Procedure.** Principles and practice of parliamentary procedure. 2 hours.
- 111. Verbal Communication.** Principles and practice in communication; stress on fundamentals of exposition in writing and speaking. The University rhetoric requirement is fulfilled by this course in conjunction with Speech Communication 112. 3 hours. Credit is not given for both Speech Communication 111 and 101.
- 112. Verbal Communication.** Theory and practice of communication; stress on deliberation and fundamentals of persuasion through speaking and writing. The University rhetoric requirement is fulfilled by this course. Prerequisite: Speech Communication 111. 3 hours. Credit is not given for both Speech Communication 112 and 101.
- 113. Group Discussion and Conference Leadership.** Study of leadership, group process, and interpersonal relations in the small group, conference, and the public forum; emphasis on practice in leading and participation in various types of public discussion and conference, with materials drawn from current public questions. Prerequisite: Sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours.
- 120. Advanced Oral Communication.** Advanced principles of speech preparation and presentation; special problems and types of speeches; and considerable practice in composition and delivery of speeches. Prerequisite: Speech Communication 101 or equivalent. 3 hours.
- 123. Public Discussion and Debate.** Study of and participation in public discussion and debate with emphasis on thorough preparation and research, principles of analysis, reasoning, evidence, and persuasive presentation of well-founded convictions; previous debate experience not required. 3 hours.
- 141. Oral Interpretation.** Same as Theatre 180. Oral reading for understanding, appreciation, and communication. 3 hours.
- 142. Group Oral Interpretation of Literature.** Same as Theatre 181. Study of modern modes of group presentation of literature; emphasis on practice in script preparation, directing, and performance in chamber theatre and readers' theatre. Prerequisite: Speech Communication 141 or consent of instructor. 2 hours.
- 161. Fundamentals of Acting.** Same as Theatre 170. See Theatre 170.
- 177. The Arts of Public Discourse.** The nature and forms of practical and artistic public speech, including adaptations for the mass audience. 4 hours.
- 178. The Arts of the Theatre and Interpretative Speech.** The nature and forms of performing speech arts of theatre, interpretation, and film, including adaptations for the mass audience. 4 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Dramatics for Teachers.** Survey of methods and procedures of play production in the secondary school. 3 hours.
- 204. Speech for Teachers.** A course in teaching methods designed for prospective teachers who are non-speech communication majors; discussion of methods and materials available for teaching speech and directing extracurricular speech activities. 3 hours.
- 207. The Art of the Screen: Humor.** Study of selected comedies and other specimens of film and television humor in relation to theories of humor. Prerequisite: Consent of instructor. 3 hours.
- 210. The Rhetorical Tradition.** Survey of major trends in the development of rhetorical theory from Homer to the present. 3 hours. (Counts for advanced hours in LAS.)

- 211. Business and Professional Speaking.** Study, preparation, and presentation of the chief types of business speeches; special attention to conferences, sales talks, interviews, and job applications. Prerequisite: Speech Communication 101. 2 hours.
- 213. Persuasion and the Arts.** Introduction to the study of narrative films, theatre, fiction, and poetry as vehicles of indirect and overt persuasion. 3 hours.
- 221. Persuasion.** Study of the processes of motivation as applied to speeches intended to influence group opinion and action; practice in the preparation and delivery of short persuasive speeches. Prerequisite: Speech Communication 101; junior standing. 3 hours. (Counts for advanced hours in LAS.)
- 223. Argumentation: Theory and Practice.** Study of the theory of argument, e.g., evidence, reasoning, and construction of briefs; practice in formal and informal forms of debate and public discourse on current public questions. Prerequisite: Speech Communication 101; sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
- 230. Interpersonal Communication.** Study of communication theory and its application to interpersonal relations; extensive discussion of problems of conflict and misunderstanding in personal affairs to facilitate the development of knowledge, insights, and skills in the processes of face-to-face interaction. Prerequisite: Speech Communication 101 and sophomore standing; by permission of the head of the department, the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
- 243. The Oral Interpretation of Shakespeare.** Analysis and oral presentation of selections from Shakespeare's plays. Prerequisite: Junior standing; Speech Communication 141. 2 hours. (Counts for advanced hours in LAS.)
- 247. Teaching of Speech.** Same as Secondary Education 247. See Secondary Education 247.
- 252. The Rhetoric of Dissent.** A study of the rhetorical strategies and tactics employed in selected cases of dissent in American political and social life. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 253. Case Studies in Public Discourse.** Detailed examination of selected cases of significant public discourse. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
- 254. Freedom of Speech and the Ethics of Speech Communication.** Examination of the nature and variety of responses to value questions concerning communication; includes a survey of the evolution of and current controversies in freedom of speech. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 255. Directing: Script Preparation.** Same as Theatre 281. See Theatre 281.
- 290. Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.25; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
- 291. Honors Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Individual study leading to a thesis for honors in the Department of Speech Communication. Prerequisite: Senior standing; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
- 296. Special Topics in Speech Communication.** Special topics in speech communication not treated in regularly scheduled courses. See Timetable for current topics. Prerequisite: Sophomore standing and one course in speech communication; or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)

- 301. General Phonetics.** Same as Speech and Hearing Science 301. See Speech and Hearing Science 301.
- 308. The Art of the Screen: Exposition and Persuasion.** Same as Communications 308. Critical study of the application of the eclectic principles of the screen narrative to the transmission of information and the influencing of attitude, opinion, and action; lectures, discussions, and reports; viewing of selected films and television programs. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 313. Interpersonal Communication: Discussion and Interview.** Advanced study of theory, research, techniques, and training methods in interviewing and group discussion; emphasis on empirical research findings concerning communication processes in face-to-face groups. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 315. Greek, Roman, and Medieval Rhetorical Theory.** Same as Classical Civilization 315. Examination of the development of rhetorical theory, criticism, and pedagogy in Western thought; analysis of the contributions of major figures and works from Homer to the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 317. Contemporary Rhetorical Theory.** Coverage of the major contributors to rhetorical theory from James and Winans to the present. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 319. Russian and East European Cinema.** Same as Communications and Slavic 319. See Slavic 319.
- 320. Argumentation and Public Decision Making.** Study of the philosophical, logical, and psychological bases of public decision making through discussion and debate. Prerequisite: Speech Communication 223 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Theories of Persuasion.** Survey of theories of persuasion derived from rhetorical, philosophical, and psychological sources and their application to persuasive discourse. Prerequisite: Speech Communication 221 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 322. Renaissance and Modern Rhetorical Theory.** Significant movements in the development of rhetorical theory in England, France, and America from 1500 to the present. Prerequisite: Senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 323. Rhetorical Criticism.** Methods of interpreting and judging persuasive discourse with emphasis on political speaking and writing; lectures and practice in criticism. Prerequisite: Credit or concurrent registration in Speech Communication 322 or 350. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 324. Persuasion in the Campaign and Movement.** Consideration of factors central to the sustained persuasive campaign or movement; special attention to the nature and functions of persuasion in the political campaign. Prerequisite: Speech Communication 221 or 321, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Sex-Related Differences in Language.** Same as Linguistics and Women's Studies 332. Study of actual and perceived differences and similarities in the use of language by women and by men; emphasizes the social contexts of speech. Prerequisite: A course in speech communication or linguistics, or equivalent. 3 hours or 1 unit.
- 335. Interpersonal Communication Processes.** Same as Communications 335. Study of the major processes involved in an individual's adjustment to the communication situations of everyday life; emphasis on the development of interpersonal competency and orientations, social perception, interpersonal sentiment and hostility, trust, and the social context as factors influencing the understanding and evaluation of interpersonal messages. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 342. Oral Interpretation of Poetry.** Analysis and oral presentation of literature representative of various poetic forms. Prerequisite: Speech Communication 141. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Criticism of the Oral Interpretation of Literature.** Examination of theories of aesthetics and practical criticism and their application to the criticism of specific examples of the oral performance of literature. Prerequisite: Speech Communication 141 or graduate standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Oral Interpretation of Prose Fiction.** Same as Theatre 376. Modern concepts underlying the relationship of interpretation to the reader's experience of literature; discussions,

reports, and oral interpretations of prose forms (including chamber theatre and readers' theatre). Prerequisite: Speech Communication 141 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 350. Selected Topics in the History and Criticism of Public Discourse.** Study of selected periods and genres of public discourse in historical context, including British, American, French, Russian, German, Chinese, and Japanese. Prerequisite: One course in rhetorical criticism or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated with different content to a maximum of 12 hours or 4 units.
- 353. Criticism of Contemporary Public Discourse.** Rhetorical criticism of selected aspects of contemporary public communication. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 374. Introduction to Empirical Research Methods in Speech Communication.** Introduction to descriptive and experimental methods in speech communication; intended to produce understanding and critical evaluation of research designs. 3 hours or $\frac{1}{2}$ unit.
- 375. Speech Science, I.** Same as Linguistics and Speech and Hearing Science 375. See Speech and Hearing Science 375.
- 376. Speech Science, II.** Same as Linguistics and Speech and Hearing Science 376. See Speech and Hearing Science 376.
- 383. Development of Spoken Language.** Same as Speech and Hearing Science 383. See Speech and Hearing Science 383.
- 387. Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Slavic 387. See English 387.
- 396. Combined Undergraduate/Graduate Seminar.** Seminar on advanced topics in speech communication not treated in regularly scheduled courses; see Timetable for current topics. Prerequisite: Junior standing and two courses in speech communication, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 400. Studies in Dramatic Form and Structure.** Same as Theatre 401. See Theatre 401.
- 403. Seminar for Teachers of Speech.** Investigation of current principles, materials, and developments in the field of speech communication and of their relationship to the teacher. 1 unit.
- 417. Contemporary Viewpoints in Speech Communication Theory.** Same as Communications 417. A readings seminar comparing the principal approaches to communication and rhetorical theory in the twentieth century along with a consideration of their philosophical assumptions. 1 unit.
- 429. Seminar in Speech Communication.** Special topics in speech communication. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 430. Contemporary Theories of Oral Communication.** Systematic study of speech making and discussion as related to contemporary views of communication; examination of the theoretical literature and experimental evidence. Prerequisite: Consent of instructor. 1 unit.
- 436. Seminar in Theories and Procedures of Discussion.** Intensive examination of selected problems of communication in small, task-oriented groups; evaluation of special instrumental forms, such as the unstructured group, the work group, the panel, and the lecture-forum; critical analysis of recent research in group communication as a means of making decisions and of changing attitudes and behavior. Prerequisite: Speech Communication 313 or equivalent. 1 unit.
- 437. The Analysis of Interpersonal Interaction.** Same as Communications 437. Exploration of theory, methodology, and empirical findings of descriptive and experimental approaches to the analysis of verbal and nonverbal interaction processes, in both laboratory and naturalistic settings. Prerequisite: Speech Communication 335 or consent of instructor. 1 unit.
- 438. Seminar in Rhetorical Theory.** Study of special topics in the history of rhetorical theory. 1 unit. May be repeated for a maximum of 4 units.
- 441. Historical Background of Oral Interpretation.** Historical survey of British and American theories of interpretation. 1 unit.

- 442. Seminar in Oral Interpretation.** Investigation of basic problems in the history, nature, and function of oral interpretation. Prerequisite: Speech Communication 441; consent of instructor. 1 unit.
- 443. Seminar in the Oral Interpretation of Individual Literary Styles.** Examination of the literary style of an individual writer or selected writers, through research, discussion, and oral readings. See Timetable for current topics. 1 unit. May be repeated with a change in content to a maximum of 4 units.
- 465. Seminar in Theatre Art.** Same as Theatre 407. See Theatre 407.
- 468. Seminar in Theatre History.** Same as Theatre 406. See Theatre 406.
- 469. Seminar in the Stage History of Classic English Plays.** Same as English 469 and Theatre 405. See English 469.
- 474. Experimental Design in Speech Communication Research.** Detailed treatment of major issues and options in designs employed in speech communication research. Prerequisite: Speech Communication 374 or equivalent; introductory statistics course. $\frac{1}{2}$ or 1 unit.
- 495. Special Problems.** Individual investigation of special projects not included in theses. Prerequisite: Consent of head of department. $\frac{1}{2}$ to 2 units. Open to master's candidates for a maximum of 1 unit, and to doctoral candidates for 1 or 2 units.
- 499. Thesis Research.** 0 to 4 units.

STATISTICS

Head of Department: Professor Jerome Sacks

Department Office: 221 Altgeld Hall, 1409 W. Green, Urbana

- 100. Statistics.** Same as Mathematics 161. A first course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models. Prerequisite: Mathematics 111 or 112. 3 hours. Credit is not given for both Statistics 100 and Economics 171 or 172 or Psychology 233.
- 210. Statistics for Scientists.** Same as Mathematics 263. A first course in the use of statistical methodology for the interpretation and analysis of data arising from scientific investigations; directed toward a general audience of students in physical, biological, social, or engineering sciences; and prepares the student for the sequel course, Statistics 320. Prerequisite: Mathematics 242, 244, or 245; or equivalent. 3 hours.
- 308. Actuarial Statistics, I.** Same as Mathematics 308. See Mathematics 308.
- 309. Actuarial Statistics, II.** Same as Mathematics 309. See Mathematics 309.
- 310. Introduction to Mathematical Statistics and Probability, I.** Same as Mathematics 363. Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Offers a basic one-semester introduction to statistics and also prepares students for Statistics 311. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit.
- 311. Introduction to Mathematical Statistics and Probability, II.** Same as Mathematics 364. Continuation of Statistics 310. Includes moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests. Prerequisite: Either Statistics 310 or both Statistics 100 and Mathematics 361. 3 hours or 1 unit.
- 320. Methods of Applied Statistics.** Same as Mathematics 369. Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of

- tests; emphasizes when and why various tests are appropriate and how they are used. Prerequisite: Statistics 210 or an introductory statistics course, Mathematics 132 or 134 or equivalent, and knowledge of basic matrix manipulations; or consent of instructor. 3 hours or 1 unit.
- 324. Analysis of Variance.** Same as Mathematics 365. Estimation and hypotheses testing in linear models; one-, two-, and higher-way layouts; incomplete layouts; analysis of covariance; and random effects models and mixed models. Prerequisite: Credit or concurrent registration in Mathematics 315 and Statistics 311. 3 hours or 1 unit.
- 325. Applied Regression and Design.** Explores linear regression, least squares estimates, F-tests, analysis of residuals, regression diagnostics, transformations, model building, factorial designs, randomized complete block designs, Latin squares, split plot designs. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 326. Sampling and Categorical Data.** Sampling: simple random, stratified, systematic, cluster, and multi-stage sampling. Categorical data: multiway contingency tables, maximum likelihood estimation, goodness-of-fit tests, model selection, logistic regression. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 327. Statistical Consulting.** Students, working in groups under the supervision of the instructor, consult with faculty and graduate students through the Statistical Consulting Service; readings from literature on consulting. Prerequisite: Statistics 324 or consent of instructor. 3 hours or 1 unit.
- 328. Statistical Computing.** Same as Mathematics 393. Examines statistical packages, numerical analysis for linear and nonlinear models, graphics, and random number generation and Monte Carlo methods. Prerequisite: Statistics 311 or equivalent; knowledge of FORTRAN. 3 hours or 1 unit.
- 329. Time Series Analysis.** Same as Mathematics 394. Studies theory and data analysis for stationary and pre-stationed time series; examines auto-regressive moving average model building and statistical techniques; and discusses spectral model building and statistical analysis using windowed periodograms and Fast Fourier Transformations. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 330. Topics in Applied Statistics.** Same as Mathematics 368. Formulation and analysis of mathematical models for random phenomena; extensive involvement with the analysis of real data; and instruction in statistical and computing techniques as needed. Prerequisite: Statistics 311 or 320; or consent of instructor. 3 hours or 1 unit. May be taken for credit more than once with consent of instructor.
- 351. Introduction to Probability Theory, I.** Same as Mathematics 361. See Mathematics 361.
- 356. Introduction to Probability Theory, II.** Same as Mathematics 366. See Mathematics 366.
- 410. Mathematical Statistics, I.** Distributions, transformations, order-statistics, exponential families, sufficiency, delta-method, Edgeworth expansions; uniformly minimum variance unbiased estimators, Rao-Blackwell theorem, Cramer-Rao lower bound, information inequality; equivariance. Prerequisite: Statistics 311. 1 unit.
- 411. Mathematical Statistics, II.** Bayes estimates, minimaxity, admissibility; maximum likelihood estimation, consistency, asymptotic efficiency; testing and confidence intervals; Neyman-Pearson lemma, uniformly most powerful tests; likelihood ratio tests and large-sample approximation; nonparametrics. Prerequisite: Statistics 410. 1 unit.
- 425. Current Research in Applied and Computational Statistics.** Various topics, such as ridge regression; robust regression; jackknife, bootstrap, cross-validation and resampling plans; E-M algorithm; projection pursuit; all with a strong computational flavor. Prerequisite: Statistics 325, 326, and 411; or consent of instructor. 3 hours or 1 unit.
- 451. Theory of Probability, I.** Same as Mathematics 451. See Mathematics 451.
- 452. Theory of Probability, II.** Same as Mathematics 452. See Mathematics 452.
- 453. Probability and Measure, I.** Same as Mathematics 481. See Mathematics 481.
- 454. Probability and Measure, II.** Same as Mathematics 482. See Mathematics 482.
- 455. Applied Stochastic Processes.** Same as Mathematics 461. See Mathematics 461.

- 470. Statistical Decision Functions.** Same as Mathematics 470. Statistics from the point of view of decision making; introduction to the theory of games; minimax and other decision functions; techniques for determining optimal decision functions; and applications to nonsequential and sequential decision making in practice. Prerequisite: Consent of instructor. 1 unit.
- 471. Multivariate Analysis.** Same as Mathematics 471. Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: Statistics 362 or 364 and Mathematics 315, or consent of instructor. 1 unit.
- 475. Large Sample Theory.** Limiting distribution of maximum likelihood estimators, likelihood ratio test statistics, U-statistics, M-, L-, and R-estimators, nonparametric test statistics, Von Mises differentiable statistical functions; asymptotic relative efficiencies; asymptotic expansions. Prerequisite: Statistics 411 and either Mathematics 451 or 482. 1 unit.
- 478. Topics in Statistics.** Same as Mathematics 478. Prerequisite: Consent of instructor. 1 unit.
- 490. Reading Course.** Directed reading on various topics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated, subject to approval by the student's advisor.
- 499. Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

TEXTILES, APPAREL, AND INTERIOR DESIGN

(Including Interior Design and Textiles and Apparel)

Head of Department: Professor Marjorie Mead

Department Office: 237 Bevier Hall, 905 S. Goodwin, Urbana

Interior Design

- 160. Residential Environments.** Design fundamentals utilized in the development and selection of housing to meet human needs; aesthetic, social, economic, structural, and functional aspects of residential environments. 3 hours.
- 161. Interior Design Studio, I.** Theory and practice in the elements of interior design: design parameter development, model building; laboratory and discussion. Primarily for students in the interior design curriculum. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Interior Design Internship.** A supervised, off-campus experience in interior design through a cooperative program with selected employers. Prerequisite: Interior Design 160, 161, 262, and 263. 4 hours.
- 260. Interiors and Furniture, I.** Development of interior environments from prehistoric times to the nineteenth century in Europe with emphasis on the social, economic, political, and cultural aspects which influenced the development of architecture and furniture; consideration of the adaptation and use of period styles in contemporary interiors. Prerequisite: History of Art 112 or consent of instructor. 3 hours.
- 261. Interiors and Furniture, II.** Continuation of Interior Design 260. Development of interior environments through the Federal Period in America and during the nineteenth and twentieth centuries in Europe and the United States; emphasizes the social, economic, political, and cultural influences on the evolution of the styles. Prerequisite: Interior Design 260. 3 hours.
- 262. Interior Design Studio, II.** Designing of interiors and their components: emphasis on design theory, presentation techniques, and evaluation of design concepts. Prerequisite: Interior Design 160 and 161; General Professional Courses in Art and Design 118 and 120. 3 hours.
- 263. Interior Design Studio, III.** Examines characteristics, manufacturing processes, and

- application of materials as related to interior design, design process, and presentation. Prerequisite: Interior Design 262 or consent of instructor. 3 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 360. Interior Design Studio, IV.** Development of complete set of working drawings for a moderate size single family house emphasizing floor plans, elevations, sections, details, schedules, electrical and furniture layouts. Prerequisite: Interior Design 263 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 361. Development and Function of Family Housing.** Same as Agricultural Mechanization and Family and Consumer Economics 361. See Agricultural Mechanization 361.
- 378. Problems in Interior Design, Studio V.** Individual investigations and reports of specific problems in the field of interior design. Prerequisite: Interior Design 360 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 380. Colonial American Interior Design.** An analysis of regional variations of American furnishings, interior finishes, and architecture from colonization to 1783; considers historical, economic, social, political, and religious influences on design. Prerequisite: Interior Design 261. 3 hours or $\frac{3}{4}$ unit.
- 485. Interior Design Seminar.** An advanced, multidisciplinary approach to current research in interior design. Prerequisite: Six hours of interior design or a related field at the 300- or 400-level, or equivalent; consent of instructor. 1 unit.
- 493. Advanced Studies in Interior Design.** Advanced research on a specific topic related to interior design; provides experience in one of the following types of research: laboratory, theoretical, historical, or a problem in design. Prerequisite: Interior Design 485. 1 unit.
- 499. Thesis Research.** Interior design thesis research using design, laboratory, or theoretical methodologies to investigate specific topics. Prerequisite: Interior Design 485. 0 to 2 units.

Textiles and Apparel

- 182. Apparel Production Analysis.** Introduces the nature and scope of apparel production methods in the U.S.; investigates new technology and apparel testing methods; includes apparel design analysis, cutting production analysis, principles of apparel construction techniques, production control, quality control and cost control. 3 or 4 hours.
- 183. Consumer Textiles.** Introductory analysis and study of textile fibers, yarns, fabrications, finishes, and regulatory legislation; designed to improve consumer competence in selection, use, and care of textile products. Lecture and laboratory. Prerequisite: Chemistry 100 or exemption. 3 hours.
- 184. Apparel Design and Selection.** A comprehensive overview of apparel design and selection of clothing for individual needs as they relate to the designing and marketing of apparel goods; emphasizes translating theory into practice by creating two-dimensional original designs. Prerequisite: Introduction to Art and Design 185 or General Professional Courses in Art and Design 119; or consent of instructor. 3 hours.
- 190. Cross-Cultural Analysis of Dress.** Analyzes cross-cultural variations in form, functions, and meaning of dress in relation to biological, psychological, and social needs of human beings. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Textile and Apparel Business Internship.** A supervised learning experience through a cooperative program with a textile and/or apparel related agency, business, or industry. Prerequisite: Sophomore standing; Textiles and Apparel 182, 183, or 184; consent of supervisor of internships. Not available to students on probation. 4 hours.
- 280. Textiles for Interiors.** Develops criteria for selection of textiles, emphasizing aesthetics, comfort, durability, energy conservation, cost and safety considerations for private and public interiors, including transportation interiors; introduces standards and specifications

- for textiles used in residential and commercial interiors. Prerequisite: Textiles and Apparel 183. 3 hours.
- 281. Retailing of Home and Apparel Accessories.** Consumer analysis of accessory items of leather, fur, plastic, metal, glass, and china; includes technological, ecological, economic, and legislative aspects of each; develops analytical skills in evaluating quality of these materials. Prerequisite: Textiles and Apparel 183 or consent of instructor. 3 hours.
- 284. Apparel Design for the Market.** Design of apparel for high fashion and mass fashion markets for various price levels and age groups through the development of color sketches; includes a survey of design sources that influence contemporary dress. Prerequisite: General Professional Courses in Art and Design 120 or Introduction to Art and Design 186; Textiles and Apparel 184. 2 hours.
- 285. History of Costume.** Costumes and their settings from the early Egyptian period through the middle of the twentieth century. 3 hours.
- 286. Apparel Design: Flat Pattern.** Use of the flat pattern technique in designing and drafting clothing patterns; construction of two garments from patterns developed. Prerequisite: General Professional Courses in Art and Design 120, or Introduction to Art and Design 186; Textiles and Apparel 182; Textiles and Apparel 183 and 184. 3 hours.
- 287. Dress and Human Behavior.** Applies selected principles from the behavioral and social sciences to the analysis of dress as it relates to human behavior; includes relevant historical and contemporary theory and research. Prerequisite: Textiles and Apparel 190; Sociology 201 or Psychology 201; or consent of instructor. 3 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 295. Textile and Apparel Marketing.** History of the development of fiber, fabric, apparel, and related industries; present structure, organization, domestic and international operation, and interrelationships of these industries; trends of the major sectors of the primary and secondary markets; and application of the principles of marketing to textiles and apparel. Prerequisite: Business Administration 202. 3 hours.
- 296. Administrative Retailing.** Analysis of functions in a retail store with emphasis on textiles and apparel; relationship of the retailer to related primary and secondary markets and the consumer; and analysis of current trends and social influences in fashion retailing. Prerequisite: Business Administration 212. 3 hours.
- 350. Textiles and Apparel Business Practicum.** A cooperatively supervised field experience in management and administration in a textile or apparel business and/or industry. Only one unit may be applied to the total required for a graduate degree in Human Resources and Family Studies, TAID option. At the undergraduate level, only four hours may be applied to the total TAID courses required. Prerequisite: Major in Textiles, Apparel, and Interior Design; Textiles and Apparel 295 or 296; and consent of instructor. Not available to students on probation. 4 or 6 hours, or 1 or ½ units. May be taken during the same semester for up to 12 hours or 3 units.
- 380. Advanced Textiles.** Studies chemical composition, polymer structure, and engineering potential of textile fibers; examines effect of chemical finishes and recycling procedures on performance characteristics of consumer textile products; and introduces physical and chemical metrology techniques useful for quality control and research purposes. Prerequisite: Textiles and Apparel 280, and Chemistry 102 or 103. 4 hours or 1 unit.
- 385. History of Textiles.** Examines the aesthetic, technological, and cultural aspects of significant textiles produced by selected societies throughout history. 4 hours or 1 unit.
- 386. Apparel Design: Draping.** Designing garments by draping fabric on a dress form; understanding garment fitting principles through fabric manipulation; developing construction techniques for design effects. Prerequisite: Textiles and Apparel 286. 4 hours or 1 unit.
- 388. Problems in Textiles and Clothing.** Individual problems in the fields of textiles, apparel, marketing, or textile design. Prerequisite: Senior standing; 3.5 grade-point average;

consent of instructor; credit in one of the following: Textiles and Apparel 285, 286, 287, 294, or 380, or Business Administration 212. 2 to 4 hours, or ½ to 1 unit.

- 395. Concepts and Cases in Retailing.** An overview of consumer behavior as related to textiles and apparel; interrelationships of foreign and domestic textile and apparel markets; current research in retailing; and analysis of fashion marketing and retailing issues through the case study method. Prerequisite: Business Administration 212. 3 hours or ½ unit.
- 405. Research Methods in Home Economics.** Same as Family and Consumer Economics 405. Theory and practice of empirical research methods that have application to such areas of home economics as textiles, apparel, interior design, and family and consumer economics. Prerequisite: An introductory course in statistics. 1 unit.
- 480. Seminar in Textiles.** Reviews research literature in the field of textiles. Prerequisite: Textiles and Apparel 380 or equivalent; consent of instructor. ½ to 1 unit.
- 481. Principles of Textile Metrology.** Examines textile metrology as a component of the production and use of textile materials; includes case studies and investigative metrology. Prerequisite: Textiles and Apparel 380 and Agronomy 340. 1 unit.
- 487. Seminar in Apparel.** Reviews and analyzes selected theory and research in the apparel fields. Prerequisite: Graduate standing in textiles and apparel, or consent of instructor. ¼ to 1 unit. May be repeated as topics vary.
- 493. Advanced Studies in Textiles and Apparel.** Researches specific problems of limited scope. Students who do not write a thesis may substitute this course for Textiles and Apparel 499 when combined with 8 additional units for a master's degree. Prerequisite: Consent of instructor. ½ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

THEATRE

Head of Department: Professor R. B. Graves

Department Office: 4-122 Krannert Center for the Performing Arts, 500 South Goodwin, Urbana

- 100. Practicum, I.** Laboratory in acting, directing, playwriting, theatre management, and in the design, construction, and handling of scenery, lighting, sound properties, costumes, and makeup for public performance. Prerequisite: Consent of instructor for nontheatre majors. 1 to 3 hours. May be repeated for three semesters.
- 106. Basic Theatre Practice, I.** Introduction to theatre as a profession; includes theatre operation in Krannert Center for the Performing Arts and the basic skills and concepts of theatre design and technology and theatre performance. Prerequisite: Concurrent registration in Theatre 108. Limited to theatre majors. 6 hours.
- 107. Basic Theatre Practice, II.** Introduction to basic skills and concepts of theatre design/technology and performance; further exploration of theatre as a profession and of acting, design, lighting, and make-up. Prerequisite: Theatre 106 and concurrent registration in Theatre 108. 6 hours.
- 108. Basic Theatre Practice Laboratory.** Practical experience in two of the following four areas: scenery and props construction and crew, costume construction and crew, lighting crew, and performance workshop. Prerequisite: Concurrent registration in either Theatre 106 or 107. Limited to theatre majors. 2 hours. May be repeated once.
- 109. Dramatic Form and Content.** Introduces elements of dramatic form and structure through intensive study of selected plays and major critical works. 3 hours.
- 110. Literature of the Modern Theatre.** Introduction to realistic drama and its mutations as the dominant bases for twentieth-century theatre practice. Prerequisite: Theatre 109. 3 hours.
- 142. Stage Makeup.** Principles, materials, and application techniques for two- and three-

dimensional makeup; lecture, demonstration, and intensive practice. Prerequisite: Theatre 107 or consent of instructor. 2 hours.

151. **Acting Studio, I.** Intensive use of improvisation as a tool for the exploration and communication of experience through speech and action; basic physical training for expressive body use; and fundamentals of voice and speech production. Prerequisite: Theatre 107 and sophomore standing in acting. 1 to 8 hours. Students must register for all sections to receive credit.
152. **Acting Studio, II.** Emphasizes analysis of roles, characterization, and application of skills learned through improvisation to scripted modern plays; continued voice and movement training. A performance is given at the end of the semester. Prerequisite: Theatre 151. 1 to 8 hours. Students must register for all sections to receive credit.
170. **Fundamentals of Acting.** Same as Speech Communication 161. Study of the methods of acting, with emphasis given to the basic stage techniques. 3 hours.
175. **Improvisation in Acting.** Improvisation as a tool for the exploration and communication of experience through speech and action on the stage. Prerequisite: Theatre 107 or 170. 4 hours.
176. **Relationships in Acting.** Behavior in stage performance explored on the basis of the actor's relationship with self, with objects, and with other players. Prerequisite: Theatre 175, equivalent stage experience, or consent of instructor. 4 hours.
180. **Oral Interpretation.** Same as Speech Communications 141. See Speech Communications 141.
181. **Group Oral Interpretation of Literature.** Same as Speech Communications 142. See Speech Communications 142.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Stage Electronics.** A laboratory course to familiarize the beginning theatre student with current wiring practices and control techniques related to theatrical electronic control systems. 3 hours.
223. **Stage Mechanics, I.** Studies traditional materials, techniques, and processes used in executing scenery for the theatre. Prerequisite: Theatre 107 or consent of instructor. 4 hours.
224. **Stage Mechanics, II.** Examines newly accepted and developing techniques, processes, and materials used in constructing and rigging stage scenery. Prerequisite: Theatre 223. 4 hours.
225. **Scene Design, I.** Projects and lectures addressing basic technical and aesthetic skills of scene design. 3 hours.
226. **Scene Design, II.** Projects and discussions focusing on single setting problems for proscenium stage. Prerequisite: Theatre 225. 3 hours.
227. **Senior Projects in Design, I.** Professional studio and independent projects for student designers specializing in stage scenery, lighting, or costume design. Prerequisite: Consent of instructor. 6 hours.
228. **Senior Projects in Design, II.** Continuation of Theatre 227. Prerequisite: Theatre 227. 6 hours.
229. **Stage Rendering.** Examines sketching and rendering problems for stage designers: stage perspective, fabric rendering, period silhouette, and figure analysis. Open to Professional Studio in Design or Applied Theatre curriculum. Prerequisite: Consent of instructor. 2 hours.
230. **Technical Direction.** Studies mechanical drawing for the theatre, production organization, and technical direction. Prerequisite: Theatre 229 or equivalent; or consent of instructor. 2 hours.
231. **Stage Lighting Practice.** A studio course analyzing current lighting practices and equipment by means of production oriented assignments. 3 hours.
232. **Lighting Design for the Stage.** Lighting design for the proscenium stage. Prerequisite: Theatre 231, or consent of instructor. 3 hours.
233. **Stage Drafting, I.** Drafting for scenery construction and rigging. Prerequisite: Theatre 107. 4 hours.

- 234. Stage Drafting, II.** Advanced work in drafting for scenery construction and rigging. Prerequisite: Theatre 233. 4 hours.
- 242. Introduction to Costume Patterning.** Introduction and practice of basic sewing, craft, and patterning skills required to construct period theatrical costumes. 3 hours.
- 245. Introduction to Costume Design.** Explores approaches to costume design, function of costume in theatrical production, relationship between designer and other theatre personnel. 3 hours.
- 253. Acting Studio, III.** Development of actors' skills for musical theatre through study of dance for actors, continued vocal training emphasizing singing, and analysis of British and American musical materials. Prerequisite: Theatre 152. 1 to 8 hours. Students must register for all sections to receive credit.
- 254. Acting Studio, IV.** Acting in twentieth-century plays; includes concentrated training in American and foreign dialects and development of movement skills through mime, fencing, and unarmed combat. Prerequisite: Theatre 253. 1 to 8 hours. Students must register for all sections to receive credit.
- 255. Acting Studio, V.** Emphasizes acting in period plays. Specialized movement training includes fencing and mime; speech classes stress poetry and interpretation of the classics. Scenes selected from Elizabethan, Restoration, and eighteenth- and nineteenth-century plays. Prerequisite: Theatre 254. 1 to 8 hours. Students must register for all sections to receive credit.
- 256. Acting Studio, VI.** Study of the techniques of acting for the camera, including such special topics as speech for the microphone and unarmed combat for the camera. Scenes are recorded on audiovisual tape. Prerequisite: Theatre 255. 1 to 8 hours. Students must register for all sections to receive credit.
- 263. Theatre of the Black Experience.** Surveys the Black Theatre Movement's history and literature, and studies dramatic works focused on the black experience through the rehearsal and performance of representative works of black dramatists. 3 hours. May be repeated to a maximum of 9 hours.
- 280. Playwriting, I.** A study of the basic structure of the drama. Classwork includes lecture and continuous analysis of weekly writing exercises, focusing on exposition, economy, diction, structural devices, and dramatic action. Term project is a one-act play. Prerequisite: Consent of instructor. 3 hours.
- 281. Directing: Script Preparation.** Same as Speech Communication 255. Methods of script analysis and the development of production concepts; explorative projects culminate in the reading of a script for rehearsal. Prerequisite: Theatre 273 and 274, Theatre 152, or Theatre 170. 3 hours.
- 291. Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
- 292. Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
- 300. Practicum, II.** Advanced laboratory in acting, directing, playwriting, and theatre management; the design, construction, and handling of scenery, lighting sound, properties, costumes, and makeup for public performance. Prerequisite: For nontheatre majors, consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{1}{2}$ unit. May be repeated to a total of 12 hours or 2 units.
- 310. Theatre Planning and Programming.** Studies recent theatre architecture and theatre renovations, examining the programming process, the stage forms, the merits of various stage technological systems, and the related business, audience and production facilities of a theatre center. 3 hours or 1 unit.
- 320. Modern Japanese Drama.** Same as Asian Studies and Japanese 325. See Japanese 325.
- 321. Design for Directors.** Concepts in production design for the theatre director and exploration of theory through projects. Prerequisite: Theatre 107 or consent of instructor. 3 hours or 1 unit.
- 322. Scene Design for Non-Majors.** Lectures and projects investigating aesthetic and mechanical problems of designing scenery for the stage; no prior design experience required. Prerequisite: Consent of instructor. 3 hours or 1 unit.

- 323. Stage Mechanics, III.** Advanced study in the design and construction of large weight-supporting scenery. Prerequisite: Theatre 224 or consent of instructor. 2 hours or $\frac{2}{3}$ unit.
- 324. Stage Mechanics, IV.** Advanced study in the design and construction of moving scenic elements. Prerequisite: Theatre 323 or consent of instructor. 2 hours or $\frac{2}{3}$ unit.
- 325. Scene Design, III.** Investigates non-proscenium performance spaces and non-traditional design forms, including thrust and arena stage, television scenery, and industrial show design. Prerequisite: Theatre 225 and 226. 4 hours or 1 unit.
- 326. Scene Design, IV.** Design studio investigating important design styles; students develop projects dealing with period design. Prerequisite: Theatre 225, 226, and 325. 4 hours or 1 unit.
- 327. Scene Design, V.** Design studio investigating complex scene-design problems, including the multi-set play, Broadway musicals, ballet, and opera. Prerequisite: Theatre 225, 226, 325, and 326 or consent of instructor. 4 hours or 1 unit.
- 328. Scene Design, VI.** Advanced problems in scene design: development of professional portfolio. Prerequisite: Theatre 225, 226, 325, 326, and 327. 4 hours or 1 unit.
- 330. Theatrical Projection.** Integrates photographic and shadow projection with the scenic design, including preliminary research and work-ups, media preparation, projection surfaces, and stage projection equipment. Prerequisite: Theatre 231 and consent of instructor. 4 hours or 1 unit.
- 331. Sound for the Theatre.** Introduction to sound reproduction, recording, and basic systems design for theatre. Prerequisite: Theatre 210 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. Stage Management.** Principles and craft of stage management. Prerequisite: Junior standing in theatre or consent of instructor. 4 hours or 1 unit.
- 335. History of Decor for the Stage.** Surveys the arts and decor during major periods of Western history as related to the theatre with emphasis upon essential resources of period styles for authentic representation of decor for staging classic plays on the contemporary stage. Prerequisite: Junior standing. 3 hours or 1 unit.
- 336. History of Scene Design.** Surveys major historic developments in stage design. Prerequisite: Junior standing. 3 hours or 1 unit.
- 337. Scene Painting Techniques.** Techniques and practice of scene painting; lab time required. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 338. Rendering Techniques for the Stage.** Perspective techniques for the stage; model building; developing the perspective sketch. Prerequisite: Consent of instructor. 2 hours or $\frac{2}{3}$ unit.
- 339. Property Design.** Principles of stage property design. Prerequisite: Theatre 335 or consent of instructor. 2 hours or $\frac{2}{3}$ unit.
- 340. Lighting Design for Dance.** Survey of conceptual technique and practice of dance lighting; also non-traditional lighting problems including disco, rock, cabaret and industrial shows. Prerequisite: Theatre 231 or 232, or equivalent. 4 hours or 1 unit.
- 342. Costume Patterning.** Draping and drafting patterns for period costumes. 3 hours or 1 unit.
- 345. Costume History for the Stage, I.** Surveys theatrical costume and fashion of major periods; emphasizes relationships to styles of art and dramaturgy, social milieu, and production design. Prerequisite: Theatre 223 and 224, or 415, or equivalent. 4 hours or 1 unit.
- 346. Costume History for the Stage, II.** Continuation of Theatre 345. Prerequisite: Theatre 345 or equivalent. 4 hours or 1 unit.
- 347. Costume Rendering.** Studio course in costume rendering techniques; analysis of costume figure, rendering of fabrics, exploration of various rendering media. Prerequisite: Theatre 245. 3 hours or 1 unit.
- 353. Creative Dramatics for Children.** Study of the subject matter and techniques of creative dramatics for children with laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Theatre for the Child Audience.** Study of the history, objectives, and techniques of play production for the child audience; laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 355. The History and Development of the American Musical Theatre.** Surveys the American Musical from early minstrel show and operetta origins to current unique theatrical form. Prerequisite: Junior standing or above. 3 hours or $\frac{3}{4}$ or 1 unit.
- 361. Development of Theatrical Forms, I.** History of the drama and theatre of ancient Greece and Rome, the Middle Ages, and the Italian and English Renaissance. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 4 hours or 1 unit.
- 362. Development of Theatrical Forms, II.** History of the drama and theatre of the Spanish Renaissance, seventeenth-century France, the English Restoration, the eighteenth and nineteenth centuries in Europe and America, and the Orient. Prerequisite: Theatre 361 or equivalent and consent of instructor. 4 hours or 1 unit.
- 371. Contemporary Theatrical Forms.** Study of post-World War I theatre, including the New Stagecraft, expressionism, Brecht and epic theatre, theatre of the absurd, and later developments. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 3 hours or 1 unit.
- 372. Introduction to Theatre Management.** Introduction to the basic practices of theatre management, including those in professional, educational, and community theatre. 3 hours or 1 unit.
- 375. Acting: Rehearsal Techniques.** Acting laboratory emphasizing the actor's work with the director. Fall semester deals with contemporary drama; spring semester deals with classical drama. Taught in conjunction with Theatre 381; students may not register concurrently in Theatre 381. Prerequisite: Theatre 176 or consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 2 units.
- 376. Oral Interpretation of Prose Fiction.** Same as Speech Communications 345. See Speech Communications 345.
- 381. Directing: Rehearsal.** Exploration of methods for directing actors and conducting rehearsal. Students may not register concurrently in Theatre 375. Reading and research in current directing principles and practices required of graduate students. Prerequisite: Theatre 281 and consent of instructor. 3 hours or 1 unit.
- 385. Preparation for Auditions.** Each actor, through extensive research, prepares a portfolio of audition pieces for the opportunities imminent before and after graduation for resident companies, commercial productions, and film, or professional graduate schools. Prerequisite: Theatre 151, 152, 253, and 254; or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 390. Professional Internship.** Professional employment with an approved host institution in an area related to the student's academic program; exposure to professional situations in which the commercial theatre operates. Full documentation of internship activities required. Prerequisite: Senior or graduate standing in theatre; consent of Internship Coordinator. 0 to 14 hours, or 0 to 3 units.
- 401. Studies in Dramatic Form and Structure.** Same as Speech Communication 400. Studies in the relationship of dramatic form and structure to the contemporary production of historical and modern plays. Prerequisite: Consent of instructor. 1 unit.
- 403. Studies in Theatre History: Seventeenth Century to 1900.** Examines selected movements and contributors to the theatre from the English Restoration to the nineteenth century. Prerequisite: Theatre 362 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
- 404. Studies in Theatre History: Twentieth Century.** Examines selected movements and contributors to the theatre from the late nineteenth-century to the contemporary period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
- 405. Seminar in the Stage History of Classic English Plays.** Same as English and Speech Communication 469. See English 469.
- 406. Seminar in Theatre History.** Same as Speech Communication 468. Studies in the history of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 407. Seminar in Theatre Art.** Same as Speech Communication 465. Studies in the aesthetics

- of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 411. Colloquium in Advanced Design and Theatre Technology.** Projects in design for the theatre or in theatre technology, including stage scenery, costuming, lighting, makeup, projections, and sound and stage systems. Prerequisite: Candidacy for M.F.A. in theatre with design and technology specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
- 415. Proseminar in Theatre Practice.** Review of contemporary theatre practice in the United States and western Europe, survey of methods in production research, and advanced instruction in theatre specialties. A diagnostic procedure is employed which culminates in the presentation of student projects to a faculty jury. Prerequisite: Admission to graduate study in theatre. 1 or 2 units.
- 450. Theatre in Education.** Examines effective teaching practices for students of theatre and the development of theatre and the development of theatre education in America considered in two seminars; topics include: methods of teaching theatre; and the academic theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 471. Colloquium in Acting.** Performance assignments in productions prepared at Krannert Center, combined with individual evaluation by the acting staff; special acting workshops dealing with problems relevant to the semester's production schedule. Prerequisite: Candidacy for M.F.A. in theatre with acting specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 12 units.
- 475. Costume Design for Dance.** Same as Dance 475. Theoretical and practical aspects of costume design and construction for dance, including fabric, renderings, pattern execution and design, and construction and craft techniques; culminates in a practical project involving the design and execution of costumes for a dance production. Prerequisite: For theatre majors, Theatre 346; for dance majors, Dance 375 and 465, and structural completion of the Dance 498 project. 1 unit.
- 480. Theory of Staging.** Seminar in theatre interpretation which considers alternative rationales which explicitly or implicitly underlie performance conceptions; performance theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 481. Colloquium in Directing.** Individual assignments in directing, stage managing, or coaching of actors carried out in conjunction with the semester's productions; prepared at Krannert Center or in conjunction with the training of actors in the undergraduate curriculum. Prerequisite: Candidacy for M.F.A. in theatre with directing specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
- 491. Special Problems.** Individual research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 2 units.
- 495. Creative Project.** Open to M.F.A. candidates in theatre only. 1 to 2 units.
- 499. Thesis Research.** 0 to 4 units.

THEORETICAL AND APPLIED MECHANICS

Head of Department: Professor F. A. Leckie

Department Office: 212 Talbot Laboratory, 104 S. Wright, Urbana

NOTE: Credit is allowed for only one of Theoretical and Applied Mechanics 150, 152, 154, or 156. Credit is not allowed for both Theoretical and Applied Mechanics 212 and either Theoretical and Applied Mechanics 154 or 156.

- 150. Analytical Mechanics (Statics).** Resultants of force systems; conditions of equilibrium of force systems; analysis of forces acting on members of trusses, frames, etc.; forces due to friction; and centroids. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 2 hours.

- 152. Engineering Mechanics, I (Statics).** Analysis of force systems; equilibrium of two- and three-dimensional systems; trusses, frames, friction; principle of virtual work. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 3 hours.
- 154. Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212 with less emphasis on some topics. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 4 hours.
- 156. Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 5 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 212. Engineering Mechanics, II (Dynamics).** Elements of vector calculus as applied to mechanics; kinematics of three-dimensional motion of a particle and of a rigid body; motion relative to translating and rotating reference frames; and kinetics of particles and rigid bodies using principles involving force, mass and acceleration, work and energy, and impulse and momentum. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.
- 221. Elementary Mechanics of Solids.** Relationship between the internal stresses and deformations produced by external forces acting on deformable bodies, primarily elastic components. Normal and shear stresses and deformations produced by tensile, compressive, torsional and bending loading of members; state of stress and failure; deflection of beams; elastic strain energy and impact loading; stability and buckling of columns. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.
- 223. Mechanical Behavior of Solids.** Influence of loading conditions and environment on the behavior of engineering materials; effects of rate of loading, time, temperature, number of stress cycles, and state of stress on the ductile and brittle behavior of materials; and significance of mechanical properties. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221. 1 hour.
- 224. Behavior of Materials.** Same as Civil Engineering 210. Mechanical behavior of engineering materials, including metals, ceramics, polymers, and materials of construction (concrete, wood, bitumens, and asphaltic concretes); laboratory sessions demonstrating macroscopic behavior and explanations of that behavior in terms of phenomena on the microscopic level. Prerequisite: Theoretical and Applied Mechanics 221. 4 hours.
- 235. Fluid Mechanics.** Lectures and weekly laboratory sessions on fluid properties; fluid statics; continuity, momentum, and energy principles; ideal and real fluid flow; similitude; laminar and turbulent boundary layers; closed conduit flow, open channel flow, and compressible flow; turbomachinery. Prerequisite: Theoretical and Applied Mechanics 212. 4 hours.
- 293. Research and Design Project.** Formulation of an applied mechanics research and design project to be completed in Theoretical and Applied Mechanics 294. Guidance is received from a faculty member; experience in research and development aspects of engineering design is gained by means of mathematical modelling, numerical analysis, and laboratory experimentation. Prerequisite: Senior or second-semester junior standing in engineering mechanics. 2 hours.
- 294. Research and Design Project.** Completion of the project formulated in Theoretical and Applied Mechanics 293. Each student prepares a technical report or paper and presents the results orally; the best papers are presented at a symposium held at the end of the semester, bound together and published as a Theoretical and Applied Mechanics *Report*. Prerequisite: Theoretical and Applied Mechanics 293. 4 hours.
- 299. Thesis.** Thesis investigation of special subjects including theoretical and/or experimental research. Prerequisite: Senior standing; approval of head of department. 3 hours.
- 308. Fluid Mechanics of Convective Heat Transfer.** Same as Mechanical Engineering 308. See Mechanical Engineering 308.
- 311. Vibrations of Mechanical Systems, I.** Theory and application of free and forced vibrations of single and multiple degree of freedom discrete linear systems; matrix methods,

- including the algebraic eigenvalue problem; Lagrange's equations; damping; modal analysis; shock spectra; and introduction to random vibrations. Prerequisite: Theoretical and Applied Mechanics 154, 156, or 212; and Math 341 or 345. 3 hours or $\frac{1}{4}$ unit. Credit is not given for both Theoretical and Applied Mechanics 311 and Civil Engineering 374.
- 314. Advanced Dynamics for Engineers.** Newtonian mechanics of a system of particles; Lagrangian mechanics of a dynamical system; the kinematics and dynamics of a rigid body; and engineering applications. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 345 or equivalent, and credit or concurrent registration in Mathematics 343. 3 hours or $\frac{1}{4}$ unit.
- 321. Advanced Mechanics of Solids.** Review of elementary mechanics of solids; transformations of stress and strain; modes and criteria for failure, including fracture-mechanics concepts; unsymmetrical bending; shear flow and shear center; torsion of noncircular sections; curved beams; Castigliano's theorem; plasticity and limit-load calculations. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours or $\frac{1}{4}$ unit.
- 324. Flow and Fracture of Structural Metals.** Fundamental concepts of strength of crystalline engineering materials at atomic, single crystal, and polycrystalline levels of association in relation to engineering mechanisms of failure; functional relationship between material variables, state of stress, strain, time, temperature, and failure of engineering components by creep, stress rupture, fatigue, and brittle fracture. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 326. Experimental Stress Analysis.** Measurement of stresses or deformations that are of significance in the engineering design of load-resisting members; use of optical, electrical, and mechanical instrumentation; brittle coatings, electrical resistance gauges, photoelasticity; new methods. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 328. Mechanical Behavior of Composite Materials.** Fundamental concepts underlying formation, characteristics, and behavior of composite materials such as fiber-reinforced laminates, honeycomb structural sandwiches, and load-bearing adhesive joints; their use in engineering structures and components under static, dynamic, and cyclic loading. Micromechanics, lamination theory, visco-elasticity, anisotropic elasticity, hygrothermal stress, fracture mechanisms and mechanics, and degradation in different environments; methods of design, analysis, and testing. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
- 335. Dynamics of Fluids.** An intermediate course in the mechanics of fluids introducing analytical methods of solution for ideal and real fluids; potential flow theory, theoretical approaches to viscous flows including boundary layer theory, and the analysis of compressible flows. Prerequisite: Theoretical and Applied Mechanics 235. 3 hours or $\frac{1}{4}$ unit.
- 351. Fundamental Concepts of Deformable Body Mechanics.** Introduction to the general theories of kinematics of deformable bodies; general balance laws applicable to continuum mechanics; constitutive relations (stress-strain relations); and introductions to linear elasticity, linear viscoelasticity, and special concepts in other areas of solid mechanics and fluids. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343 and 345. 3 hours or $\frac{1}{4}$ unit.
- 360. Continuum Mechanics, I.** A unified treatment of modern continuum mechanics; linear algebra and analysis, review of kinematics and general balance laws, and general theory of mechanical constitutive equations (simple materials). Prerequisite: Theoretical and Applied Mechanics 351 or equivalent. 3 hours or $\frac{1}{4}$ unit.
- 373. Fundamentals of Engineering Acoustics.** Same as Electrical Engineering 373. See Electrical Engineering 373.
- 392. Design and Analysis in Engineering Practice.** Examples of design problems which occur in engineering practice and the procedures which are used to solve them; emphasis on establishing the relationship between the sophistication of analysis and the level and nature of the design process. Considerable use is made of the case study approach and students are expected to execute a number of tasks at different design levels. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{4}$ unit.

- 393. Independent Study.** Individual studies in any area of theoretical and applied mechanics. 1 to 8 hours, or $\frac{1}{4}$ to 2 units.
- 400. Seminar in Engineering Mechanics.** Treatment of special topics in the field of mechanics including mechanics of solids problems such as fracture of metals and creep of materials; fluid flow problems such as the nature of turbulence, boundary layer theory, nature and effects of roughness of boundary, and effects of free surface; dynamics problems such as vibration of beams with moving loads and the gyroscope; and certain other topics, such as biomechanics, that cut across all areas of mechanics. Each semester one or more of these topics is selected and announced as the area to be covered. 0 to $\frac{1}{4}$ unit.
- 412. Vibrations of Mechanical Systems, II.** Examination of problems in the vibration of continuous linear elastic structures, including strings, rods, beams, membranes, and plates; Hamilton's principle; solution by separation of variables, integral equation and transform methods; variational methods of approximation including the finite element method; and computational methods. Prerequisite: Theoretical and Applied Mechanics 311 or Civil Engineering 374; Theoretical and Applied Mechanics 314 or equivalent. 1 unit.
- 416. Energy Principles in Engineering Mechanics.** Introduction to the variational principles of mechanics and their applications to engineering problems; the derivation, interpretation, and applications of the principle of virtual displacements, the principle of minimum potential energy, and the principle of complementary energy; major emphasis on Castigliano's theorem, Hamilton's principle, and Lagrange's equations of motion; brief treatment of variational methods of approximation; and numerous illustrative applications to the stress analysis of statically determinate and statically indeterminate frames, problems of elastic stability, the theories of rings and curved beams, the theory of elastic plates, vibrations of structures, and wave motions. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 417. Stochastic Structural Dynamics.** Same as Aeronautical and Astronautical Engineering 452. See Aeronautical and Astronautical Engineering 452.
- 418. Aerodynamic Noise.** Same as Aeronautical and Astronautical Engineering 453. See Aeronautical and Astronautical Engineering 453.
- 424. Properties of Engineering Materials.** Structure of metals and behavior of materials under various conditions of loading and use, including static loading, creep, fatigue, and impact; effects of high and low temperature, strain rate, state of stress, and internal structure; criteria of failure; relation of mechanical properties to behavior; significance of mechanical properties; tests and interpretation of test data; and material specifications. 1 unit.
- 428. Analysis of Nonlinear Systems.** Same as Electrical Engineering 428. See Electrical Engineering 428.
- 429. Theory of Linear and Nonlinear Viscoelasticity.** Same as Aeronautical and Astronautical Engineering 429. See Aeronautical and Astronautical Engineering 429.
- 431. Theory of Ideal Fluid Flow.** Topics in advanced fluid mechanics, particularly the motion of incompressible fluids of negligible viscosity. Differential equations of motion and several methods of obtaining flow solutions, including velocity potentials and stream functions; superposition of the effects of sources, doublets, and vortices; and methods of conformal mapping. Resultant forces and moments on bodies and lifting surfaces; theory and application of free streamline flows; vortex motions; and surface wave theory. Prerequisite: An elementary course in fluid flow; a course in advanced calculus. 1 unit.
- 432. Theory of Flow of Viscous Fluids.** Theoretical development, analysis, and solution of incompressible viscous fluid flow problems; derivation of the differential equations of motion, starting with the stress relations occurring in viscous fluids; development of direct and approximate solutions for laminar flows; presentation of boundary-layer theory; introduction to the occurrence of turbulence and its characterization; basic equations for analyzing turbulent flows; presentation of approximate solution for flows in boundary layers with and without pressure gradients; pipes and jets; and consideration of experimental observation and application to technological problems. Prerequisite: An elementary course in fluid flow; a course in differential equations. 1 unit.

- 438. Turbulence.** Statistical models for characterizing turbulence; statistical theory, energy considerations, and nature of turbulence in typical flows; laboratory experiments illustrating hot-wire technique of turbulence measurements and the structure of turbulence. Prerequisite: Theoretical and Applied Mechanics 432 or equivalent. 1 unit.
- 441. Applied Analysis in Engineering.** Training in applications of mathematics to engineering problems, including ordinary differential equations and special functions, boundary-value problems and series solutions, and partial differential equations; illustrations taken from engineering mechanics. Prerequisite: Mathematics 242; Mathematics 343 and 345 recommended. 1 unit.
- 442. Applied Analysis in Engineering.** Continuation of Theoretical and Applied Mechanics 441. Application of complex-variable methods; Laplace transforms; Fourier transforms; and special topics selected by the instructor. Prerequisite: Mathematics 242; Mathematics 343 and 345 recommended. 1 unit.
- 445. Advanced Physical Acoustics.** Same as Electrical Engineering 445. See Electrical Engineering 445.
- 451. Theory of Elasticity with Application to Engineering Problems.** Study of the mechanics of elastic deformable bodies, based on the fundamental concepts of equilibrium, geometry of strain, and properties of materials; detailed study of relations between stresses, strains, and displacements; and special consideration given to their significance in engineering problems. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343; Mathematics 341 or equivalent. 1 unit.
- 452. Theory of Elasticity with Application to Engineering Problems.** Continuation of Theoretical and Applied Mechanics 451. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 454. Theory of Shells.** Stress analysis of shell-type structures, such as ships, submarines, monocoque aircraft structures, concrete roofs and domes, pressure vessels, and containers for liquids; differential geometry of shell theory, equilibrium equations, momentless theory of shells, strains in shells, statically indeterminate problems of shells, energy formulations, and stability of shells. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 457. Classical Elastostatics.** A modern unified treatment of the concepts and techniques developed by investigating the Cauchy-Navier equations; emphasis on the interpretation and motivation of ideas and their interrelation for the solution of three-dimensional problems; and topics including the classical boundary-value problems, existence and uniqueness theorems, stress functions and displacement potentials, singular states of stress, extension of Green's method to the equations of elasticity, method of series, and approximation techniques. Intended for (1) students interested in the current state of knowledge in classical elasticity, and (2) students planning doctoral dissertations in classical elasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent; consent of instructor. 1 unit.
- 458. Elastic Waves.** Simple one-dimensional waves; Fourier and Laplace transforms; review of linear elasticity; waves in an unbounded medium; reflection, refraction, and surface waves; basic singular solutions, integral representation theorems; waves in an elastic half-space; waveguides; waves in anisotropic and heterogeneous media. Prerequisite: Theoretical and Applied Mechanics 311 or Electrical Engineering 373; and Theoretical and Applied Mechanics 431 or 451; and Mathematics 346; or consent of instructor. 1 unit.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Physics 459. See Mathematics 459.
- 462. Theory of Plasticity.** The physical and mathematical formulation of the mechanics of inelastically deformed bodies, plastic stress-strain laws, and their association with yield and loading function; members subjected to biaxial and triaxial stress conditions; applications to flexure and torsion of prismatic members; expansion of thick-walled cylinders and spherical shells; and introduction to problems in plane plastic flow and variational plasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent. 1 unit.
- 464. Theory of Buckling.** The pertinent information and theoretical background required for

- the prediction of failure by buckling of structures such as airplanes, ships, bridge trusses, fabricated towers, and shells; practical illustrations, including elastic columns with various end restraints; buckling of framework, arches, rings, and plates; inelastic buckling of columns and plates; lateral buckling of beams; energy theory; Ritz procedure; and Euler's equation of the calculus of variations. Prerequisite: Theoretical and Applied Mechanics 416 and 451. 1 unit.
- 485. Fracture Mechanics.** Analytical and experimental techniques used to solve current fracture problems; discussion of the macroscopic theories used to determine the static strength of bodies containing cracks; linear elastic fracture mechanics: the tool and the model; and its relation to the Griffith criteria of fracture; elastic-plastic fracture mechanics models; small-scale yielding results and their implications; an introduction to fracture mechanics in the realm of general yielding; fracture control. Prerequisite: Theoretical and Applied Mechanics 324 and 451, or consent of instructor. 1 unit.
- 493. Advanced Independent Study (Special Problems).** Analytical or experimental studies in one or more phases of theoretical and applied mechanics, including mechanics of materials, theory of elasticity, theory of plasticity, properties of materials, mechanical vibrations, hydraulics and fluid mechanics, and applied mathematics. * (1) 2 units
- 499. Thesis Research.** 0 to 4 units.

URBAN AND REGIONAL PLANNING

Head of Department: Professor Lewis D. Hopkins

Department Office: 1008 West Nevada Street, Urbana

- 101. Planning of Cities and Regions.** Survey of city and regional planning as related to problems and programs of urbanization and resource development. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
- 230. Introduction to Transportation Engineering and Planning.** Same as Civil Engineering 230. See Civil Engineering 230.
- 240. Land Use Planning Process.** Techniques in the preparation of land use plans, including a review of the land use aspects of community facilities and transportation. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours.
- 247. Planning Workshop, I.** Field work dealing with selected physical and/or social planning problems. Prerequisite: Consent of instructor. 6 hours.
- 260. Urban Social Problems and Planning.** Examines the traditional pattern of social planning decisions and emergent alternatives at the federal, city, and neighborhood levels. Includes case studies, field work, and term project. 3 hours.
- 290. Planning Internship.** Professionally supervised field experience in public and private planning or development agencies; designed to introduce students to professional employment and actual planning practice. Students work in a department approved agency of their own choice either during the summer session or part-time during a regular semester. At least two weeks of full-time employment or its equivalent is required for each semester hour of credit. Summary reports are submitted by both employer and student. Prerequisite: Senior standing or consent of instructor. 0 to 6 hours. No more than 3 hours of Urban Planning 290 may be applied toward the Bachelor's degree.
- 297. Special Problems.** Special projects, research, and independent reading. Prerequisite: Consent of head of department. 2 to 6 hours.
- 301. Development of American Planning Thought.** Planning from the mid-nineteenth century to the present as related to cultural, societal, and philosophical influences. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.
- 303. Urban Structure and Functions.** The concepts of urban structure; the elements of urban spatial structure and growth; the human stresses in urban spatial structure, and structural remedies past and present. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.

- 304. Urban Planning Theory.** Examination of the urban planning function within a theoretical, methodological, institutional, and professional context. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 305. Environmental Science Methods in Planning.** Overview of environmental science methods and data interpretation used in planning, including the scientific method; studies the distribution and analysis of natural population, aerial photographic interpretation, soils and their roles in development and siting analysis, methods for the design of wildlife refuges and natural parks, and environmental data bases. Prerequisite: Landscape Architecture 350 or consent of instructor. 4 hours or 1 unit.
- 307. Managing Urban Development.** Implementation of the planning program through administrative mechanisms, finance, citizen participation, and reorganization; evolution of implementation techniques; status of the local planning agency; and professional approaches to operation and management of the planning agency. Prerequisite: Political Science 150, or 305 and 306, or senior standing in urban and regional planning. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 308. Law and Planning Implementation.** Cases, legislation, and materials illustrative of the social, economic, and environmental interrelationships of land-use planning and the dynamic role of law as a system of controlled conflict; traditional and emerging concepts of zoning, subdivision regulation, housing codes, and review procedures. Prerequisite: Political Science 150, or 305 and 306, or Urban Planning 315, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 312. Graphics and Communication for Planners.** Graphics, media communication, photography, and report preparation techniques applied particularly to professional planning practice. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. United States Population and Land Settlement Policy.** Scientific, ethical, constitutional, political, and land use planning aspects of American population policy and issues, including migration and immigration; population distribution and redistribution; and national, regional, and local growth and land use policy. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 315. Legal Basis of Governmental Planning.** Cases and materials illustrative of legal concepts and institutions basic to the governmental planning process including property, police power, eminent domain, taxation, separation of powers, and due process; indicates both the problems and potential of adaptability by the legal system in response to contemporary socioenvironmental issues. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 316. Planning Analysis.** Research and analytic techniques in urban planning; economic base and employment; population; market analysis; and derivation and use of statistical data. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Planning for Historic Preservation.** Survey of the preservation movement in relation to urban planning; techniques for selection of sites and definition of districts; funding, regulation, and implementation measures; and case studies of preservation plans and programs. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Methods of Preservation Research and Planning.** Techniques of preservation research and planning, including historical research, inventory methods, interpretive methods, neighborhood preservation, financial and legal tools, special problems and issues, and field work. Prerequisite: Urban Planning 320 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 326. Urban Design and Planning Methods.** Concepts and techniques of urban analysis, plan making, and implementation essential for effective interdisciplinary work in urban design; case studies of major types of large-scale projects. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 327. Preservation Planning Workshop.** Small group field work dealing with application of planning principles and techniques to actual preservation planning problems in a nearby community or area. Prerequisite: Urban Planning 101 or 320, or consent of instructor. 3 to 6 hours, or $\frac{3}{4}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 12 hours or 3 units.

- 330. Urban Transportation Planning.** Same as Civil Engineering 330. Role of transportation in urban development and planning; characteristics of urban-person transportation systems and methods of analysis and forecasting of urban-person transportation demand; transportation systems management and capital improvement programming; and emphasis on the needs and activities of metropolitan planning organizations. Prerequisite: Civil Engineering 230, Urban Planning 332, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Regional Transportation Planning.** Same as Civil Engineering 331. See Civil Engineering 331.
- 337. Transportation Planning Workshop.** Analysis, evaluation, and plan preparation for a client of a real-world transportation problem; the planning process including extensive use of Urban Transportation Planning Systems (UTPS) package. Prerequisite: One transportation-related course. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 341. Land Resource Evaluation.** Same as Landscape Architecture 341. See Landscape Architecture 341.
- 342. Seminar on Environmental Policy and Law.** Identification and analysis of environmental issues and legal developments primarily at the state and federal levels. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 343. Environmental Quality Management.** Same as Environmental Studies 393. See Environmental Studies 393.
- 344. New Town Development in Europe and the U. S.** Applies planning and design skills to the development and management of New Towns with case study examples. Prerequisite: Urban Planning 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Urban Economic Development and Fiscal Packaging.** Public-private-partnerships in urban economic development, including study of potentials, problems, and projects; financing urban economic development through federal grant programs, tax increment financing and other means. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 347. Land Use Planning Workshop.** Small group field work applying principles and techniques to specific land use problems in selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 348. Environmental Planning Workshop.** Small group field work applying planning theory, principles, and techniques to specific environmental problems of selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 349. Environmental Management and Planning Simulation.** Management of environmental resources for a large urban area using computer assisted gaming simulation techniques; focuses on the law, technology, administration, and politics associated with environmentally sensitive decisions that require interrelated responses and development of consistent strategies. Prerequisite: Urban Planning 307, 308, 342, 401, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 353. Economic Development Planning Workshop.** Small group field work applying planning and economic principles and techniques to specific economic development problems in selected jurisdictions. Prerequisite: Urban Planning 316 or 407, or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 360. Introduction to Social Planning.** Survey of the major social policy issues confronting urban areas in the United States today; examines problems, policies, and programs in several functional areas (education, manpower development, health, welfare, etc.), as well as their interrelationships and their respective contributions to the problems of poverty; and analyzes processes of citizen participation as well as the roles of government in general and the planner in particular. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 364. Social Dimensions of Land Use Planning Methodology.** Analyzes the relationships between sociocultural variables and land use planning, emphasizing the rationale and methodology. Prerequisite: Urban Planning 260 or two courses in the social sciences. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 365. Social Planning Evaluation.** Evaluates design and research as it applies to social planning; emphasizes the logic and theoretical assumptions underlying the design, develop-

ment, implementation, and evaluation of social planning programs rather than techniques of data analysis. Prerequisite: Sociology 185 or Urban Planning 316, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 366. Concepts and Techniques of Citizen Participation.** Examines concepts and techniques of citizen participation in relation to planning and public administration. Analyzes alternative approaches at federal, city, and neighborhood levels; decentralization; public information; advocacy planning; community planning; and representational theory and practice. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 367. Social Planning Workshop.** Small group field work applying social planning principles and techniques to resolution of actual planning problems of community-based self-help organizations or of public social policies which affect social equity and social choice. Prerequisite: Either Urban Planning 260 or 360, and either Sociology 185 or Urban Planning 316; or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 374. Neighborhood Planning.** Examines rationale and techniques for planning at the neighborhood level; the major social, political, and economic issues that confound public and private sector efforts to revitalize distressed neighborhoods. Prerequisite: Urban Planning 260 or 360, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 377. Housing Workshop.** Small group field work dealing with real world problems and clients; clients vary each time the course is taught. Local, regional, state, and national governments or nonprofit organizations serve as clients. Prerequisite: Urban Planning 247 or 473; or consent of instructor. 3 to 6 hours, or $\frac{3}{4}$ to 1 $\frac{1}{2}$ units. May be repeated once for credit.
- 378. Community Development Workshop.** Community development planning covers the upgrading and redevelopment of neighborhood environments, including housing, capital improvements, social organization, economic revitalization. Small group field work applying planning techniques to specific community development problems in selected jurisdictions; emphasizes problem analysis and developing strategies. Prerequisite: Undergraduate - Urban Planning 247; Graduate - completion of three core courses in the MUP program. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 394. Special Topics in Urban and Regional Planning.** Seminar on topics of current interest, as announced in the Timetable. 2 to 6 hours, or $\frac{1}{2}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 12 hours or 4 units.
- 399. Study Abroad.** Studies comparative urban, regional, national and supranational planning systems, with emphasis on comparing European and Third World with United States planning. Consists of a seminar-discussion section and an application-workshop section. Prerequisite: Urban Planning 247 or equivalent, Urban Planning 301 or 304, or consent of instructor. 0 to 10 hours, or 0 to 2 $\frac{1}{2}$ unit.
- 401. Land Use Planning and Policy Formulation.** Principles and techniques for the preparation of land use, transportation, and community facilities plans; delineation of the comprehensive plan and the policy report; and social and economic implications of land use planning. Prerequisite: Consent of instructor. 1 unit.
- 405. Planning Methods.** Applied analytic methods in urban and regional planning, including survey research techniques, population analysis and projection, community economic and employment analysis, land-use and transportation studies, and evaluation techniques. Prerequisite: Urban Planning 316 or equivalent; consent of instructor. 1 unit.
- 406. Urban and Regional Analysis.** Same as Geography 406. Economic and demographic analysis of regional growth and change; emphasizes forecasting and impact studies. Topics include data sources, economic base studies, population estimation and projection, economic impact analysis, and employment projection; practical application of methods to a study area. Prerequisite: Introductory statistics such as Sociology 185 or Geography 185 or consent of instructor. 1 unit.
- 407. Economic Analysis of Public Plans and Policies.** Techniques of policy analysis and evaluation; includes microeconomic concepts, cost-benefit analysis, cost-effectiveness, and planning-programming-budgeting systems; and examines selected public policies in areas such as transportation, environmental control, health, education, housing, and local finance. Prerequisite: Consent of instructor. 1 unit.

- 411. Planning Strategies and Models.** Critical overview of current planning and decision-making models, with particular reference to their application to social problem-solving in urban areas; interaction between the planning process and urban political systems. Prerequisite: Consent of instructor. 1 unit.
- 414. Issues in Local Public Finance.** Recent trends in financing local governments; revenue and expenditure analysis; accounting and budgeting methods for local governments, with particular emphasis on financing capital improvements and the planning process. Prerequisite: Graduate standing in Urban and Regional Planning, or consent of instructor. 1 unit.
- 434. Urban Transportation Policy.** Major policy elements in urban transportation and the relationship of urban transportation to the region, including the decision-making process, configuration and growth of the metropolitan area, and allocation of resources. 1 unit.
- 445. Spatial Design Methods.** Same as Landscape Architecture 442. See Landscape Architecture 442.
- 446. Seminar on Land Use Modeling.** The concept of mathematical modeling; usefulness of models in land use and transportation planning; the mathematics of modeling; methods and procedures used in building models of location and allocation of urban land use; the role of movement, economic activity, locational trends, and institutional constraints; model taxonomy, characteristics, applications, and problems; and examination of characteristic modeling efforts. Prerequisite: One course in statistics, one course in microeconomics, and one course in calculus; or consent of instructor. 1 unit.
- 450. Issues in Regional Development.** Same as Geography 450. See Geography 450.
- 456. Regional Science Methods: Economic and Demographic.** Same as Geography 456. See Geography 456.
- 457. Seminar in Regional Science.** Same as Geography 457. See Geography 457.
- 473. Housing and Urban Policy Planning.** The role of housing in American social policy planning; economic modeling of the housing market, emphasizing supply and demand functions and private market imperfections; and analysis of public policies for housing as they affect special consumer groups, such as the poor, the elderly, and the nonwhite. Prerequisite: Urban Planning 407 or consent of instructor. 1 unit.
- 474. Housing and Community Development Law.** Seminar using expanded case methods to research and analyze housing and community development law emphasizing rights, responsibilities, and procedures. Prerequisite: One law course using the case method, comparable legal experience. 1 unit.
- 475. Housing and Urban Planning Analysis.** Housing location and developmental models; housing need and market analysis techniques; survey and appraisal of housing; and case studies of current housing problems and current research priorities. Prerequisite: Urban Planning 407 and 473, and a course in urban real estate; or consent of instructor. 1 unit.
- 480. Advanced Planning Theory.** Recent advances in planning, policy-making and decision-making theories as they relate to the efficient use of land and to the complex interrelationships among the major uses of land, i.e., housing, transportation, agriculture; specific applications vary annually, reflecting the students' dissertation research topics. Prerequisite: Urban Planning 301, 303, and 304; or equivalents. 1 unit.
- 483. Geology, Hydrology, and Land Use.** Same as Landscape Architecture 483. Elements of geology and hydrology with emphasis on land-related issues: geologic feasibility of large-scale construction and development, geologic hazards and resources, and water management on the geologic scale from individual wells to watersheds. Prerequisite: Urban Planning 247 or 305; or consent of instructor. 1 unit.
- 490. Professional Internship.** Summer, part-time, or other professional-level employment in the field of planning, usually in an area of concentration; exposure to the social, political, and institutional setting in which planning operates; and full documentation of internship activities required. Prerequisite: Consent of instructor. 0 units.
- 494. Seminar.** Selected topics in urban and regional planning; several sections each semester. Prerequisite: Consent of instructor. 1 unit.
- 497. Urban Planning Research.** Independent study in selected urban and regional planning topics. Prerequisite: Consent of instructor and head of the department. $\frac{1}{4}$ to 1 unit. No more than 4 units may be applied toward the Master of Urban Planning degree.

- 498. Master's Project.** A major independent or small-group project, conducted in lieu of a master's thesis. Prerequisite: Consent of instructor. 1 unit.
- 499. Thesis Research.** Prerequisite: Graduate standing in urban and regional planning; consent of the head of the department. 0 to 4 units.

VETERINARY BIOSCIENCES

Head of Department: Professor W. C. Wagner

Department Office: 3516 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

- 300. Gross Anatomy, I.** The systematic and topographic study of the pure and applied anatomy of the dog and cat by lecture and dissection laboratory. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 301. Histology-Embryology, I.** Lecture-laboratory consideration of basic microscopy, cytology, and both the development and histology of tissues and their organization into the locomotory, integumentary, and digestive systems of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 302. Gross Anatomy, II.** Study of the systematic and topographic anatomy of the large domestic animals, including reference to diagnostic and surgical procedures, by lecture and dissection laboratory. Prerequisite: Veterinary Biosciences 300 and 301, or consent of instructor. 5 hours or 1 ¼ units.
- 304. Applied Anatomy.** Lecture-laboratory course considering the morphology of food and companion animals relative to diagnostic and surgical procedures. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
- 305. Histology-Embryology, II.** Lecture-laboratory consideration of the development and histology of the cardiovascular, urinary, reproductive, respiratory, and endocrine systems of domestic and laboratory animals. Prerequisite: Veterinary Biosciences 301. 3 hours or ¾ unit.
- 306. Biomechanics of Quadripedal Locomotion.** Investigates the relationship between the biology and mechanics of the quadripedal locomotor system utilizing the techniques of morphology and mechanical engineering; where appropriate, considers the role of biomechanics in the pathobiology and treatment of orthopedic diseases. Prerequisite: Consent of instructor. 3 hours.
- 307. Comparative Primate Anatomy.** Same as Anthropology 308. Lecture-discussion and dissection laboratory comparing the organ systems of old and new world primates to those of a dog. Prerequisite: Veterinary Biosciences 300 or Physiology 234, or equivalent; consent of instructor. 2 hours or ½ unit.
- 309. Veterinary Clinical Electrocardiography.** Utilizes basic principles of cardiac electrophysiology in delineating the value and limitations of electrocardiography in veterinary medicine and diagnosing cardiac enlargement and/or arrhythmias. Prerequisite: Veterinary Biosciences 316. 1 hour.
- 310. Neurobiology.** An introduction to the science of neurobiology, both neuroanatomy and neurophysiology and their importance to an understanding of the normal integrative nervous system of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 3 hours or ¾ unit.
- 315. Physiology, I.** Lecture-discussion and laboratories on endocrine and reproductive systems, physiology of vision, ear structure and function. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 316. Physiology, II.** Lecture-discussion of digestive, cardiovascular, and respiratory systems; and acid-base balance. Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.

- 317. Physiology-Pharmacology Laboratory.** Laboratory study of physiological processes and the effects of drugs upon these processes. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
- 318. Pharmacology, I.** Lecture-discussion on the general principles of pharmacology and analysis of the action of chemical agents on physiological processes. Prerequisite: For professional students, second-year standing in the veterinary curriculum; for graduate students, Veterinary Biosciences 315 and 316, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 319. Pharmacology, II.** Lecture-discussion on the action of chemical agents on physiological processes and disease-producing organisms. Prerequisite: Veterinary Biosciences 318 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 320. Toxicology.** Discusses the mechanisms of action, clinical, diagnostic, and therapeutic aspects of chemical and plant toxicants in domestic animals. Prerequisite: Veterinary Biosciences 319 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 321. Advanced Clinical Cardiology.** Lecture-discussion course devoted to veterinary clinical cardiology; discusses various cardiac conditions such as arrhythmias, congenital anomalies, acquired vascular disease, and other common types of acquired cardiac disease from the standpoint of diagnosis, treatment, and management. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 322. Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Clinical Medicine 322. Lectures designed to assist the student in integrating knowledge of the science of pharmacology with an understanding of veterinary internal medicine; emphasizes the establishment of therapeutic objectives as applied to various body systems. Prerequisite: Fourth-year standing in the veterinary curriculum. 2 hours.
- 324. Nutritional Aspects of Large Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in cattle, horses, sheep, and swine; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
- 326. Nutritional Aspects of Small Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in small animals; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 329. Advanced Veterinary Toxicology.** Applies and expands concepts in Veterinary Biosciences 320; emphasizes discussion of clinical and diagnostic aspects of major toxicoses. The optional laboratory is offered only to students enrolled in the discussion section; laboratories and field trips give students additional expertise in proper diagnostic and therapeutic practices. Prerequisite: Veterinary Biosciences 320. 1 or 2 hours.
- 345. Statistical Methods.** Same as Agricultural Engineering, Animal Science, Dairy Science, and Forestry 345. See Dairy Science 345.
- 367. Radiology and Radiobiology.** Same as Veterinary Clinical Medicine 367. See Veterinary Clinical Medicine 367.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Clinical Medicine and Veterinary Pathobiology 378. See Veterinary Clinical Medicine 378.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
- 405. Morphology of Reproduction.** Morphology of genital and endocrine organs of reproduction in domestic and laboratory animals, including histochemistry and radioautography; interpretation of illustrations, such as light and electron micrographs, as well as morphometric and stereologic data. Prerequisite: Credit or concurrent registration in Physiology 406. $\frac{1}{2}$ unit.
- 412. Advanced Endocrinology.** Same as Animal Science, Dairy Science, and Physiology 412. See Physiology 412.

- 413. Cardiovascular Physiology.** Same as Physiology 413. Structure and function of myocardial cells, mechanics of contraction, determinants of cardiac performance, methods for assessing cardiac contractility, determinants of myocardial oxygen utilization, coronary circulation and its regulation, neurogenic control of circulation, circulation during exercise, heart failure, myocardial hypoxia and ischemia. Prerequisite: Veterinary Biosciences 316 or Physiology 401; or consent of instructor. ½ unit.
- 431. Advanced Reproductive Endocrinology.** Same as Animal Science 431, Dairy Science 431, and Physiology 431. See Animal Science 431.
- 432. Advanced Reproductive Physiology.** Same as Animal Science 432 and Dairy Science 432. See Dairy Science 432.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433, Dairy Science 433, and Physiology 433. See Animal Science 433.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Animal Science 463 and Biophysics 463. Lectures, demonstrations, and laboratory on the fundamentals of radioisotope procedures and applications in biology and medicine. Prerequisite: Quantitative chemistry; one year each of mathematics, physics, and biology, or consent of instructor. 1 unit.
- 465. Comparative Disposition of Xenobiotics.** Lecture-discussion concerning the fate of foreign chemicals in various species of animals; principles of absorption, distribution, biotransformation, and excretion of drugs and toxicants; and pharmacokinetics and factors which modify these processes. Prerequisite: Biochemistry 353 and Veterinary Biosciences 320, or equivalent. 1 unit.
- 466. Comparative Environmental Toxicology and Drug Resistance.** The chemistry, action, and disposition of selected toxic substances at levels associated with environmental contamination; nature and biological consequences of host-toxicant interactions from the perspective of chronic and subclinical effects. Prerequisite: Veterinary Biosciences 465 or Environmental Studies 331; or consent of instructor. ¾ unit.
- 467. Principles of Drug and Toxicant Evaluation.** Comprehensive discussion of the design and performance of clinical trials for evaluation of drugs and toxic materials in domesticated animals. Prerequisite: Veterinary Biosciences 318 or equivalent; credit or concurrent registration in Agronomy 340 or Biology 371. ¾ unit.
- 490. Seminar.** Required of all graduate students whose major is veterinary biosciences. 0 or ¼ unit.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. ¼ to 1 unit.
- 496. Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

VETERINARY CLINICAL MEDICINE

Head of Department: Professor B. K. Gustafsson

Department Office: 244 Small Animal Clinic, 1008 West Hazelwood Dr., Urbana

- 322. Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Biosciences 322. See Veterinary Biosciences 322.
- 342. Interpretive Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 342. See Veterinary Pathobiology 342.
- 347. Veterinary Clinical Oncology.** Advanced clinical techniques used in the diagnosis and treatment of neoplastic diseases of domestic animals. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
- 348. Advanced Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 348. See Veterinary Pathobiology 348.

- 360. Medicine, I: General Medicine.** Diagnosis, treatment, and prophylaxis of infectious, noninfectious, and surgical diseases of the small domestic animals; lectures, quizzes, and demonstrations. Required in the veterinary curriculum. Prerequisite: Second-year standing in veterinary curriculum. 5 hours.
- 361. General Veterinary Surgery.** Surgical principles including sterile technique, hemostasis, tissue handling, and wound healing with emphasis on clinical application in domestic animals; surgical procedures of the major body systems emphasizing pre-operative, operative, and post-operative patient care. Laboratory covers demonstration and practice of surgical principles. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
- 362. Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases; lectures, quizzes, and demonstrations. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
- 363. Small Animal Dermatology.** The first half of the course presents a systematic approach to small animal dermatologic diagnoses and therapeutics; the second half deals with immunological disorders, seborrheic syndromes, hereditary disorders, cutaneous neoplasms, and feline dermatology. Prerequisite: Veterinary Clinical Medicine 364 or equivalent, or consent of instructor. 1 hour.
- 364. Medicine, II: General Medicine.** Diagnosis, treatment, and prophylaxis of infectious and non-infectious, metabolic, and toxic diseases of domestic and exotic animals. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
- 365. Special Veterinary Surgery.** Lectures and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and aftercare, together with appropriate laboratory practice. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 5 hours.
- 366. Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
- 367. Radiology and Radiobiology.** Same as Veterinary Biosciences 367. General principles of radiology and radiobiology techniques and application to the diagnosis and therapy of animal diseases; lectures and discussions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 3 hours.
- 368. Infectious Diseases.** Diagnosis, treatment, and prophylaxis of infectious diseases of domestic animals. Prerequisite: Third year standing in Veterinary Medicine. 5 hours.
- 369. Clinical and Laboratory Practice.** Clerkship in veterinary clinical medicine and surgery for VM-4 professional students. Prerequisite: Fourth-year standing in veterinary medicine professional curriculum, or equivalent. 2 to 5 hours.
- 370. Seminar.** Faculty presentation of in-depth material concerning clinical aspects of medicine and surgery. Prerequisite: Fourth-year standing in veterinary medical curriculum. 1 hour.
- 371. The Evolution and Principles of Surgery.** Studies the evolution of surgery from an empiric craft to a scientific discipline. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
- 372. Veterinary Jurisprudence.** Principles of law of importance to members of the veterinary profession; animal disease and related regulatory laws and their administration; and federal procedure under animal disease, food, and meat inspection laws. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
- 373. Small Animal Urology.** The anatomic and physiologic basis for urologic examination of the dog and cat; discussions integrate lesions, pathogenesis, and signs of disease and stress the pathophysiologic basis of diagnosis and therapy in small animal urology. Prerequisite: Veterinary Clinical Medicine 360 or consent of instructor. 1 hour or ¼ unit.
- 375. Theriogenology.** Examines principles of animal reproduction, fertility, and obstetrics of all species of domestic animals, emphasizing farm animals; lectures, discussion, and laboratory practice in obstetrics, pregnancy diagnosis, and male and female fertility. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
- 376. Veterinary Anesthesiology and Fluid Therapy.** Principles of veterinary anesthesiology

emphasizing clinical application of anesthetic techniques and procedures in domestic animals; clinical pharmacology of preanesthetic, anesthetic and related drugs, anesthetic and physiologic monitoring equipment, and shock; teaches fluid and electrolyte therapy with overall emphasis on maintenance of homeostasis in anesthetized animals. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.

- 377. Disease Prevention and Therapy in Swine Production.** Practical diagnostic, preventive, and treatment procedures in modern veterinary swine practice; relationships between swine production methods and disease conditions; and herd health programs. Lectures, laboratories, and field trips. Prerequisite: Fourth-year standing in veterinary curriculum. 2 hours.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Pathobiology 378. Lectures and demonstrations illustrating the interrelationships between the basic sciences and their applications in medicine and surgery; includes methods of restraint and handling of several animal species. Prerequisite: First-year standing in the veterinary curriculum. 1 hour.
- 379. Advanced Veterinary Ophthalmology.** Anatomic, physiologic, pathologic, and pharmacologic considerations in eye diseases and their treatments; instrumentation and methods of study of ocular structure, physiology, and diseases; and laboratories devoted to techniques of examination of the eye and surgical procedures used in treatment of eye diseases. Prerequisite: Fourth-year standing in veterinary curriculum. 1 or 2 hours (1 hour if taking lecture only; 2 hours if taking lecture and lab), or $\frac{3}{4}$ unit.
- 380. Dairy Herd Health Management.** A study of dairy cattle practice, including economics, enterprise, management, herd and individual cow health, reproduction, and disease control. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 382. Exotic Pets.** Principles of restraint, diagnosis, and medical and surgical treatment of diseases of small exotic mammals, birds, reptiles, and fish kept as pets. Prerequisite: Third-year standing in veterinary curriculum. 1 hour.
- 384. Client Relations.** Introduction to client relations, including techniques of effective verbal and nonverbal communication and applications of these techniques for veterinary students. 1 hour.
- 385. Advanced Radiographic Interpretation: Large Animal.** In-depth study of radiographic diagnosis applied to large animals, primarily equine; lecture, case study, and discussion centering on anatomic areas, e.g., foot, fetlock, metacarpus/metatarsus, carpus, tarsus, upper limb joints, and head and neck. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
- 386. Advanced Radiographic Interpretation—Small Animal.** An exercise in systematic interpretation of small animal radiographs. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
- 387. Advanced Veterinary Anesthesiology.** Lectures cover mechanical ventilators and the physiologic effects of mechanical ventilation on acid-base status, cardiopulmonary function and other homeostatic mechanisms in anesthetized animals; high frequency ventilation in relation to other forms of mechanical respiratory support; recently developed anesthetic agents, techniques, and their clinical applications; interactions between non-anesthetic drugs and their effects on surgical patient response to anesthetic and anesthetic-related agents. Prerequisite: Fourth year standing in veterinary curriculum or consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 389. Small Animal Diagnostic Instrumentation.** Training in the use of special medical and surgical diagnostic techniques, including endoscopy, ultrasound, and an introduction to electrodiagnostics. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 390. Equine Reproduction.** Instruction in equine reproductive physiology, infectious and noninfectious infertility problems, obstetrical procedures, and preventive medicine practices. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 391. Advanced Orthopedics: Fracture Fixation.** Advanced instruction in the pathophysiology of bone fracture and healing, techniques of fracture fixation and complications of fracture repair. Prerequisite: Veterinary Clinical Medicine 361 and 365; fourth year standing in the veterinary curriculum. 1 hour.

- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 393. Advanced Neurology.** An advanced course which expands the participants' knowledge of clinical neurology and introduces participants to research techniques used in the elucidation of neurologic disease processes. Prerequisite: Senior or graduate standing in the College of Veterinary Medicine; or consent of instructor. 1 hour or $\frac{1}{2}$ unit.
- 394. Advanced Bovine Theriogenology.** Advanced instruction in pregnancy diagnosis, postparturient palpations, breeding soundness evaluations, artificial insemination techniques, and special obstetrical procedures. Prerequisite: Veterinary Clinical Medicine 363. 1 hour.
- 395. Beef Cattle Economics, Management, and Herd Health.** A study of management systems and the economic factors that influence the cattle industry; health programs for beef cattle emphasizing the herd approach and the veterinarian's role in the beef cattle industry. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 396. Advanced Small Animal Surgery.** Lecture and laboratories in advanced small animal surgery. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 397. Advanced Equine Lameness.** An elective in the diagnosis and treatment of equine lameness. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
- 399. Principles of Ocular Physiology and Pharmacology.** Current concepts in ocular physiology of the tear film, cornea, aqueous dynamics, lens, and retina; includes the pharmacology of drugs which alter normal physiologic states as well as those affecting the ocular autonomic nervous system. Prerequisite: For professional students, second-year standing in the veterinary curriculum; for graduate students, DVM degree or equivalent and consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 490. Seminar.** Required of all graduate students whose major is veterinary clinical medicine. 0 or $\frac{1}{4}$ unit.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 493. Advanced Topics in Veterinary Clinical Medicine.** Instruction in advanced diagnosis, therapeutic modalities, and research methodologies in the areas of small animal internal medicine, small animal surgery, equine and food animal medicine and surgery, ophthalmology, theriogenology, radiology, and clinical pharmacology. Prerequisite: D.V.M. degree or equivalent; consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

VETERINARY MEDICAL SCIENCE

Dean of College: Professor R. E. Dierks

Department Office: 3229 Veterinary Medicine Basic Sciences Building, 2001 S. Lincoln, Urbana

Effective January 1, 1980, the graduate courses in veterinary medical science have been realigned with one of the three departments in the College of Veterinary Medicine. The following courses have been retained to allow existing VMS students to complete their degree requirements in veterinary medical science.

- 490. Seminar.** Required of all graduate students whose major is veterinary medical science. $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

VETERINARY PATHOBIOLOGY

Head of Department: Professor J. A. Shadduck

Department Office: 2522 Veterinary Medicine Basic Sciences Building, 2001 S. Lincoln Ave., Urbana

- 326. Parasitologic Techniques and Systematics.** Survey of taxonomy of animal parasites; structures used for taxonomy are studied after collection, preservation, and preparation of parasite specimens. Prerequisite: Veterinary Pathobiology 333 and 336, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 330. Veterinary Medical History, Ethics, and Orientation.** Introduction to the history, recent developments, scope, and trends of veterinary medical education, practice, research, public health, and other areas; functions, obligations, and organization of the profession. Prerequisite: First-year standing in veterinary curriculum. 1 hour.
- 331. Veterinary Bacteriology and Mycology.** Studies the properties of bacteria and fungi responsible for diseases of domestic and wild animals; emphasizes epidemiology, pathogenesis, and morphological and cultural characteristics of bacteria and fungi, and diagnosis. Prerequisite: First-year standing in veterinary curriculum or consent of instructor. 4 hours.
- 332. Veterinary Immunology.** Fundamental principles of immunology; mechanisms and functions of the humoral and cell-mediated immune responses; role of the immune system in protection against infectious diseases and tumors; immune dysfunctions and diseases of immunologic origins. Lectures and laboratory. Prerequisite: Veterinary Pathobiology 331 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 333. Protozoan, Arthropod and Helminth Parasites.** Protozoan, arthropod, helminth parasites affecting domestic animals and humans; lectures, discussions, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 20 hours in chemistry or animal biology, or both; consent of instructor. 5 hours or 1 unit.
- 334. General Pathology.** Cellular, organic, and systematic reactions to acute and chronic injury related to infections, circulatory disturbances, intoxications, parasitism, immunologic disorders, metabolic disturbances, and disturbances of growth, including neoplasms; lectures, quizzes, demonstrations, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 25 hours in histology, parasitology, physiology, and microbiology; consent of instructor. 4 hours or 1 unit.
- 335. Special Pathology.** Disease processes including specific diseases, affecting organs and anatomic systems. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 337. Veterinary Virology.** Fundamental principles of animal virology; mechanisms of virus-cell and virus-host interactions; explores properties of the major groups of animal virus in relation to replication and pathogenesis of viral disease. Lecture and laboratory. Prerequisite: Veterinary Pathobiology 331 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 338. Veterinary Clinical Pathology.** Discusses the function and interpretation of hematological, chemical, and certain other procedures, including exfoliative cytology, as aids in the diagnosis of animal diseases; emphasizes the correlation of laboratory findings with fundamental changes and clinical manifestations of disease. Prerequisite: Second-year standing in veterinary curriculum. 4 hours.
- 339. Basic Biomedical Photography.** Uses photography as a tool for scientific communication emphasizing production and design for research and instructional purposes; encourages students to explore in depth those areas that are of specific interest (e.g., clinical photography, photomicrography, special techniques in lighting, or areas such as multimedia productions or self-instructional techniques). Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 1 or 2 hours.
- 340. Wildlife Diseases and Medicine.** Lectures and clinical demonstrations cover diseases, diagnostic methods, medical and surgical treatments, and principles of restraint of wild hoofed stock, fur bearers, marine mammals, raptors, and waterfowl; emphasizes diseases

common to this geographic region and those of significance in zoological collections. Offers a lab for additional demonstration and practice of techniques; invited speakers cover special areas. Prerequisite: Fourth year standing in veterinary medical professional curriculum or equivalent, or consent of instructor. 2 hours.

- 341. Food Hygiene and Public Health.** Introduction to public health; diseases of animals transmissible to humans; and procedures and techniques used in inspection of food of animal origin. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 3 hours.
- 342. Interpretive Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 342. Discusses clinical pathologic findings used in the diagnosis of disease affecting domestic animals including dog, cat, horse, and cow with emphasis on hematology, urinalysis, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338 or equivalent. 2 hours.
- 343. Diseases of Poultry.** The causes, symptoms, lesions, prevention, and treatment of noninfectious and infectious diseases of domestic birds; lectures, quizzes, and PLATO demonstrations. Prerequisite: Third or fourth year standing in veterinary curriculum or consent of instructor. 2 hours.
- 344. Clinical Immunology.** The impact of immunologic mechanisms in clinical medicine; autoimmunity, tolerance, immune complex disease, and immunoprophylaxis; lectures and demonstrations. Prerequisite: Veterinary Pathobiology 332 or equivalent. 2 hours or ½ unit.
- 346. Management and Diseases of Laboratory Animals.** Principles of colony management and disease control of common laboratory animals; emphasizes the production and maintenance of quality animals for research; and includes a field trip to AAALAC-accredited facilities. Prerequisite: Two courses in biology and consent of instructor. 2 hours or ½ unit.
- 348. Advanced Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 348. Advanced lectures, discussions, and laboratory work in hematology, exfoliative cytology, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338. 2 hours.
- 350. Epidemiology.** Principles and uses of epidemiology and biostatistics in the practice of veterinary medicine. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 355. Animal Necropsy Procedures.** Instruction and practice in the performance of postmortem dissections; emphasizes the recognition of macroscopic pathologic changes on the assessment of their effects and on their diagnostic significance. For nonpathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; and consent of instructor. 1 or 2 hours, or ¼ or ½ unit. May be repeated to a maximum of 6 hours or 1 ½ units.
- 374. General Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Medical Sciences 374. See Health and Safety Studies 374.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Clinical Medicine 378. See Veterinary Clinical Medicine 378.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or ¼ to ¾ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 415. Mechanisms of Microbial Infections.** Newer concepts of host-microorganism relations; emphasis on the dynamics and pathogenic mechanisms of microorganisms, immune responses and defense factors of the host, and pathogenesis of specific infections. Lectures, discussions, laboratory, and special problems. Prerequisite: Microbiology 326 or Veterinary Pathobiology 332, or equivalent; consent of instructor. ¾ or 1 unit.
- 416. Epizootiology.** Principles and problems of epizootiology; special consideration of the zoonoses; ecology of the host and parasite as related to resistance, adaptation, perpetuation, and distribution; the principles and factors in interference, carrier and latent states, and reservoirs and control. Prerequisite: Veterinary Pathobiology 331 or 332, or equivalent, or consent of instructor. 1 unit.

- 418. Concepts and Topics in Immunology.** Same as Genetics and Development 418. Newer concepts and theories in the field of immunology, including theories of antibody formation and immunological tolerance, regulation of the immune response, biosynthesis and structure of antibodies, and evolutionary aspects of the immune response. Lectures and discussion. Prerequisite: Consent of instructor; Microbiology 327 and Genetics and Development 307 recommended. $\frac{1}{2}$ unit.
- 419. Animal Virology.** Same as Microbiology 419. A discussion-laboratory with major emphasis on host-parasite relationships, natural history, and epidemiology, supplemented with appropriate laboratory techniques as they pertain to the major groups of animal viruses. Prerequisite: Microbiology 327 and 328, or Veterinary Pathobiology 331 and 332; Biochemistry 350 or 354; consent of instructor. $\frac{1}{4}$ unit.
- 425. Experimental Parasitology.** Same as Genetics and Development 425. A broadly based consideration of the relationship of parasites to their hosts and to their environments, and of the factors which influence these relationships. Prerequisite: A laboratory course in parasitology or protozoology; organic chemistry; Biochemistry 350 and statistics recommended. 1 unit.
- 427. Parasitology Seminar.** Discussion of selected historic and current literature related to parasitology. Prerequisite: Veterinary Pathobiology 333 and 336; or Genetics and Development 321 or equivalent; or concurrent registration in any one of these courses. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 437. Immunoparasitology.** Discusses the immune response to protozoan, helminth, and arthropod parasites of veterinary and zoonotic importance and its relationship to parasite survival, protective immunity and diagnosis. Prerequisite: Veterinary Pathobiology 332 or Genetics and Development 307, or equivalent; and Veterinary Pathobiology 333. 1 unit.
- 445. Veterinary Diagnostic Pathology, I.** Instruction in the performance of necropsy examinations; emphasizes recognition, interpretation, oral presentations, and written descriptions of gross and histologic lesions; emphasizes histologic features of lesions. For pathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 446. Veterinary Diagnostic Pathology, II.** Instruction in the use of supplemental diagnostic data in the areas of bacteriology, clinical pathology, immunology, parasitology, toxicology, and virology in arriving at differential and definitive diagnoses; emphasizes pathogenesis of gross and histologic lesions and mechanisms of lesion development. Prerequisite: Veterinary Pathobiology 445 or equivalent, or consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 447. Pathology Seminar.** Discusses selected pathologic and clinico-pathologic material; requires presentation of a formal seminar. Prerequisite: Credit or concurrent registration in Veterinary Pathobiology 445, and consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 448. Toxicologic Pathology.** Examines the morphological and biochemical aspects of cellular reactions to injury in acute and chronic toxicities; effect of selected toxic agents on target organs in relation to induced functional and structural changes. Prerequisite: Veterinary Pathobiology 334; and Veterinary Biosciences 320 or Animal Science 360; or equivalent. $\frac{3}{4}$ or 1 unit.
- 449. Pathology of Selected Systems.** Pathogenesis and pathology of disease processes in selected tissue and organ systems; emphasizes the mechanisms of cellular and tissue responses to injury. Topics differ each term. Prerequisite: Veterinary Pathobiology 335 or equivalent; consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 450. Concepts in Pathology.** Discusses experimental and theoretical aspects of general pathology; emphasizes an interdisciplinary approach to mechanisms of disease processes. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. 1 unit.
- 453. Tumor Biology.** Examines concepts and principles of the neoplastic process and its morphologic correlates; topics include events mediated by chemical and viral causes of

neoplastic transformation, behavioral alterations that mark commitment to neoplastic growth, biology of metastases, and clonal selection as a property of successful tumors. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. $\frac{3}{4}$ unit.

455. **Comparative Oncology.** Comparative study of the nature of mammalian and avian neoplasms based on general and special methods of tumor identification and classification; lectures, demonstrations, and laboratory. Prerequisite: Veterinary Pathobiology 334 and 335, or equivalent. 1 unit.
457. **Ultrastructural Pathology.** Same as Biology 457. Ultrastructural basis of pathologic processes occurring in animal tissues and cells. Lectures, discussions, and reports. Prerequisite: Consent of instructor. $\frac{3}{4}$ or 1 unit.
459. **Surgical Pathology.** Discusses and interprets disease processes of domestic animals; emphasizes interpretation of pathologic changes in tissue specimens obtained during surgical procedures; correlates structure, function, and prognosis. Prerequisite: Veterinary Pathobiology 445 and 455, or equivalent; consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
490. **Seminar.** Required of all graduate students whose major is veterinary pathobiology. 0 or $\frac{1}{4}$ unit.
491. **The Experimental Method in Veterinary Research.** Planning of experiments, use of controls, interpretation of results, sources of error, and writing the research report. $\frac{1}{2}$ unit.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
496. **Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Biosciences 496. Interdisciplinary seminar on topics within the area of toxicology; topics vary each semester. Seminars are presented by faculty, visiting lecturers, and students based upon their study, research, and/or professional activities in the selected topic area. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units.

VOCATIONAL AND TECHNICAL EDUCATION

Chairperson of Department: Professor H. C. Kazanas

Department Office: 347 Education Building, 1310 South Sixth, Champaign

101. **Nature of the Teaching Profession.** Introduction to educational problems; a general study of the nature of teaching; its opportunities and responsibilities. Through individual work, students are helped to evaluate their potentialities for teaching. 2 hours.
152. **Pre-educational Internship.** Early field experiences in an educational setting, including observation and laboratory experiences in community colleges, adult vocational programs, business and industry, health service settings, or governmental agencies; provides opportunities for career exploration, professional orientation, interrelating theory and practice, and understanding the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 3 hours.
181. **Introductory Woodwork.** Beginning course in hand woodwork, with emphasis on both manipulative skills and related technical material. This course is offered for majors in industrial education and students in the occupational therapy curriculum. May be taken by others as an elective on a space available basis. 4 hours.
182. **Advanced Course in Woodwork.** Advanced course in design and construction of woodwork projects with related technical information. Prerequisite: Vocational and Technical Education 181. 4 hours.
189. **Supervised Occupational Experience.** Provides students preparing to teach in the vocational and technical fields the occupational experience necessary or appropriate to

complete the requirements in these curricula. Students who are employed and concurrently enrolled in this course complete assignments covering the related technical information of their chosen fields and undergo regularly scheduled written, oral, and performance examinations. Application for a job assignment must be made three months prior to the semester in which placement is desired. Prerequisite: Sophomore standing. 2 or 3 hours. May be repeated to a maximum of 17 hours.

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 240. Principles of Vocational and Technical Education.** Provides each specialized educational worker with a common orientation as to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Prerequisite: Vocational and Technical Education 101; Psychology 100. 2 to 4 hours.
- 249. Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper five percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
- 252. Educational Internship.** A practicum in a postsecondary educational setting to prepare students for educational roles where public school certification is not necessary or appropriate. Prerequisite: Vocational and Technical Education 152 and satisfactory progress in the technical education specialties curriculum. 5 to 8 hours.
- 270. Technique and Curriculum Development for Teaching Secretarial and Office Practice Subjects.** Review of results of current research and experimentation in the teaching of typewriting, shorthand, and other office practice subjects; review of basic education principles relative to skill development; and introduction to the use of innovations and technology, and their implications for office education. Proficiency level in typewriting and shorthand must be validated through examination administered by business education faculty prior to enrollment in the course. 3 hours.
- 271. Technique and Curriculum Development for Teaching Data Processing and Office Machines.** Introduction of techniques for teaching the operation of a variety of office machines used for processing data; introduction of current methods of teaching the use of automated data-processing equipment and requirements for employment. Proficiency level in the operation and theory of operation of office machines used for processing data must be validated through examination administered by business education faculty prior to enrollment in the course. 3 hours.
- 275. Pre-Student Teaching in Agricultural Education.** Supervised experience in the work of a teacher of vocational agriculture during a two- or three-week period in the summer; planning summer work, teaching adult classes, supervising occupational practice or on-the-job training of students, advising school-sponsored youth organizations, counseling students, studying a community, becoming acquainted with facilities and equipment used in a vocational agriculture program, and becoming familiar with the situations in which the student will later do student teaching during a school year. Course work is completed during the summer with official registration in the fall semester. Prerequisite: Educational Policy Studies 201. 2 or 3 hours.
- 276. Student Teaching in Vocational Agriculture.** Supervised experience in the work of a teacher of vocational agriculture during an eight-week period; planning programs, teaching high school and adult students, managing facilities and equipment, supervising students on the job, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 277. 8 hours.
- 277. Programs and Procedures in Agricultural Education.** Preparation for a successful experience in student teaching and for beginning work as a teacher of vocational agriculture; teaching high school and adult classes, maintaining and using facilities and equipment, supervising occupational experience programs, advising youth organizations,

- counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 276. 5 hours.
- 278. Vocational Home Economics Education for Youth and Adults.** Preparation for work as a teacher in vocational home economics programs for youth and adults; study of procedures for planning, organizing, executing, and evaluating home economics occupational programs. Prerequisite: Senior standing and consent of instructor. 3 hours.
- 280. General Drafting for Teachers.** An integrating course to prepare industrial education students to teach drafting; deals primarily with the problems of organizing and teaching drafting courses. 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 309. Vocational Education for Special Needs Learners.** Same as Special Education 309. Examines contemporary legislation, program models, assessment, and instructional practices pertaining to special needs learners in vocational, technical and practical arts education programs at the secondary and post-secondary levels. Prerequisite: Student teaching or consent of instructor. 4 hours or 1 unit.
- 345. Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Special Education 345. See Special Education 345.
- 349. Special Study and Investigation in Vocational and Technical Education.** Offers opportunity for an individual to study, on or off campus, selected problems, trends, and new developments or to conduct specialized technological investigations for the improvement of instructional programs in areas related to vocational and technical education. Prerequisite: Consent of instructor; demonstrated ability to pursue special study or investigation proposed. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 350. Education for Rural Development in Low Income Countries.** Same as Agriculture 350. Study of educational institutions needed to further rural development in developing nations; emphasizes educational programs that enable rural families to improve their quality of life. Prerequisite: Senior standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 353. Curriculum Development in Nutrition Education.** Same as Health and Safety Studies 313. Applies principles of teaching and learning to nutrition education for children and adults emphasizing choice of content, teaching techniques, and resources to promote interest and enhance achievement. Prerequisite: Foods and Nutrition 220 and Educational Psychology 311, or consent of instructor. 3 hours or 1 unit.
- 354. Program Development in Family Life Education.** Studies current issues impacting on families, family organization and family functioning and interaction; reviews theories of human development as they relate to curriculum development in family life education; emphasizes selecting and organizing content, and specific approaches to teaching family relationships in school and non-school settings. Prerequisite: Psychology 100; Human Development and Family Ecology 105; Human Development and Family Ecology 215 or consent of instructor. 3 hours or 1 unit.
- 356. Study of Careers in Health Occupations.** Analysis of health occupations careers through comparison of models for preparing various health practitioners; generalization of effects of health care needs across the allied health fields; and determination of cause-effect relationships impinging on health occupations role performance. Prerequisite: Vocational and Technical Education 381 or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 357. The Relationship of Health Occupations Education and Health Care Delivery Systems.** Assessment of the present status, trends, issues, and implications of health care delivery systems as related to health occupations education; identification of leadership skills for initiation, implementation, and evaluation of health occupations programs; and generation of criteria for curriculum modification in response to impinging social forces, such as legislation and manpower needs. Prerequisite: Vocational and Technical Education 356 and 383 or 388, or equivalent. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 359. Professional Skill Development Workshop in Vocational and Technical Education.** Designed to teach practitioner-oriented skills in specialized areas of vocational and techni-

- cal education; students or faculty members may make requests for initiation of sections of this course. Topics vary; consult Timetable for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 370. Agricultural Education for Inexperienced Teachers.** Specific help with the problems of beginning teachers; campus meeting in August; other meetings in centers in the state convenient to beginning teachers; and visits by instructors to schools in which enrolled teachers are employed. Prerequisite: Vocational and Technical Education 276 and 277. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 381. Foundations of Career, Occupational, and Practical Arts Education.** A study of basic concepts and practices of career, occupational, and practical arts education; explores the development of the curricular areas concerned, including types of programs, their place and role in various types of educational settings, students served, and issues and trends in program change. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 382. Cooperative Vocational and Technical Education Programs.** Provides the specific professional background required of teachers, coordinators, and administrators who organize and conduct public school programs utilizing community resources and experiences; includes the background, philosophy, organization, and administration of cooperative education. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 383. Planning and Organizing Content for Career, Occupational, and Practical Arts Education.** Emphasizes selection, organization, and preparation of content for instructional programs in career, occupational, and practical arts education; students perform task analyses, prepare instructional objectives, arrange content in appropriate sequence, and determine allocation of resources. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 384. The General Shop Program.** A laboratory and theory course in the organization and administration of the industrial arts general shop program. Prerequisite: Sixteen hours of undergraduate credit in appropriate vocational and technical education courses. 4 hours or 1 unit.
- 385. Problems in Concurrent Work-Education.** While employed in approved cooperating business firms, students observe the relationships between their activities and the specialized educational programs in the high school and community college; in class sessions, emphasis on job analysis, current trends, wage and benefit structure, personnel practices, labor relations, and their implications for teaching. Prerequisite: Completion of prescribed courses in vocational and technical education for teaching in their area of specialization; consent of instructor. 4 hours or 1 unit.
- 387. Training Programs in Industry.** Study of the organization, instruction, supervision, and evaluation of training programs conducted within industry and their relationships to other educational agencies. 4 hours or 1 unit.
- 388. Special Techniques of Teaching Career, Occupational, and Practical Arts Education.** A study of teaching techniques appropriate to career, occupational, and practical arts education; focuses on communication methods and instructional strategies; students conduct investigations, develop materials, and make applications to their areas of concern. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 399. Issues and Developments in Vocational and Technical Education.** A special course for experimentation or for seminar on topics not treated by regularly scheduled courses; requests for initiation of this course may be made by students or faculty members. Topics vary; consult Timetable for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 442. The Community College.** Same as Administration, Higher, and Continuing Education 442. See Administration, Higher and Continuing Education 442.
- 445. Investment in Human Resources.** Same as Labor and Industrial Relations 445. See Labor and Industrial Relations 445.
- 448. Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Secondary Education 448. See Administration, Higher, and Continuing Education 448.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent

study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.

- 450. Evaluation in Vocational, Technical, and Practical Arts Education.** Theory and techniques of vocational education evaluation in cognitive, affective, and psychomotor domains at different educational levels; development and analysis of activities and instruments for student and program evaluation, follow-up studies, and interpretation of results for self-evaluation and for administrative decision making. Prerequisite: Educational Psychology 392 and Vocational and Technical Education 471, or consent of instructor. 1 unit.
- 451. Directing Personnel Development in Vocational, Technical, and Practical Arts Education.** Principles and techniques for development of personnel in programs of vocational, technical, and practical arts education; emphasis on personnel development and instructional supervision of paraprofessionals, employers, and foremen of vocational and technical education students. Prerequisite: One unit in vocational and technical education or consent of instructor. 1 unit.
- 453. Disciplined Inquiry in Vocational Education.** Provides an analysis and synthesis of disciplined inquiry in vocational education including an historical perspective, formulation of the research process, and the utilization and communication of research. Prerequisite: Vocational and Technical Education 381 and Educational Psychology 390; or equivalent. 1 unit.
- 454. Problems of Home Economics Teachers in the School and Community Setting.** Advanced study of principles of teaching and learning in the school and community setting; includes group meetings on campus and in centers convenient to students, and visits by the instructor to settings in which enrollees work. Instruction utilizes the experience and resources of teachers enrolled. Prerequisite: BS in Home Economics Education; currently teaching home economics. 1 unit.
- 455. Principles of Supervision of Home Economics Interns in School and Non-School Settings.** Studies principles and techniques for the development of supervisors of student interns; develops the educational capabilities of supervisors for their role as educators through knowledge of supervisory processes and practices and awareness of the scope of the supervisor's responsibilities. Prerequisite: Educational Psychology 311 and 312; or equivalent. 1 unit.
- 456. Problems and Trends in Specialized Fields of Vocational and Technical Education.** Introduction to significant problems, points of view, and trends in the field concerned; explores significant research relating to organization, content, and techniques in the field in question. Topics vary; consult Timetable for specific section offerings. Students are encouraged to make special studies in approved areas. 1 unit.
- 471. Policy and Program Development in Vocational, Technical, and Practical Arts Education.** Local, state, and national policies for vocational and technical education; organizing for policy making and program development; and developing desirable policies and programs. 1 unit.
- 472. Course Planning and Teaching Procedures in Agricultural Education Programs.** Gathering data essential in course planning, constructing course plans, and developing resource units, teaching procedures, and instructional aids. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 473. Adult Education in Agriculture.** The case for adult education, needs of young and adult farmers for education, development and present status of adult education in agriculture, objectives, evaluation, using advisory committees, organizing adult classes, enrolling students, course planning, teaching procedures and aids, supervised practice, group activities, and facilities. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 474. Supervised Experience in Vocational Agriculture Programs.** Supervised agricultural experience programs as an educational strategy; importance and meaning of supervised

agricultural experiences; planning, conducting, supervising, and evaluating agricultural experience programs; relation of supervised agricultural experience programs to establishment and advancement in an occupation; keeping and using records; and relating class instruction to supervised agricultural experience programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.

- 475. Organizing and Teaching Agricultural Mechanics.** Agricultural mechanics as a phase of vocational education in agriculture: purposes, course planning for high school students, young farmers, and adults; methods of teaching and evaluating on-farm or on-job instruction; planning agriculture-mechanics shops and facilities; and providing and teaching safety in agriculture mechanics. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 476. Guidance in Vocational, Technical, and Practical Arts Education.** The guidance function of a vocational or technical teacher; developing guidance related instructional programs; identifying and selecting students for vocational and technical programs; determining labor market needs and projections and job requirements; providing occupational information; placing graduates; counseling parents, students, supervisors, advisory committee members, union members, and employers; and conducting follow-up studies. 1 unit.
- 481. History and Basic Concepts of Vocational and Technical Education.** The historical development of modern vocational education; the educational theories underlying its development; and the educational concepts upon which present programs and procedures are based. 1 unit.
- 482. Research Studies in Vocational and Technical Education.** Study and evaluation of examples of research in this field; consideration of the research needed to solve present problems. Each student proposes and completes a brief research project, or plans in detail a major research project to be completed later. 1 unit.
- 487. Seminar in Vocational, Technical, and Practical Arts Education.** Overview and interpretation of social, economic, and technological trends which have relevance to the problem of developing new programs in the vocational, technical, and practical arts areas; analysis and evaluation of innovations in the field; and current issues and problems. Prerequisite: Graduate standing in vocational and technical education. 1 unit.
- 488. Foundations of Curriculum Development for Occupational and Practical Arts Education.** Synthesizes selected sociological, psychological, and epistemological foundations for curriculum development in occupational and practical arts education; application of theories from fundamental disciplines to practice in existing and emerging curricula involving perceptual and psychomotor learning. $\frac{1}{2}$ or 1 unit.
- 489. Administration of Vocational and Technical Education.** Problems and approved practices in the administration and supervision of programs of vocational, technical, and practical arts education in secondary schools, junior colleges, and technical institutes. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in vocational and technical education open only to persons who have been admitted for doctoral study in vocational and technical education; sections are usually offered in the following areas: (a) industrial education, (b) agricultural education, (c) home economics education, (d) business education, (e) health occupations, and (f) general vocational and technical education. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

WOMEN'S STUDIES

Director of Office: Professor Berenice A. Carroll

Office address: 304 Stiven House, 708 S. Mathews, Urbana

- 111. **American Women in Change: An Introduction.** Interdisciplinary introduction to women's studies in literature, history, and speech communication; includes women's actual roles in American history (seventeenth to early twentieth centuries) and literature and sex-related issues in language; and emphasizes interconnections among the three fields. 3 hours.
- 112. **Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Ecology 145 and Sociology 145. The impact of culture and society on gender roles, including socialization and identity formation, as expressed in life-styles, marriage and family alternatives, and patterns of education and employment. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours.
- 219. **Women in Japanese Literature.** Same as Asian Studies, Comparative Literature, and Japanese 219. See Japanese 219.
- 224. **Women in Society.** Same as Sociology 224. See Sociology 224.
- 235. **Women in Politics.** Same as Political Science 235. See Political Science 235.
- 262. **Cultural Images of Women.** Same as Anthropology 262. See Anthropology 262.
- 272. **History of Women in Europe, 1700 to the Present.** Same as History 272. See History 272.
- 273. **The History of American Women: Colonial Period to the Present.** Same as History 273. See History 273.
- 280. **Women Writers.** Same as English 280. See English 280.
- 332. **Sex-Related Differences in Language.** Same as Linguistics and Speech Communication 332. See Speech Communication 332.
- 346. **Sexism: Social Service and Social Welfare.** Same as Social Work 346. See Social Work 346.
- 370. **Selected Topics on Women and Politics.** Same as Political Science 370. See Political Science 370.
- 396. **Seminar in Women's Studies.** Interdisciplinary seminar on special topics in women's studies. Prerequisite: Women's Studies 111 or 112, and two courses in women's studies at the 200-300 levels; junior standing or consent of instructor. 3 hours, or ½ to 1 unit. May be repeated once as content varies.

Appendix A

LANGUAGE OFFERINGS

The following is a complete list of the languages regularly offered, together with the unit responsible for offering the course. The reader should consult the listing for the unit for the specific courses offered in the language.

<i>Language</i>	<i>Unit responsible for the language</i>
African Languages	Linguistics
Arabic	Linguistics
Bulgarian	Slavic Languages and Literatures
Catalan	Spanish, Italian, and Portuguese
Chinese	Asian Studies
Coptic	Classics
Czech	Slavic Languages and Literatures
Danish. <i>See</i> Scandinavian	Germanic Languages and Literatures
French	French
German	Germanic Languages and Literatures
Greek (Ancient)	Classics
Hausa. <i>See</i> African Languages	Linguistics
Hebrew	Linguistics
Hindi	Linguistics
Italian	Spanish, Italian, and Portuguese
Japanese	Asian Studies
Korean	Asian Studies
Latin	Classics
Lingala. <i>See</i> African Languages	Linguistics
Norwegian. <i>See</i> Scandinavian	Germanic Languages and Literatures
Persian	Linguistics
Polish	Slavic Languages and Literatures
Portuguese	Spanish, Italian, and Portuguese
Russian	Slavic Languages and Literatures
Sanskrit	Linguistics
Scandinavian	Germanic Languages and Literatures
Serbo-Croatian	Slavic Languages and Literatures
Spanish	Spanish, Italian, and Portuguese
Swahili. <i>See</i> African Languages	Linguistics
Swedish. <i>See</i> Scandinavian	Germanic Languages and Literatures
Ukrainian	Slavic Languages and Literatures
Urdu. <i>See</i> Hindi	Linguistics
Wolof. <i>See</i> African Languages	Linguistics

Other languages may be offered by tutorial in the following units:

Asian Studies
Latin American and Caribbean Studies
Linguistics

Appendix B

RUBRIC ABBREVIATIONS

Following is a list of official rubric abbreviations for courses currently approved for offering on the Urbana-Champaign campus of the University of Illinois.

A A E	Aeronautical and Astronautical Engineering	BIOEN	Bioengineering
ACCY	Accountancy	BIOL	Biology
ADV	Advertising	BIOPH	Biophysics
AFAS	Air Force Aerospace Studies	BULG	Bulgarian
AFLNG	African Languages	BUS	Business
AFRO	Afro-American Studies	CATAL	Catalan
AFRST	African Studies	C E	Civil Engineering
AGCOM	Agricultural Communications	CER E	Ceramic Engineering
AG E	Agricultural Engineering	CH E	Chemical Engineering
AG EC	Agricultural Economics	CHEM	Chemistry
AG M	Agricultural Mechanization	CHIN	Chinese
AGR	Agriculture	CLCIV	Classical Civilization
AGRON	Agronomy	C LIT	Comparative Literature
AHCE	Administration, Higher and Continuing Education	COMM	Communications
ANAT	Anatomical Sciences	COP	Coptic
AN S	Animal Science	C S	Computer Science
ANTH	Anthropology	CZECH	Czech
ARAB	Arabic	DANCE	Dance
ARCH	Architecture	D S	Dairy Science
ART&D	Introduction to Art and Design	ECON	Economics
ARTCI	Cinematography	ED PR	Educational Practice
ARTCR	Crafts	EDPSY	Educational Psychology
ARTED	Art Education	EDUC	Education
ARTGD	Graphic Design	E E	Electrical Engineering
ARTGP	General Professional Courses in Art and Design	EEE	Ecology, Ethology, and Evolution
ARTHI	History of Art	EL ED	Elementary and Early Childhood Education
ARTID	Industrial Design	ENG	Engineering
ARTPA	Painting	ENG H	Engineering Honors
ARTPH	Photography	ENGL	English
ARTPR	Printing	ENTOM	Entomology
ARTSC	Sculpture	ENVST	Environmental Studies
AS ST	Asian Studies	E P S	Educational Policy Studies
ASTR	Astronomy	E S L	English as a Second Language
ATMOS	Atmospheric Sciences	F A A	Fine and Applied Arts
AVI	Aviation	FACE	Family and Consumer Economics
B ADM	Business Administration	FIN	Finance
B&T W	Business and Technical Writing	F N	Foods and Nutrition
BIOCH	Biochemistry	FOR	Forestry
		FR	French
		F S	Food Science

G & D	Genetics and Development	NUTRS	Nutritional Sciences
G E	General Engineering	P E	Physical Education
GEOG	Geography	PERS	Persian
GEOL	Geology	PHIL	Philosophy
GER	German	PHYCS	Physics
GMC	Germanic	PHYSL	Physiology
GRK	Greek	PLBIO	Plant Biology
HDFE	Human Development and Family Ecology	PL PA	Plant Pathology
HSS	Health and Safety Studies	POL	Polish
HEBR	Hebrew	POL S	Political Science
HINDI	Hindi	PORT	Portuguese
HIST	History	PSYCH	Psychology
HORT	Horticulture	RELST	Religious Studies
HRFS	Human Resources and Family Studies	RHET	Rhetoric and Composition
HUMAN	Humanities	RMLNG	Romance Linguistics
I D	Interior Design	R SOC	Rural Sociology
I E	Industrial Engineering	RUSS	Russian
ITAL	Italian	R TV	Radio and Television
JAPAN	Japanese	SANSK	Sanskrit
JOURN	Journalism	SCAN	Scandinavian
KOREA	Korean	S CR	Serbo-Croatian
L A	Landscape Architecture	SE ED	Secondary Education
L A S	Liberal Arts and Sciences	SLAV	Slavic
LA ST	Latin American and Caribbean Studies	SOC	Sociology
LAT	Latin	SOC S	Social Science
LAW	Law	SOC W	Social Work
LEIST	Leisure Studies	SOILS	Soils
LIS	Library and Information Science	SP ED	Special Education
LING	Linguistics	SPAN	Spanish
L I R	Labor and Industrial Relations	SPCOM	Speech Communication
MATH	Mathematics	SPSHS	Speech and Hearing Science
MCBIO	Microbiology	STAT	Statistics
M E	Mechanical Engineering	STS	Science, Technology, and Society
MED S	Medical Sciences	T A	Textiles and Apparel
MET E	Metallurgical Engineering	T A M	Theoretical and Applied Mechanics
MIL S	Military Science	THEAT	Theatre
MIN E	Mining Engineering	UKR	Ukrainian
MUSIC	Music	U P	Urban and Regional Planning
NA	Medical-Surgical Nursing	V B	Veterinary Biosciences
NE	Public Health Nursing	V C M	Veterinary Clinical Medicine
NS	General Nursing	V M S	Veterinary Medical Science
N S	Naval Science	VP	Veterinary Pathobiology
NUC E	Nuclear Engineering	VOTEC	Vocational and Technical Education
		W S	Women's Studies

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Where to Write or Telephone for Information about:

ADMISSIONS FOR UNDERGRADUATE, GRADUATE, AND VETERINARY MEDICINE STUDENTS; APPLICATION FORMS; *TIMETABLES*: Admissions and Records, University of Illinois at Urbana-Champaign, 10 Administration Building, 506 South Wright Street, Urbana, IL 61801; (217) 333-0302.

EMPLOYMENT: Student Employment, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, IL 61820; (217) 333-0600.

FINANCIAL ASSISTANCE: Student Financial Aids, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, IL 61820; (217) 333-0100.

SCHOLARSHIP, AWARD, AND FELLOWSHIP INFORMATION; HONORS PROGRAMS; PUBLICATIONS OF COLLEGES, SCHOOLS, AND OTHER URBANA-CHAMPAIGN CAMPUS UNITS:

College of Agriculture
College of Applied Life Studies
Institute of Aviation
College of Commerce
and Business Administration
College of Communications
College of Education
College of Engineering
Institute for Environmental Studies
College of Fine and Applied Arts

Graduate College
Institute of Labor
and Industrial Relations
College of Law
College of Liberal Arts and Sciences
Graduate School of Library and
Information Science
School of Social Work
College of Veterinary Medicine

HOUSING: Housing Information, University of Illinois at Urbana-Champaign, 2 Turner Student Services Building, 610 East John Street, Champaign, IL 61820; (217) 333-1420.

MOTOR VEHICLE AND BICYCLE REGISTRATION: Campus Parking, University of Illinois at Urbana-Champaign, 505 East Green Street, Champaign, IL 61820; (217) 333-3530.

PERMANENTLY PHYSICALLY HANDICAPPED STUDENT SERVICES: Rehabilitation-Education Services, University of Illinois at Urbana-Champaign, 1207 South Oak Street, Champaign, IL 61820; (217) 333-4602.

STUDENT ASSISTANCE: Student Assistance Center, 107 Turner Student Services Building, 610 East John Street, Champaign, IL 61820, (217) 333-4636.

CAMPUS LIFE AND STUDENT WELFARE: Dean of Students, University of Illinois at Urbana-Champaign, 130 Turner Student Services Building, 610 East John Street, Champaign, IL 61820; (217) 333-0050.

VETERANS' EDUCATIONAL BENEFITS: Veterans Educational Benefits, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, IL 61820; (217) 333-0100.

OTHER INFORMATION: Public Affairs, Swanlund Administration Building, 601 East John Street, Champaign, IL 61820; (217) 333-5010.

CHICAGO CAMPUS: Admissions and Records, University of Illinois at Chicago, P.O. Box 4348, Chicago IL 60680; (312) 996-4377. Admissions, Health Sciences, P.O. Box 6998, Chicago IL 60680; (312) 996-7755.

Reference copies of this publication are available at Illinois public libraries, high schools, and community colleges. Copies of the *Undergraduate Programs*, *Graduate Programs*, and *Courses* catalogs may be purchased at or ordered by mail from the Illini Union Bookstore, 715 South Wright Street, Champaign, IL 61820.



1988-90
Courses
Catalog

University of Illinois
at Urbana-Champaign

University of Illinois administrative offices at Urbana-Champaign are open Monday through Friday from 8:00 a.m. to 12:00 noon and 1:00 to 5:00 p.m., except on all-campus holidays which are indicated in the University Calendar.

An information center, available to visitors to the campus, is located in the north entrance lobby of the Illini Union. The center is open from 8:00 a.m. to 8:00 p.m. daily, including Saturdays and Sundays, when classes are in session.

Small group information sessions about the campus are available at the Campus Visitor's Center in Levis Faculty Center, 919 West Illinois Street. Visitors are welcome between 9:00 a.m. and 4:00 p.m., Monday through Friday, excluding campus holidays.

The commitment of the University to the most fundamental principles of academic freedom, equality of opportunity, and human dignity requires that decisions involving students and employees be based on individual merit and be free from invidious discrimination in all its forms, whether or not specifically prohibited by law.

The policy of the University of Illinois is to comply with all federal and state nondiscrimination, equal opportunity, and affirmative action laws, orders, and regulations. The University of Illinois will not discriminate against any person because of race, color, religion, sex, national origin, ancestry, age, marital status, handicap, unfavorable discharge from the military, or status as a disabled veteran or a veteran of the Vietnam era. This nondiscrimination policy applies to admissions, employment, access to and treatment in the University programs and activities.

Among the forms of invidious discrimination prohibited by University policy but not law is sexual orientation. Complaints of invidious discrimination based solely upon policy are to be resolved within existing University procedures.

For additional information on the equal opportunity and affirmative action policies of the University, please contact on the Urbana-Champaign campus: William A. Savage, Assistant Chancellor and Director of Affirmative Action, Swanlund Administration Building, 601 East John Street, Champaign, Illinois 61820, (217) 333-0574.

Information contained herein is for informational purposes only and is subject to change without notice. Individual departments and units should be contacted for further information. Courses, faculty assignments, prerequisites, graduation or completion requirements, standards, tuition and fees, and programs may be changed from time to time. Courses are not necessarily offered each semester or each year. The University retains the exclusive right to judge academic proficiency and may decline to award any degree, certificate, or other evidence of successful completion of a program, curriculum, or course of instruction based thereupon. While some academic programs described herein are designed for the purposes of qualifying students for registration, certification, or licensure in a profession, successful completion of any such program in no way assures registration, certification, or licensure by an agency not the University of Illinois.

1988-90 Courses Catalog

University of Illinois at Urbana-Champaign

(217) 333-1000

The 1988-90 Courses Catalog is compiled by the Office of the Vice-Chancellor for Academic Affairs and produced by the Office of Public Affairs/Office of Publications.

COURSES CATALOG

About the University of Illinois at Urbana-Champaign

Since its founding in 1867, the University of Illinois at Urbana-Champaign has earned a reputation as an institution of international stature. It is recognized for the high quality of its academic programs and the outstanding facilities and resources it makes available to students and faculty, including the third largest academic library in the country.

The University of Illinois at Urbana-Champaign is a comprehensive institution offering undergraduate, graduate, and professional degrees in more than 100 fields of study. There are approximately 36,000 students (27,000 undergraduate; 9,000 graduate) and 10,800 faculty and staff members in the University community.

About This Catalog

This is one of three catalogs describing study at the University of Illinois at Urbana-Champaign. The *Undergraduate Programs* and the *Graduate Programs* catalogs give detailed information relating to admission, costs, programs, and requirements for undergraduate students and graduate students respectively. This catalog gives information about all courses—both undergraduate and graduate—that are currently available at the University as possible offerings. Course descriptions are arranged in alphabetical order by department and in numerical order within the department listing.

Courses numbered:

100-199 are intended primarily for freshmen and sophomores, although they may also be taken by juniors and seniors. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

200-299 are intended for undergraduate students who satisfy the published prerequisite(s), if any. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

300-399 are intended primarily for juniors, seniors, and professional and graduate students who satisfy published prerequisite(s), if any. These courses are offered for either undergraduate credit (expressed in hours) or graduate credit (expressed in units). Only graduate students and certain seniors with Graduate College approval may receive graduate credit.

400-499 are available for professional and graduate students, and for certain seniors with Graduate College approval to register for graduate credit (expressed in units).

An undergraduate must have 30 hours of credit to be classified as a sophomore, a minimum of 60 hours to be classified as a junior, and a minimum of 90 hours to be classified as a senior. A graduate student is a person who has been admitted to the Graduate College.

Following the title of each course is a brief description of the content, the credit given, and the requirements for admission to the course, if any. Additional information relating to the course content is available from the department offering the course. Special requirements for admission to certain courses are introduced by the word *prerequisite*. Courses listed in this catalog are subject to revision without advance notice and are not necessarily offered each semester or each year. Individual departments or units should be contacted for information regarding regularity of course offerings.

Each department has available the undergraduate course number 199, Undergraduate Open Seminar. This is a special course for independent study, for experimentation, or for seminars on topics not treated by regularly scheduled courses. Requests for initiation of the course and suggestions for areas of study may be made by students or faculty. The seminar may be offered only with the approval of the faculty member involved and the department head. A student may accumulate an unlimited number of credit hours in 199 courses, but no more than 12 such hours listed on the student's transcript may be counted toward fulfilling graduation requirements. Exceptions to this rule are made in cases where a larger number of credit hours in 199 courses is an integral part of a formal, college-approved program of study (such as Individual Plans of Study or Unit One). Credit toward satisfying particular college or departmental requirements is contingent upon approval of the appropriate college or departmental committee.

Credit for undergraduate students is counted in semester hours. A semester hour represents the work of one classroom period for fifty minutes each week through one semester (two periods per week in an eight-week summer session), or the equivalent in laboratory or field work, or approved independent study. In descriptions of courses, "3 hours" means 3 hours of credit each semester or summer session.

Credit for graduate students taking courses numbered 300 and above typically is counted in units. One unit is usually considered the equivalent of 4 semester hours of credit.

Undergraduate students wishing to enroll in courses numbered 300 and above for graduate credit or in 400-level courses for undergraduate credit must obtain the advance approval of the Graduate College.

Each undergraduate student is expected to pursue a normal program of studies; the number of hours required varies with the college and the curriculum. More or less than a normal program may be permitted only by the dean of the student's college or the dean's representative. To be eligible for participation in specified undergraduate student activities, the student must carry 12 hours in a semester. Twelve credit hours and above (3 units and above) in a semester comprise a full program of study for tuition and fees assessment; in an eight-week summer session the number of hours is 6 semester hours and above (1½ units and above). For information about criteria determining eligibility for Dean's List recognition, interested students should contact their college offices.

The minimum program required for receipt of maximum educational benefit payments under the Veterans Readjustment Benefits Act of 1966 and for receipt of social security benefits as a dependent is 12 hours (or 3 units) in a semester and 6 hours (or 1½ units) in an eight-week summer session.

ACCOUNTANCY

Head of Department: L. A. Tomassini

Department Office: 360 Commerce Building (West), 1206 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Fundamentals of Accounting.** A survey course in the principles of accounting for students registered in schools and colleges other than Commerce and Business Administration. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 200 and either 201 or 202.
- 201. Principles of Accounting, I.** Introduction to financial accounting; the communication of relevant information to external parties; includes development of accounting model, internal control, measurement processes, data classification and terminology, as well as interpretation and use of the resultant financial statements. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 201 and 200.
- 202. Principles of Accounting, II.** Introduction to managerial accounting; fundamentals of cost-volume analysis and product costing, management reporting and information for decision making; introduction to budgets and standards for planning, control, and performance measurement. Prerequisite: Accountancy 201. 3 hours. Credit is not given for both Accountancy 202 and 200.
- 211. Intermediate Accounting, I.** Accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts for external reporting purposes; emphasizes the use of accounting information as a basis for decisions by management, stockholders, creditors, and other users of financial statements and accounting reports. Prerequisite: Accountancy 202. 3 hours.
- 221. Cost Accounting.** Use of costs for control and decision making, with emphasis on standard costs, relevant costs, direct costing, nonmanufacturing costs, and responsibility accounting; for students who have already studied the basic elements of job order, process costs, and budgeting. Prerequisite: Accountancy 202. 3 hours.
- 251. Basic Federal Income Tax Accounting.** Basic discussion of history, theory, and broad outlines of federal income taxation for individuals, partnerships, and corporations, including the more important basic concepts involved in federal income taxation. Prerequisite: Accountancy 200 or 202. 3 hours.
- 299. Senior Research.** A research and readings course for students majoring in accountancy. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. May be repeated to a maximum of 6 hours.
- 300. Socio-Economic Management as Public Policy.** Same as Business Administration, Political Science, and Social Science 300. See Political Science 300.
- 311. Intermediate Accounting, II.** Examines accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts of financial accounting for external reporting purposes; continuation of Accountancy 211. Prerequisite: Accountancy 211 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 312. Advanced Accounting.** Accounting for various entities including partnerships, consolidations, and mergers; also considers such topics as foreign exchanges, fund and segment reporting, and accounting for reorganizations. Prerequisite: Accountancy 211. 3 hours or $\frac{3}{4}$ unit.
- 321. Managerial Accounting and Quantitative Techniques.** Application of quantitative and mathematical techniques to managerial accounting problems including empirical methods, network techniques, probabilistic methods, linear algebra, sensitivity analysis, and other methods. Prerequisite: Accountancy 221; Economics 172; Mathematics 125. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 322. Managerial Accounting and Organizational Controls.** Studies managerial accounting and its functioning as an information subsystem, in relation to the system of organization and the attainment of the goals of the enterprise; stresses the interactions of the components of the enterprise in response to information generated by the man-

agerial accountant. Prerequisite: Accountancy 221; senior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 331. Accounting Systems Design.** Examines the fundamentals of accounting systems design, including systems analysis and design techniques; surveys hardware and software considerations; analyzes accounting applications within functional areas of the firm; and studies the control of computerized systems in a business environment. Prerequisite: Accountancy 202 and Computer Science 105, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. Introduction to Management Information Systems.** Same as Business Administration 391. Analyzes information systems from a management control perspective, emphasizing organization environment, technology, decision models and performance evaluation as determinants of information processing requirements; cases and design projects explore the management of information processing systems, major functional applications and impacts of information technology on individuals and society. Prerequisite: Computer Science 105 or equivalent, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 333. Information Organization for Management Information Systems.** Same as Business Administration 392. See Business Administration 392.
- 334. Management Information System Development.** Same as Business Administration 393. See Business Administration 393.
- 335. Management Information and Control Systems.** Same as Business Administration 394. Integration of behavioral, quantitative, and system design concepts in relation to professional work in the management information systems area. Prerequisite: Business Administration 393 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 341. Introduction to Auditing.** Surveys the auditing discipline encompassing issues common to external, internal (and operational) auditing; specific topics include auditing theory, evidential matter, principles of internal control, sampling, testing, and the impact of the computer. Prerequisite: Accountancy 211 and 331, and Economics 172. 3 hours or $\frac{3}{4}$ unit.
- 342. Advanced Auditing Concepts and Practice.** Emphasizes the concepts and practice of professional auditing, including the application of generally accepted auditing standards, review of internal control, audit reporting practices, professional ethics, S.E.C. practices, statistical sampling, auditing EDP systems, and management advisory services practice. Prerequisite: Accountancy 341. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 343. Control and Audit of Computer Systems.** Considers the impact of the computer on the performance of the audit; studies the means by which the auditor adjusts the audit to an EDP environment; deals with both control issues and tests of activity, as well as computer security. Prerequisite: Accountancy 341, and Computer Science 105 or equivalent; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Internal Auditing and Management Control.** Examines concepts, standards, and procedures of internal auditing and management control; discusses specific case studies and problems to develop student awareness of and skills in the nonfinancial types of auditing such as operational, compliance, and management auditing, especially as practiced by either a business or a not-for-profit organization's own auditors. Prerequisite: Accountancy 341. 2 hours or $\frac{1}{2}$ unit.
- 351. Advanced Income Tax Problems.** Practical and theoretical training in the more common and important provisions of the federal income tax, advanced problems, and tax case research and preparation. Prerequisite: Senior standing; Accountancy 251. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 361. Public Sector Accounting.** Examines accounting, budgeting, auditing, and reporting principles and practices for municipalities and other not-for-profit organizations, including federal government, public schools, universities, hospitals, charities, religious organizations, and others. Prerequisite: Accountancy 200, 202, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 371. Introduction to International Accounting.** Explores similarities and differences of accounting principles and procedures between the United States and other countries with special emphasis on worldwide and regional standardization; emphasizes consolidation of foreign subsidiaries, performance evaluation of foreign operations, state-

ment analysis, translation, solutions to inflation accounting, and taxation of multinationals. Prerequisite: Accountancy 211 and 221, or equivalent; or Business Administration 460. 3 hours or $\frac{3}{4}$ unit.

- 381. Advanced Theory and Practice.** Selected problems from CPA examinations: analysis and revision of statements, partnerships, corporations, quasi-reorganizations, mergers, and others; theory, auditing, and ethics. Prerequisite: Accountancy 251, 311, 312, and 341. 3 hours or 1 unit.
- 382. Accounting Policy and Practice.** Uses case analysis to develop ethical judgment and communication skills concerning a wide range of policy issues and practice problems of the professional accountant. Prerequisite: Accountancy 341 or 404, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 401. Accounting Analysis, I.** Uses of accounting information; collection, processing, and communication of accounting information; measurement of assets, liabilities, equities, and income; and accounting system design. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 402. Accounting Analysis, II.** An in-depth study of accounting valuation processes, accounting income measurement, and special reporting problems of multiple-entity organizations. Prerequisite: Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 403. Managerial Accounting.** Introduction to management accounting as part of the firm's information system, in terms of modern cost accounting and budgetary systems for planning and controlling business operations. Prerequisite: Credit or concurrent registration in Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 404. Auditing.** Introduction to conceptual and applied material in the specialized accounting area of auditing; emphasizes the audit process, reporting, and professional responsibilities. Prerequisite: Credit or concurrent registration in Accountancy 402, or equivalent; enrollment in graduate degree program or consent of instructor. $\frac{1}{2}$ unit.
- 405. Federal Taxation.** Introduction to historical and conceptual as well as applied material in the accounting area of federal taxation; emphasizes the provisions of the tax law relevant to accounting measurement methods. Prerequisite: Accountancy 401; enrollment in graduate degree program or consent of instructor. $\frac{1}{2}$ unit.
- 411. Concepts and Principles.** The fundamental structure of accounting theory developed through the study of concepts characteristic of accounting and an examination of the literature dealing with the concise formulation of accounting principles. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor; Accountancy 491. 1 unit.
- 412. Income Measurements.** A study of the pros and cons of various unsettled issues involved in the calculation and disclosure of enterprise periodic income. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. 1 unit.
- 417. Financial Statement Analysis.** Examines tools and techniques of financial statement analysis from the perspective of investors and creditors; emphasizes theoretical and empirical properties of financial ratios. Prerequisite: Business Administration 451, 460, and 472; or equivalent; and enrollment in graduate degree program or consent of instructor. 1 unit.
- 421. Management Accounting, I.** Examines recent conceptual and analytical developments in the area of management accounting; includes a study of modern and relevant planning and control techniques and their underlying concepts as applied to the various functional areas within the firm. Prerequisite: Enrollment in graduate degree program or consent of instructor; an undergraduate course in management accounting. The student's background in statistics, economics, and mathematics should be equivalent to the undergraduate requirements of the University of Illinois College of Commerce and Business Administration in these areas. 1 unit.
- 422. Management Accounting, II.** Development of the role and importance of accounting data in conjunction with modern quantitative methods in the process of industrial enterprise administration; attention focused on the use of existing accounting data in models and the demands on data accuracy and reliability as well as the necessity to

develop additional data for the purpose of facilitating integrated planning, budgeting, and control processes. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.

- 431. The Theory of Accounting System Design.** Problems and procedures in connection with designing and installing accounting systems. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 432. Information Systems and Inquiry Processes.** Investigates systems theory and methodology as a basis for generating knowledge useful in action to achieve social goals. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 441. Auditing Concepts and Standards.** Seminar on contemporary audit theory and standards which provides background for discussion of contemporary audit issues; surveys the professional literature relating to such issues with an emphasis on the development of an ability to critique this literature. Prerequisite: Accountancy 341 and 342, or equivalent; enrollment in a graduate degree program or consent of instructor. 1 unit.
- 450. Impact of Income Tax on Management Decisions.** Studies the impact of federal income tax law on management decisions; stresses awareness and recognition of the types of tax problems, so that the managers who are generalists will recognize situations where they will need to seek advice from specialists. Prerequisite: Business Administration 460 or consent of instructor. 1 unit.
- 451. Partnership Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving partnerships and their partners, including Subchapter S corporations and their shareholders. Prerequisite: Accountancy 251 or equivalent. 1 unit.
- 452. Corporate Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving corporations and their shareholders; coverage includes formations, operations, distributions, liquidations, reorganizations, and affiliations. Prerequisite: Accountancy 351 or equivalent. 1 unit.
- 453. Selected Topics in Federal Taxation.** Seminar on federal tax topics of current interest and how they shape the tax system; topics include international taxation, problems of closely-held businesses, tax factors in organizing and selling a business, planning for capital gains, real estate taxation, tax shelter, and new developments. Prerequisite: Accountancy 351 or consent of instructor. 1 unit.
- 459. Income Tax Development.** A theoretical and historical approach to the study of the development of federal income taxation, together with some research on tax cases and critical appraisal of the current law and proposals for its revision. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 471. Multinational Enterprise Accounting.** Analysis of accounting for operations of multinational enterprises which are subject to a wide variety of regulatory, social, and environmental influences; emphasizes financial and managerial accounting systems and their functions as evaluative, control, and reporting tools; and examines social accounting, foreign taxation, and nonmonetary evaluation methods. Prerequisite: Undergraduate degree in accountancy or equivalent; or Business Administration 460 and consent of instructor. 1 unit.
- 472. Accounting Under Different Social Systems.** Analyzes and compares accounting systems under different social systems with emphasis on the impact of regulatory and political structures on accounting; compares both macro and micro accounting systems for politically centralized and decentralized planning. Prerequisite: Undergraduate degree in accounting. 1 unit.
- 481. History of Accounting Theory.** Examines the more important aspects of accounting theory under the impact of changing conditions over four centuries, with major emphasis on the later developments. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 485. Theoretical Constructs in Accounting Research.** Examines the role of information in economic and behavioral models of decision making under uncertainty; presents major paradigms underlying contemporary accounting research. Interdisciplinary approach; readings drawn from the accounting, behavioral, economics, and finance literature. Prerequisite: Mathematics 363, Accountancy 491, and Economics 402. 1 unit.

- 491. Methods and Practices in Professional Research.** Instruction in research methods, materials, and techniques together with individual practice in conducting and reporting specific professional research projects. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. 1 unit.
- 492. Accountancy Research Orientation.** Comparative study of alternative methodologies and conceptual frameworks and their application to selected current research issues central to the development of accounting thought, both theoretical and empirical. Prerequisite: Accountancy 411 and 421 and courses in behavioral science, mathematics, and economics; or equivalent background and admission to the accountancy Ph.D. program; or consent of instructor. 1 unit.
- 493. Special Research Problems.** Individual investigations or research projects selected by the students, subject to approval by the graduate adviser and the executive officer of the department. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. $\frac{1}{4}$ to 2 units.
- 494. Doctoral Research Seminar.** Seminars in various accounting areas designed to enhance the research abilities of doctoral students and to assist them in preparing research proposals; these include Behavioral Dimensions, Public Sector, Tax, Auditing, Managerial, and others announced in the Timetable. Prerequisite: Credit or concurrent registration in Accountancy 492 or consent of instructor. 1 unit. May be repeated.
- 499. Thesis Research.** Individual direction and guidance in writing theses; seminar discussion of progress made. 0 to 4 units.

ADMINISTRATION, HIGHER, AND CONTINUING EDUCATION

Chairperson of Department: T. L. McGreal

Department Office: 333 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 267. The American College.** A survey of the American college and university; its history, structures, problems, trends, and governance. Provides an opportunity to explore the nature and scope of higher education in the United States. 3 hours.
- 362. Adult Learning and Development.** Same as Educational Psychology 362. Theory of and research on adult learning and development; includes societal context, performance, physiology and health, personality, and learning; and considers stability and change during young adulthood, middle age, and old age. Prerequisite: Educational Psychology 311 or 312, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 363. Instructional Design.** Same as Educational Psychology 363. See Educational Psychology 363.
- 380. Continuing Education General Seminar.** Introductory analysis of literature and professional practice in continuing education of adults; for beginning graduate students majoring in continuing education and for non-majors. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 418. Economics of Education, Health, and Human Capital.** Same as Economics 418. See Economics 418.
- 433. Clinical Supervision of Instruction.** Same as Secondary Education 433. See Secondary Education 433.
- 438. Instructional Supervision.** Methods, theories, and research applying to supervision in education; analyzes the work of curriculum directors, supervisors, supervising principals, and department heads; studies supervisory methods, staff utilization, and staff development; and stresses evaluation of educational programs and the effects of supervision. 1 unit.
- 442. The Community College.** Same as Vocational and Technical Education 442. Community colleges and vocational-technical institutes: their purposes, function, and objectives; social forces related to their development and evaluation; characteristics and

needs of students; educational programs and teaching strategies; and organization, control, and financing. 1 unit.

- 443. The College Student.** Study of the characteristics and development of college students, the institutional contexts in which they operate, and the interaction of students with the college environment. 1 unit.
- 448. Continuing Education Program Development.** Same as Secondary Education 448 and Vocational and Technical Education 448. Analysis of the process of planning and conducting continuing education programs for adults; includes theory, research, and practice regarding sponsors, need appraisal, objectives, selection and organization of learning activities, and evaluation. Recommended for majors in continuing education. Prerequisite: Consent of instructor. Administration, Higher, and Continuing Education 362 is recommended, especially for majors in continuing education. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; that is, develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ to 1 unit. May be repeated for credit with consent of advisor and department chair.
- 450. Public Control and Administration of Education.** Provides the basic common understanding of theory and practice in operation and control of schools useful to teachers and other citizens; analyzes both formal and informal influences on governance; and serves as an introductory course for prospective administrative officers and supervisors. Not open to experienced administrators nor to students who have taken any of the following (or equivalents): Administration, Higher, and Continuing Education 430, 440, 461, 462, 463, 465, 466. 1 unit.
- 452. Current Issues in Higher Education.** Seminar on current issues, problems, and trends in higher education. Prerequisite: Two units in higher education or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 455. The Principalship in Elementary and Secondary Education.** Provides an overview and analysis of the administrative, supervisory, and leadership functions of building-level administrators; emphasizes the design and implementation of effective educational programs on a schoolwide basis; analyzes administrative tasks and processes through case studies, interviews with practitioners, simulations, and readings. Prerequisite: Administration, Higher, and Continuing Education 450 and teaching experience required. 1 unit.
- 461. Administration of Educational Programs and Personnel.** Studies principles and criteria for analysis of programs at various levels of operation, such as individual departments, schools, school systems, intermediate units, state education departments, and the federal government. This course and Administration, Higher, and Continuing Education 462 and 463 and Educational Psychology 413 constitute the required core program for all students specializing in educational administration who are candidates for a degree beyond the master's. Prerequisite: Admission to post-master's degree program in Administration, Higher, and Continuing Education; Administration, Higher, and Continuing Education 450, and 430 or 440; or consent of instructor. 1 unit.
- 462. Organization and Business Administration of Public Education.** Organization and operation of public school government; functions and processes of school business administration, including internal organization of the division of business services; and scope and role of the business manager, budgetary process, accounting and financial reporting, contracts, liability, insurance, purchasing, auxiliary services, salary policies, and methods of survey, evaluation, and planning. Prerequisite: Administration, Higher, and Continuing Education 450, 430 or 440, and 461. 1 unit.
- 463. The Role of Administrative Leadership.** Studies perspectives on administrative leadership drawn from the social sciences and their application to the analysis and formulation of strategies for performing leadership functions in educational administration. Prerequisite: For majors in educational administration, Administration, Higher, and Continuing Education 461 and Educational Psychology 413; for students

in other departments, admission to a post-master's degree program and consent of instructor. 1 unit.

- 464. Directed Field Experience in Administration.** Direct experience in the study of educational problems of concern to administrators; features an action component whereby the student is provided with opportunities for assuming responsibility for decision making in a live or simulated setting; each student works under the supervision of a professor, and where possible and appropriate, a practicing administrator. 1 to 3 units. May be repeated to a maximum of 3 units, with no more than 1 unit earned at the master's level.
- 465. Personnel Administration.** Principles, problems, and trends in the administration of professional public school personnel; organization of personnel; assessment and definition of personnel needs; recruitment, selection, and induction; evaluation; personnel development programs; and teacher organizations. Prerequisite: Administration, Higher, and Continuing Education 430 or 440, and 450. 1 unit.
- 466. Public School Finance.** Advanced graduate study of the theory and technology of public school finance; attention centered on analysis of principles and theory underlying fiscal practice in various states; technical knowledge of designing controls, organization, and fiscal systems in harmony with expressed theory; and the application of research to the analysis of problems related to the improvement of financing public schools. Prerequisite: Admission to advanced graduate program in the Department of Administration, Higher, and Continuing Education, or consent of instructor. 1 unit.
- 468. School-Community Relations.** Studies the relationship of the American school to the community; analysis of the power structure, social agencies, school liaison groups, and economic character of the community as they affect and are affected by the school; and evaluation of the various media of communication between the school and the larger community, and the development of criteria for an effective program of school-community relations. 1 unit.
- 469. Legal Basis of School Administration.** Legal rights, privileges, responsibilities, immunities, and authority of pupils, parents, teachers, administrators, and school board members in relation to the school. 1 unit.
- 471. State and Federal Educational Politics and Policies.** Examines the legislative and political processes in the formulation of current federal and state educational policies, together with the evaluation of policy and the formulation of policy alternatives. Prerequisite: Administration, Higher, and Continuing Education 469. 1 unit.
- 474. The American College and University.** Introduction to higher education as a subject: its history, purposes, leaders, and literature; attention to conceptual framework in which further development of this subject can progress. 1 unit.
- 475. Administration of Higher Education.** Administrative practices, procedures, and arrangements for policy implementation in the American college (including the community college) and university; special attention given to the roles of major administrative officers. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 477. Student Personnel Work in Higher Education.** Studies the theoretical foundations and principles underlying the practice of student personnel work; investigation of the role and function of student personnel workers in terms of their relationship to various goals, philosophies, issues, trends, and research. 1 unit.
- 478. The Administration of Student Personnel Work.** Structural arrangements for meeting student-oriented needs in the American college (including the junior college) and university; attention to the role of the chief administrative officer for student affairs. Prerequisite: Administration, Higher, and Continuing Education 477 or equivalent. 1 unit.
- 479. Organization and Control of Higher Education.** Organizational patterns whereby colleges and universities seek to accomplish their purposes; agencies involved in the control of higher education. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 480. Internship in the Administration of Higher Education.** Provides supervised direct experience in the administration of higher education; with the aid of the faculty, students

- select the institution and position most relevant to their career goals. Prerequisite: Consent of instructor. 1 unit. No more than 2 units may be given toward an advanced degree.
- 483. Societal Context of Continuing Education.** Analyzes the continuing education agency as a social system; includes learning group, planning committee, organizational relations with parent institution, and linkage with community; recommended for majors in continuing education. Prerequisite: A basic graduate course on social systems (such as Educational Psychology 413, Educational Policy Studies 315 or 385, Sociology 436 or 492, or Psychology 355). 1 unit.
- 484. Continuing Education Internship.** Supervised field experience. Prerequisite: Consent of instructor. 1 to 2 units. May be repeated to a maximum of 4 units.
- 485. Continuing Education Agency Administration.** Organization and administration of continuing education programs for adults; decision making, policy, finance, personnel, program, and community relations; analysis of theory, research, and practice; and emphasis on case analysis. Recommended for majors in continuing education. Prerequisite: Administration, Higher, and Continuing Education 483 and a basic administration course (such as Administration, Higher, and Continuing Education 450 or 479, Vocational and Technical Education 489, Library Science 405, or Business Administration 401). 1 unit.
- 486. Continuing Education Advanced Seminar.** Analyzes specialized topics related to continuing education of adults; for advanced students. Recommended for majors in continuing education. Prerequisite: Consent of instructor. 1/2 or 1 unit. May be repeated to a maximum of 3 units.
- 490. Seminar for Advanced Students of Education.** Open only to persons who have been admitted for doctoral study in the Department of Administration, Higher, and Continuing Education. Prerequisite: Consent of instructor. 1 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Prerequisite: Consent of instructor. 1 to 2 units.
- 497. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Social Work 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ADVERTISING

Head of Department: K. B. Rotzoll

Department Office: 103 Gregory Hall, 810 South Wright, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 281. Introduction to Advertising.** A survey of the economics, psychology, and philosophy of advertising; preparation of advertisements; selection of media; and organizational structure. Not open to seniors unless enrolled in the College of Communications. Prerequisite: Sophomore standing and consent of department. 3 hours. This course may require limited participation as a subject in research.
- 288. Sales Writing.** Same as Business and Technical Writing 271. See Business and Technical Writing 271.
- 291. Special Problems.** Special projects, research, and independent reading in advertising for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Written research proposal and consent of head of department. 2 or 3 hours.
- 309. Public Relations.** Publicity methods and public relations; representation of profit and nonprofit institutions to the public; use of communications research and media; product

publicity reviewed, case studies utilized. Prerequisite: Junior standing in the College of Communications; consent of department. 3 hours or 1/2 unit.

- 381. Advertising Research Methods.** Overview of basic concepts of research methodology with particular emphasis on advertising research. Computer analysis and interpretation of actual data sets; measurement with both structured and unstructured techniques; principles of survey and experimental design. Prerequisite: Advertising 281; junior standing; a specified course in statistical methods; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.
- 382. Advertising Creative Strategy and Tactics.** Theory and practice of advertising message planning and creation for print and broadcast media; use of consumer and market surveys, copytesting methods, and advertising readership studies. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.
- 383. Advertising Media Planning.** Analyzes the various advertising media in terms of markets served and factors to consider in the selection and evaluation of media. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.
- 390. Advanced Creative Strategy and Tactics.** Advanced work in application of behavioral science and creative process to planning and writing of advertisements. Prerequisite: Advertising 382; consent of department. 3 hours, or 1/2 or 1 unit.
- 391. Advertising Management: Planning.** Application of analytical planning concepts to advertising planning and decision making; covers all of the decision-making areas of advertising. Prerequisite: Advertising 381, 382, and 383; Mathematics 111 or 112, or equivalent; Business Administration 202; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.
- 392. Advertising Management: Strategy and Tactics.** Application of advertising management decision criteria to actual communication problems involving advertisers; development of strategy and tactics. Prerequisite: Advertising 391; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.
- 393. Advertising in Contemporary Society.** Studies advertising as an institution and its role in communications, society, our economy, and business. Prerequisite: Advertising 281; senior standing; consent of department. 3 hours or 1/2 unit. No graduate credit is given to graduate majors in advertising.
- 481. Economic and Social Aspects of Advertising.** Same as Communications 481. Examines advertising as an institution; the economic, social, and legal aspects of advertising with focus on current problems. Prerequisite: Advertising 391, 393, and consent of department. 1 unit.
- 482. Research Methods in Advertising and Communications.** Same as Communications 482. A treatment of basic research concepts and procedures in the social sciences with emphasis on advertising and communications; examines both nonquantitative and quantitative methods. Prerequisite: Advertising 381, a basic course in statistical methods, and consent of department. 1 unit.
- 483. Advertising as Communication.** Advertising messages from the perspective of communication and mass communication theories; application of theory to advertising communication problems. Prerequisite: Advertising 382 and consent of department. 1 unit.
- 484. Advertising and Consumer Behavior.** Examines consumer behavior as a means of shaping the communications message; use of the behavioral sciences in creative communication strategy. Prerequisite: Advertising 391 and consent of department. 1 unit.
- 485. Advertising Planning and Decision Making.** Same as Communications 485. Examines the theoretical foundations of decision theory as they relate to planning and decision making in advertising; reviews concepts of strategic planning and client side operations; case studies utilized extensively. Prerequisite: Advertising 391 and consent of department. 1 unit.
- 486. Analytical Methods in Advertising and Communications.** Same as Communications 486. Seminar emphasizing fundamental problems in advertising and communications and the methods applicable to their solution; problem areas covered include

aspects of message-related issues and response function building and usage; applies methods drawn from various disciplines to these problem areas; and applies analyses on pre-collected advertising and communications data using computerized statistical program packages. Prerequisite: Advertising 391 and a specified course in statistical methods. 1 unit.

490. Special Topics in Advertising. Prerequisite: Consent of department. $\frac{1}{2}$ or 1 unit.

499. Thesis Research. Prerequisite: Graduate standing in advertising. 1 to 2 units.

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

Acting Head of Department: S. M. Yen

Department Office: 101 Transportation Building, 104 South Mathews, Urbana

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

212. Aerodynamics, I. Quasi-one-dimensional flow; conservation of mass, momentum, and energy; steady flow with variable area; steady, constant area flow with friction, heat addition, and mass injection; shock waves; nonsteady, one-dimensional flows; and two-dimensional flow, oblique shock waves, and Prandtl-Meyer waves. Prerequisite: Mechanical Engineering 207; Theoretical and Applied Mechanics 156; credit or concurrent registration in Mathematics 343. 4 hours.

213. Aerodynamics, II. Equations of motion for a viscous, heat-conducting fluid; exact solutions of the Navier-Stokes' equations; boundary layer theory; inviscid approximations, vorticity, and circulation; potential flow; solutions of potential flow equations, sources, sinks, and Prandtl-Meyer flow; thin airfoil and slender body theory; and method of characteristics. Prerequisite: Aeronautical and Astronautical Engineering 212. 4 hours.

224. Flight Structures, I. Development of fundamental concepts of elasticity as related to stress, strain, equilibrium, compatibility, and material properties; applications to flight vehicle structural problems in unsymmetric bending, torsion, thick-walled cylinders, rotating discs, shear flow, and shear center problems. Prerequisite: Mathematics 345; Theoretical and Applied Mechanics 156. 4 hours.

225. Flight Structures, II. Energy concepts with applications to indeterminate flight structures, sandwich beams, and shear flow; elastic and plastic buckling of columns and plates; and membrane theory of shells. Prerequisite: Aeronautical and Astronautical Engineering 224. 4 hours.

233. Aircraft Propulsion. Fundamentals of air breathing jet propulsive devices; prediction of thrust, specific fuel consumption, and operating performance; ramjets; turbojets; turbofans; turboprops; aerothermodynamics of inlets, combustors, and nozzles; compressors, turbines, and propellers; and component matching. Prerequisite: Aeronautical and Astronautical Engineering 212 or first course in gas dynamics. 3 hours.

241. Flight Vehicle Design. Introduction to preliminary design of airplanes, missiles, and space vehicles; further development of concepts in orbital mechanics, hypersonic aerodynamics, and aerodynamic heating. Prerequisite: Aeronautical and Astronautical Engineering 213, 225, 233, and 255; Computer Science 101. 3 hours.

254. Aerospace Dynamic Systems, I. Modeling of linear dynamic systems; Laplace transforms and linear feedback control systems; stability criteria and design techniques; introductory aircraft flight stability and control. Prerequisite: Mathematics 345 and Theoretical and Applied Mechanics 156. 4 hours.

255. Aerospace Dynamic Systems, II. Examines particle kinematics and dynamics; fundamentals of orbital mechanics; Lagrange's equations; vibration of multiple degree of freedom systems and continuous elastic structures; rotational kinematics and dynamics of rigid bodies. Prerequisite: Aeronautical and Astronautical Engineering 254 and Mathematics 225. 4 hours.

260. Aerospace Laboratory, I. Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on fluid dynamics.

aerodynamics, thermal, combustion and propulsion phenomena. Prerequisite: Aeronautical and Astronautical Engineering 213 and 233. 2 hours.

- 261. Aerospace Laboratory, II.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on structural mechanics, vibrations, dynamics, and systems. Prerequisite: Aeronautical and Astronautical Engineering 225 and 255. 2 hours.
- 280. Energy Alternatives and Societal Values: Technology Assessment for Non-Engineers.** The energy/environment crisis as a societal problem. Energy alternatives: their technology, potential, and human and environmental consequences. Values, technology, and the social construction of future reality. Introduction to the information, ideas, values, and perceptions currently affecting the societal definition and resolution of the energy/environment problem. Student participation in simulated adversary proceedings, role-playing, panel discussions, and values-clarification and problem-clarification strategies. Lectures and extensive readings. 4 hours.
- 281. Introduction to Renewable Energy Sources.** The technology of renewable energy sources: wind power and the performance of large and small wind turbine systems; ocean thermal energy conversion and ocean wave power; solar thermal electric power; solar cells; the elements of design and sizing of solar heating and cooling systems; hydroelectric power; biomass fuels; hydrothermal-reservoir and dry-rock geothermal energy; energy storage; on-site energy systems; the concept of appropriate technology; and the economics of renewable energy systems. Prerequisite: Mathematics 132, and Physics 102 or 108; or consent of instructor. 3 hours.
- 292. Seminar.** Reports and discussions of recent developments in the fields of aerodynamics, flight mechanics, power plants, structures, and maintenance and operations as related to airplanes, missiles, and space vehicles. Prerequisite: Senior standing. 1 hour.
- 296. Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 303. The Effect of Space Environment on Satellite Motion.** Free molecule aerodynamics; gravity gradient and solar radiation torques on satellites; interaction of on-board magnetic dipoles with the earth's magnetic field; solar wind; cosmic dust and micrometeoroid torques; lifetime problem and density determination; and utilization of these various environmental effects in satellite attitude control. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 306. Orbital Mechanics.** Analysis of orbits in an inverse-square gravitational field; elementary rocket dynamics, impulsive orbit transfer and rendezvous, and Lambert's Theorem with applications; patched-conic trajectories, planetary swing-by maneuvers, and linearized orbit theory with application to simplified analytical models. Prerequisite: Aeronautical and Astronautical Engineering 255 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 311. Aerodynamics of Compressible Fluids.** Methods of solution of fluid flow problems in subsonic, transonic, and supersonic flight regimes. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 313. Aerodynamics of Incompressible Fluids.** Governing equations for incompressible flow; vorticity, circulation, and Kelvin's, and Helmholtz's theorems; velocity potential and stream function; three-dimensional steady and nonsteady flows, d'Alembert's paradox, and apparent mass; two-dimensional steady flows, complex potential and velocity, and mapping of flows; two-dimensional airfoils and Joukowski transformation and airfoils; and thin airfoil theory. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 314. Aerodynamic Heat Transfer.** Thermal boundary layers; turbulent heat transfer; aerodynamic heating; and radiative heat transfer. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 316. Applied Aerodynamics.** Two-dimensional and finite wing theory with emphasis on

- the mechanisms of lift and drag generation; Reynolds number and Mach number effects; drag analysis; high-lift wing systems; propeller and rotor aerodynamics; control surface design; and application of V/STOL aerodynamics. Prerequisite: Aeronautical and Astronautical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 317. Elements of Magnetohydrodynamics.** Equations of magnetohydrodynamics; single-fluid and multiple-fluid models; magnetic interaction parameters; magnetosonic waves; hydromagnetic shock waves; aligned-field and crossed-field flows; theory of characteristics; MHD acceleration, generation, and propulsion. Prerequisite: Aeronautical and Astronautical Engineering 212 or consent of instructor. 3 hours or 1 unit.
- 319. Aircraft Flight Mechanics.** Steady and quasi-steady aircraft flight performance; take-off and landing, climbing and diving, cruise, level turn, and introduction to energy methods; longitudinal, directional, and lateral static stability and control; and introduction to longitudinal and lateral motion and dynamic stability. Prerequisite: Aeronautical and Astronautical Engineering 213, 233, and 255, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Finite Element Methods in Aerospace Structures.** Finite element methods in the analysis of aerospace structures; includes treatment of different types of elements in the analysis of static, dynamic, and stability problems; and emphasizes structures most commonly used in aerospace applications. Introduction to NASTRAN program use. Prerequisite: Computer Science 101 and Aeronautical and Astronautical Engineering 225. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 326. Theory of Continuous Media.** Introduction to the general theory of continuous media and its application to the theories of elasticity, fluid mechanics, and inelasticity; stress and strain tensors and their invariants; nonlinear equilibrium conditions; the mechanism of deformation of single crystal and polycrystalline media; basic concepts of the structure of matter; thermodynamic considerations; and equations of state and stress-strain relationships with applications. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 333. Electric Propulsion.** Elements of propulsion as applied to deep space missions; physics of ionized gases; plasmadynamics; electrothermal, electromagnetic, and electrostatic acceleration of gases to high velocity; high-impulse thruster design and performance; and the resistojet, arcjet, ion engine, MPD arc, and plasma gun. 3 hours or 1 unit.
- 334. Rocket Propulsion and Rocketry.** Basic principles of rocket propulsion and rocketry, propellants and their influence on design of rockets, internal and external ballistics, combustion processes, design of components, flight performance, and rocket testing. Prerequisite: Aeronautical and Astronautical Engineering 212 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 351. Aeroelasticity and Aeroinelasticity.** Advanced fundamental treatment of aerodynamic and dynamic structural phenomena associated with flexible airplanes and missiles; divergence of linear and nonlinear elastic lifting surfaces; effect of elastic and inelastic deformations on lift distributions and stability; elastic flutter of straight and swept wings; equations of disturbed motion of elastic and inelastic aircraft; dynamic response to forces, gusts, and continuous atmospheric turbulence; creep divergence of lifting surfaces; flutter in the presence of creep; and effect of temperature on inelastic divergence and flutter. Prerequisite: Aeronautical and Astronautical Engineering 255. 3 hours or 1 unit.
- 381. Wind Power Technology.** Aerodynamic, electromechanical, and structural design of wind power systems; classical windmills; modern wind power generators; wind characteristics and distribution; instrumentation and measurement; energy storage considerations; socioeconomics of wind power systems; performance of large and small scale wind turbines; and current design approaches. Prerequisite: A fluids course, an electrical course, and a course in mechanics, all at the 200 level or higher; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 391. Special Problems.** Special problems relating to the theory, design, testing, operation, maintenance, or production of airframes or aircraft power plants. Prerequisite: Senior standing in engineering; consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.

- 404. Optimization of Aerospace Systems.** Formulation of parameter and functional optimization problems for dynamic systems; applications of optimization principles to the control and performance of aerospace vehicles, including optimal flight paths, trajectories, and feedback control. Prerequisite: Aeronautical and Astronautical Engineering 255 or equivalent. 1 unit.
- 412. Aircraft Dynamic Stability and Control.** Study of dynamic stability and control of rigid aircraft; small disturbance theory, linearization of equations of motion; uncontrolled motion characteristics, longitudinal and lateral natural modes; open loop control response; introduction to closed-loop response. Prerequisite: Aeronautical and Astronautical Engineering 319, or consent of instructor. 1 unit.
- 414. Boundary Layer Theory.** Theories of the boundary layer of a compressible fluid and their solutions, laminar and turbulent; boundary layer in hypersonic flows. Prerequisite: Aeronautical and Astronautical Engineering 213. 1 unit.
- 415. Wing Theory.** Theoretical analysis of the aerodynamic characteristics of two- and three-dimensional wings and multiple-body systems in subsonic and supersonic flows. Prerequisite: Mathematics 346 or equivalent. 1 unit.
- 417. Fundamentals of Gas Kinetics.** Fundamental concepts required to study gas dynamic problems from the viewpoint of kinetic theory; derivation of the Boltzmann equation from classical mechanics; reduced and truncated distribution functions and the BBGKY hierarchy; molecular collisions; flux vectors and equations of change; moment equations; summational invariants; H-theorem and Maxwellian distribution; inclusion of the effect of solid surfaces in kinetic theory; existence theory for the Boltzmann equation; iteration procedures; moment methods; Chapman-Enskog procedure; and first and second approximations to the distribution function, heat flux vector, and stress tensor. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 1 unit.
- 418. Theory of Rarefied Gas Flows.** Application of kinetic theory to rarefied gas flow problems; free-molecule flow; near free-molecule flow; linearized problems; and flows with appreciable deviation from equilibrium. Prerequisite: Aeronautical and Astronautical Engineering 417. 1 unit.
- 428. Theory of Large Deformations in Nonlinear Continuous Media.** Fundamental concepts of large deformations in nonlinear elasticity and inelasticity with applications: generalized tensors, finite deformations, stress-strain relations in terms of strain energy functions, solutions of tension, shear and bending problems, finite plane strain, theory of successive approximations, fiber-reinforced beams, plates and cylinders, thermodynamics of deformable media, stability considerations, and constituent relations for inelasticity. Prerequisite: Aeronautical and Astronautical Engineering 326 or equivalent. 1 unit.
- 429. Theory of Linear and Nonlinear Viscoelasticity.** Same as Theoretical and Applied Mechanics 429. Fundamental concepts of viscoelasticity with applications: elastic-viscoelastic analogies, creep and relaxation functions, thermomechanical reciprocity relations, variational principles, model fitting, shear center motion, thick-walled cylinders under pressure and inertia loads with material annihilation, sandwich plates, propagation of viscoelastic waves, vibration of bars, plates and shells, nonlinear elastic-viscoelastic analogy, properties of nonlinear viscoelastic stress-strain laws, creep rupture, and torsion of nonlinear bars and shells. Prerequisite: Aeronautical and Astronautical Engineering 326 or consent of instructor. 1 unit.
- 434. Aerodynamic Heating.** Theory of convective aerodynamic heating in high-speed flow and laminar and turbulent flows; ablation, transpiration cooling, and mass transfer cooling; aerodynamic heating in hypersonic flow, real gas effects, and effect of pressure interactions and vorticity interactions; and heat transfer in rarefied gas flows. Prerequisite: Aeronautical and Astronautical Engineering 414 or equivalent. 1 unit.
- 438. Fundamentals of Combustion.** Same as Mechanical Engineering 403. Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex deto-

nation waves; and supersonic burning. Prerequisite: Aeronautical and Astronautical Engineering 213 or Mechanical Engineering 305. 1 unit.

- 452. Stochastic Structural Dynamics.** Same as Theoretical and Applied Mechanics 417. Structural dynamics problems treated from a probabilistic point of view; theory of probability and random processes introduced as mathematical tools; response of structures under random excitation is studied in order of increasing complexity; and probability of failure for such structures is discussed. Prerequisite: Aeronautical and Astronautical Engineering 255. Theoretical and Applied Mechanics 314, or equivalent. 1 unit.
- 453. Aerodynamic Noise.** Same as Theoretical and Applied Mechanics 418. Mathematical techniques for the analysis of intensity, spectrum, and directivity of noise field in various environments; practical examples including jet and rocket engines, propeller and fan, sonic boom, and cabin noise of high speed vehicles. Prerequisite: Graduate standing in engineering, physics, or mathematics. 1 unit.
- 490. Seminar.** Presentation by graduate students and staff of current topics in the field of aeronautics. Prerequisite: Graduate standing in aeronautical and astronautical engineering. 0 units.
- 493. Special Problems.** Theoretical and experimental investigations of problems in air-plane, missile, and space flight engineering. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Research in the various areas of the aeronautical and astronautical engineering sciences. 0 to 4 units.

AFRICAN STUDIES

Director of Center: D. E. Crummey

Center Office: Room 101, 1208 West California, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Elementary Hausa, I.** Same as African Languages 201. See African Languages 201.
- 202. Elementary Hausa, II.** Same as African Languages 202. See African Languages 202.
- 210. Introduction to Modern African Literature.** Same as Comparative Literature 210 and English 211. Significant contemporary African writings depicting the history and cultural traditions of African peoples. 3 hours.
- 211. Elementary Lingala, I.** Same as African Languages 211. See African Languages 211.
- 212. Elementary Lingala, II.** Same as African Languages 212. See African Languages 212.
- 222. Introduction to Modern Africa.** Same as Anthropology, Political Science, and Sociology 222. An interdisciplinary introduction to Africa dealing with basic themes and problems in the politics, economics, sociology, anthropology, and history of Africa. 3 hours.
- 231. Elementary Swahili, I.** Same as African Languages 231. See African Languages 231.
- 232. Elementary Swahili, II.** Same as African Languages 232. See African Languages 232.
- 241. Elementary Wolof, I.** Same as African Languages 241. See African Languages 241.
- 242. Elementary Wolof, II.** Same as African Languages 242. See African Languages 242.
- 303. Intermediate Hausa, I.** Same as African Languages 303. See African Languages 303.
- 304. Intermediate Hausa, II.** Same as African Languages 304. See African Languages 304.
- 310. Modern African Fiction.** Same as Comparative Literature and French 310 and English 370. Examines selected major African novels along thematic and formal lines; literary responses to colonialism and political independence and the crises that accompanied both in Africa; and study of critical approaches to the African novel and African characteristics of and contribution to the novel as a genre. Readings in English. Prerequisite: African Studies 210 or 222, or junior standing. 3 hours or 1 unit.
- 313. Intermediate Lingala, I.** Same as African Languages 313. See African Languages 313.
- 314. Intermediate Lingala, II.** Same as African Languages 314. See African Languages 314.

- 325. Southern Africa: Race and Power.** Same as History 325 and Political Science 333. An interdisciplinary survey of both the internal and international dimensions of the changing situation in Africa south of the Zambezi; focuses on the historical background to, and a political, economic, and social analysis of current events in the Republic of South Africa, Mozambique, Namibia, and Zimbabwe, emphasizing the central significance of race and power in this region. Prerequisite: History 216 or African Studies 222. 3 hours or 1 unit.
- 333. Intermediate Swahili, I.** Same as African Languages 333. See African Languages 333.
- 334. Intermediate Swahili, II.** Same as African Languages 334. See African Languages 334.
- 335. Advanced Swahili, I.** Same as African Languages 335. See African Languages 335.
- 336. Advanced Swahili, II.** Same as African Languages 336. See African Languages 336.
- 343. Intermediate Wolof, I.** Same as African Languages 343. See African Languages 343.
- 344. Intermediate Wolof, II.** Same as African Languages 344. See African Languages 344.
- 354. Social Structure of Southern Africa.** Same as Sociology 354. See Sociology 354.
- 450. Seminar on Selected Topics in African Studies.** Topics vary with the disciplinary focus. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.

AFRO-AMERICAN STUDIES

Acting Director of Program: D. M. Pinderhughes
Program Office: 1204 West Oregon, Urbana

- 100. Introduction to Afro-American Studies.** An interdisciplinary introduction to the basic concepts and literature in the disciplines covered by Afro-American studies; stresses the role of historical, political, and economic forces in shaping cultural expression. 3 hours.
- 161. Black Folk Culture.** Same as Anthropology 161. See Anthropology 161.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 224. Humanistic Perspectives of the Afro-American Experience.** A multidisciplinary study of major aspects, events, and periods of the Afro-American experience; includes a series of topics each focusing on one movement or historical event as reflected in Afro-American literature, art, and music. Prerequisite: Afro-American Studies 100 or consent of instructor. 3 hours.
- 244. Social Science Perspectives in Afro-American Studies.** A multidisciplinary analysis of social science perspectives on the Afro-American experience; critically reviews traditional social science literature, compared and contrasted with theory and research following more Afro-centric perspectives. Prerequisite: Afro-American Studies 100 or equivalent; or an introductory course in sociology, economics, anthropology, political science, or history; or consent of instructor. 3 hours.
- 253. Afro-American History to 1877.** Same as History 253. See History 253.
- 254. Afro-American History Since 1877.** Same as History 254. See History 254.
- 259. Afro-American Literature, I.** Same as English 259. See English 259.
- 260. Afro-American Literature, II.** Same as English 260. See English 260.
- 261. Afro-American Societies and Cultures.** Same as Anthropology 261. See Anthropology 261.
- 298. Special Topics in Afro-American Studies.** Advanced seminar on selected topics with particular emphasis on current research trends. Prerequisite: Junior status and one of the following: Afro-American Studies 224, or History 253 or 254, or English 259 or 260. 3 hours. May be repeated to a maximum of 6 hours.
- 327. Black Political Participation in the American Political Process.** Same as Political Science 327. See Political Science 327.
- 368. The South in American History.** Same as History 368. See History 368.

379. Slavery and Race Relations in Latin America. Same as History 379. See History 379.

AGRICULTURAL COMMUNICATIONS

Head of Office of Agricultural Communications and Extension Education: J. F. Evans
Office: 67 Mumford Hall, 1301 West Gregory, Urbana

- 100. Functional Writing.** Instruction and practice in functional writing related to unique interests of students in the College of Agriculture; designed primarily to be taken with freshman rhetoric by students with special needs for improvement in their use of English. Prerequisite: Restricted to students in the College of Agriculture. 2 hours.
- 110. Introduction to Agricultural Communications.** Introduces agricultural communications as a professional field; examines the development, role, and potential of the professional agricultural communicator. Prerequisite: Registration in agricultural communications curriculum, or consent of instructor. 1 hour.
- 114. Agricultural Communications Media and Methods.** Same as Journalism 114. Introduction to print, broadcast, visual, and other major communications media used to convey agricultural information; development of basic skills in communicating through those media. Prerequisite: Completion of rhetoric requirement. 3 hours.
- 214. Agricultural Communications Strategy.** Same as Journalism 214. Coordinated approach to planning and carrying out programs of agricultural information and education using a variety of communications media; students apply principles of strategy to actual communications problems of their choice. Prerequisite: Agricultural Communications 114 or consent of instructor. 3 hours.
- 240. Photography in Agriculture.** Application of visual communications principles to agriculture using the photograph as medium; emphasizes communicative, creative, and technical aspects. See Timetable for approximate cost of materials. Prerequisite: Agricultural Communications 114; consent of instructor. 4 hours.
- 280. Leadership Development.** Same as Human Resources and Family Studies 280. Examines leadership theory, styles and roles of leaders; includes exercises and activities to improve functional leadership skill, as adapted to career interests of the individual class member. Prerequisite: Rhetoric 105 and Speech Communication 101; or equivalent. 3 hours.
- 290. Professional Seminar.** Professional developments and issues in agricultural communications; the agricultural communicator today; and avenues for continuing professional growth. Prerequisite: Junior-senior standing in agricultural communications. 1 hour.
- 300. Special Problems in Agricultural Communications.** Special projects, research, and independent study in agricultural communications. Prerequisite: Agricultural Communications 114 or equivalent; written consent of instructor and authorized departmental approval prior to advance enrollment and registration; not open to students on probation. Specific approval of the associate dean is required in advance of registration for a second and/or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this academic unit subject to approval of the instructor. 1 to 5 hours, or $1\frac{1}{2}$ to 2 units.
- 310. Information for Agriculture.** Examines the role, value, kinds, channels, sources, and uses of information in U.S. agriculture; changes in channels, emerging communications technologies and other forces that may affect them; also examines outlook and issues concerning information for agriculture. Prerequisite: Agricultural Communications 114 and 214. 3 hours or $\frac{3}{4}$ unit.
- 320. Agriculture and Its Publics.** Communications analysis of major interactions between agriculture and other segments of American society. Prerequisite: 6 hours of social science. 3 hours or $\frac{3}{4}$ unit.

- 330. Promotion of Farm Products.** Studies producer-sponsored efforts to promote consumption of farm products; includes consumption trends and forces, current promotion activities, uniqueness and effects of commodity promotion, funding and organization, export promotion, and principles in promotion planning. Prerequisite: Economics 101 or Agricultural Economics 100; Agricultural Communications 114. 3 hours or $\frac{3}{4}$ unit.
- 460. Teaching of College-Level Agriculture.** Analysis and preparation for the problems encountered in the effective teaching of college-level agriculture and home economics; systems approach, including instructional objectives, preassessment of students, instructional strategies, materials, and student performance evaluation; and detailed study of individual problems supplements class work. Prerequisite: Master's standing. $\frac{1}{2}$ unit.
- 461. Extension Communications Management.** Analysis and management of effective extension communications based on present communication and educational concepts. 1 unit.

AGRICULTURAL ECONOMICS

(Including Rural Sociology)

Acting Head of Department: D. L. Uchtmann

Department Office: 304 Mumford Hall, 1301 West Gregory, Urbana

Agricultural Economics

- 100. Introductory Agricultural Economics.** Principles of production, supply, and demand applied to economic problems of agriculture and agriculturally related industries and to decisions in farm management, marketing, foreign trade, and agricultural policy; the role in economic growth of natural resources, population, and capital. 3 hours.
- 161. Microcomputer Use in Agriculture and Human Resources and Family Studies.** Studies selection and agricultural applications of microcomputer hardware and software; includes instruction and practice in solving data-related problems with microcomputers and general purpose software packages. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Problems in Agricultural Economics.** Individual research work under the supervision of senior members of the staff in the following fields: agricultural credit and finance; agricultural law; agricultural marketing; agricultural policy; agricultural prices; farm management; land economics; rural organization; and statistical analysis. Students may receive credit for research in preparing for intercollegiate debating and speaking on problems in agricultural economics when such opportunities exist. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
- 203. Farm Taxation.** Federal, state, and local taxation with emphasis on their application to farm income, farm property, farm property transfers, and agricultural cooperatives; introductory material on the uses and sources of revenue. 2 hours.
- 220. Farm Management.** Economic principles applied to management of farms; budgeting; crop and livestock systems; record analysis; financial management; farm leases; and problems in resource appraisal and business reorganization. Field trip required; see Timetable for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. Three hours credit without home farm problem or 4 hours credit with home farm problem. 3 or 4 hours.

- 223. Farm Business Accounting and Organization.** The legal structure of farm business organizations, including individual proprietorships, partnerships, corporations, and land trusts; accounting principles and methods as applied to farm businesses; financial and management analysis from accounting records; and accounting systems commercially available to farm businesses. Prerequisite: Accountancy 200 or 201; Agricultural Economics 203 and 220. 2 hours.
- 230. Marketing of Agricultural Products.** Examines factors affecting the size of the market for agricultural products and the scope of marketing activities; functions and services performed; pricing agricultural products, including the nature and causes of price fluctuations; and costs of marketing and efforts to reduce costs and improve the marketing system. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
- 235. Agricultural Cooperative Organization and Management.** Theory of cooperation; growth and distinguishing organizational characteristics of agricultural cooperatives; control and management of cooperatives with emphasis on financial and other management problems; and legal aspects of cooperatives. See Timetable for approximate cost of field trips. Prerequisite: Agricultural Economics 100 or Economics 101. 2 hours.
- 250. Agricultural Economics Internship.** A supervised, off-campus experience in a field directly pertaining to a subject matter in agricultural economics; typically the internship is with an agriculturally-oriented firm or governmental agency. Prerequisite: Junior standing, cumulative grade point average of 3.4 or above at the time the internship is arranged, and consent of instructor. 1 to 4 hours.
- 261. Agricultural Economic Statistics.** Statistical methods applied to agricultural economics, including graphic presentation, frequency distributions, index numbers, statistical inference, hypothesis testing, sampling, survey design, simple analysis of variance, basic linear regression, and correlation. Prerequisite: Mathematics 124. 3 hours.
- 301. Economics of Agricultural Development.** The economics of agricultural development and the relationships between agriculture and other sectors of the economy in developing nations; agricultural productivity and levels of living in the less developed areas of the world; and studies of agricultural development in different world regions including Africa, Asia, and Latin America. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 302. Agricultural Finance.** Introduction to agricultural finance including study of financial markets and institutions providing debt and equity capital to agricultural firms, development of skills in applying principles and methods of financial management to agricultural firms. Prerequisite: Agricultural Economics 220 or Accountancy 201, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 303. Agricultural Law.** Relation of common-law principles and statutory law to land tenure, farm tenancy, farm labor, farm management, taxation, and other problems involving agriculture. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 304. Intermediate Agricultural Finance.** Examines finance principles applied to commercial agriculture at an intermediate level; farm financial and investment analysis, risk and liquidity analysis, capital structure and leasing in agriculture; and organization, structure, and analysis of rural financial markets and institutions. Prerequisite: Agricultural Economics 302 and 261, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 305. Agricultural Policies and Programs.** The problems of agriculture as an industry; analysis of past and current federal and state governmental policies and programs affecting agriculture; objectives and development of policies; the use of economic concepts in evaluating possible future agricultural policies and programs; and forces in policy formation. Field trip; see Timetable for approximate cost. Prerequisite: Economics 101. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 312. Rural Real Estate Appraisal.** Same as Soils 312. Valuation methods and value bases of rural real estate; legal aspects of property rights, appraisal theory and procedures, condemnation appraisal, characteristics of the rural land market, soil identification and productivity, and other legal, economic, agronomic, and engineering aspects of real estate valuation. Laboratory field trips, including a practice appraisal; see Time-

table for approximate cost. Prerequisite: Soils 101 and Agricultural Economics 220, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 317. Introduction to Natural Resource Economics.** Same as Environmental Studies and Forestry 317. Examines economic aspects of natural resources and their implications for public policy development; discusses economic growth, resource scarcity, property rights, stock vs. flow resources, conservation, investment decisions, discounting, and the institutional framework for decision-making; and applies the above to agricultural problems. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{3}{4}$ unit.
- 318. Land Economics.** Physical, economic, and institutional factors that affect the role of land in economic life; population and resource requirements; principles of land utilization; returns from land; land value; property rights and tenure rights; social controls; land development. Prerequisite: Economics 101 or equivalent; graduate students must also have consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 319. Regional Environmental Management Simulation.** Same as Civil Engineering 341, Environmental Studies 341, Geography 341, and Urban and Regional Planning 375. See Civil Engineering 341.
- 324. Decision Making for Farm Operators.** Analyzes decision procedures for common farm operation problems, decision making under uncertainty, control procedures for the farm firm, evaluation of farm investments, and labor management. Prerequisite: Agricultural Economics 220; credit or concurrent registration in Agricultural Economics 302. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Economics of Agricultural Production.** Examines economic theory relevant to the analysis of agricultural production; factor-product, factor-factor, and product-product relationships; technical versus economic efficiency concepts; cost functions, their use and derivation; time in the production process; risk and uncertainty; and the use of mathematical programming in production economic analysis. Prerequisite: Agricultural Economics 261 and 324; Economics 300; Mathematics 134. 3 hours or $\frac{3}{4}$ unit.
- 326. Professional Farm Management.** Examines principles of farm management applied to problems of those managing farms for others as a profession; business practices and procedures; professional ethics; relationships with clients and farm operators; division of inputs and returns between owner and operator; and direct operation of farms with hired labor. Case studies and field trips; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Agricultural Economics 324 or 325. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Grain Marketing.** Economic and marketing problems associated with grain at farm and country elevator; the utilization of grain; pricing arrangements for grain; operational problems at country and interior points; factors affecting grain prices and seasonal variation; problems of transportation and grades and standards. Field trips; see Timetable for approximate cost. Prerequisite: Agricultural Economics 230, or an elementary marketing course. 3 hours or $\frac{3}{4}$ unit.
- 332. Livestock and Meat Marketing.** Same as Animal Science 332. Examines the nature, function, structure, and operation of livestock and livestock product markets; economic principles applied to prices, costs, and margins; market information, regulation, and controls; evaluation of alternative marketing methods; current, past, and potential changes in livestock and meat marketing. Field trip; see Timetable for approximate cost. Prerequisite: Agricultural Economics 230, or an elementary marketing course. 3 hours or $\frac{3}{4}$ unit.
- 335. Food Marketing.** Same as Food Science 335. Economics of food manufacturing and distribution; food purchasing behavior; structure of food industries; managerial decision making in food product development and marketing; and governmental and public interest in the food system. Prerequisite: Economics 101. 4 hours or 1 unit.
- 338. Agribusiness Management.** Covers financial analysis, business operations, and management functions of agribusiness firms through the integration of lecture-discussions, field trips to agribusinesses, and a business management game in which the class divides into decision-making teams representing competing firms in an industry. Field trips; see Timetable for approximate cost. Prerequisite: Accountancy 200 or 201, and Economics 101 or Agricultural Economics 100. 3 hours or $\frac{3}{4}$ unit.

- 340. Commodity Futures Markets and Trading.** Development of futures trading; operation and governance of commodity exchanges; economic functions of futures trading; operational procedures and problems in using futures markets; public regulation of futures trading; evaluation of market performance. Field trips required; see Timetable for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{3}{4}$ unit.
- 342. Agricultural Prices.** Studies the factors affecting prices of agricultural products: long-time cyclical, seasonal, and other price movements; sources of information relating to production and demand factors; government activities as they relate to prices of agricultural products; and methods and problems in price analysis and forecasting. Prerequisite: Economics 101 and Agricultural Economics 261; or equivalents. 3 hours or $\frac{3}{4}$ unit.
- 352. Economic Development in Latin America.** Same as Economics 352. See Economics 352.
- 353. Economic Development in India and Southeast Asia.** Same as Economics 353. Analysis of plans and progress toward economic development in India and southeast Asia; economic characteristics of the area and their significance for economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Economic Development of Tropical Africa.** Same as Economics 354. Types of African economies and growth of the exchange economy; development of natural resources, industry, trade, finance, and education; analysis of economic integration, governmental planning, and development projects; and demographic, land tenure, and institutional influences on development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. International Agricultural Trade.** Examines trends and patterns of exports and imports of major agricultural commodities, and evaluates the economic and institutional factors having a bearing on this trade. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 361. Agricultural Surveys and Statistical Analysis.** Reviews methods of survey statistics used with agricultural producers and others in agriculture; studies survey instruments, interviewing, coding, sample design, sampling, survey statistics, and tests of significance; and includes a class problem survey conducted by students. Field trip to the Illinois Crop Reporting Service; see Timetable for approximate cost. 8 week course. Prerequisite: Agricultural Economics 261. 2 hours or $\frac{1}{2}$ unit.
- 362. Applications of Regression Models in Agricultural Economics.** Emphasizes the application of single equation regression methods to problems in agricultural economics; techniques include ordinary least squares, maximum likelihood estimators, estimators with heteroskedastic, serially correlated, and multicollinear data; and uses of binary independent variables. Prerequisite: Agricultural Economics 261 and Mathematics 134, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 363. Optimization Methods in Agricultural Economics.** Application of mathematical programming methods to discrete models in agricultural economics; Kuhn-Tucker theorem, Lagrange multipliers, duality, simplex method as applied to linear and quadratic programming, and input-output analysis models in agriculture. Prerequisite: Mathematics 124 and 134. 2 hours or $\frac{1}{2}$ unit.
- 370. Family Economics.** Same as Economics 346 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
- 401. International Comparative Agriculture.** Agricultural and food problems of the world and of selected countries viewed in the world setting; resources and institutional factors affecting production; and national and international policies and plans for developing agricultural production and improving levels of living. Emphasis is given to a comparative approach to agricultural development of countries on different economic levels. 1 unit.
- 402. Agricultural Finance.** Financial planning applied to farms and farm-related firms and sectors; financial aspects of risks and risk management in the food production/distribution system and related financial markets; and cash flow, capital budgeting,

and liquidity management. Prerequisite: Agricultural Economics 302 or consent of instructor. 1 unit.

- 403. Macro Agricultural Finance.** Analyzes farm sector financial statements, demand and supply of physical and financial assets and liabilities, effects of monetary and fiscal policies on agriculture, and effects of the structure of financial institutions on agriculture. Prerequisite: Agricultural Economics 302 and 362, or equivalent. $\frac{1}{2}$ unit. Offered every other year.
- 405. Economic Policies and Programs Affecting Agriculture.** Economic analysis of state, national, and international policies and programs, including proposed legislation having important bearing on the well-being of farm people. Prerequisite: One semester of graduate work or consent of instructor. 1 unit.
- 406. Research Methodology in Agricultural Economics.** The use of theory and observations in the formulation and resolution of research problems in agricultural economics, including criteria for choice in modeling options and observational methods. Prerequisite: Economics 300 or 301, or equivalent and Agricultural Economics 362. $\frac{1}{2}$ unit.
- 425. Microeconomics of Agricultural Production.** Examines analysis of agricultural production at the enterprise or farm level; theory, estimation, and utilization of response analysis in agricultural production; estimation of firm production functions; evaluation of firm costs and size economies in agriculture; optimal replacement of durable assets; and theory of leasing and utilization of optimization techniques in firm level analysis. Prerequisite: Economics 300, and an introductory knowledge of multiple regression and linear programming. 1 unit.
- 426. Macroeconomics of Agricultural Production.** Evaluation of efficiency in the use of agricultural resources at aggregative level; supply response analysis; evaluation of technological change in agriculture; concepts of productivity and capacity of agriculture and their application; externalities resulting from agricultural production; and research approaches to production analysis. Prerequisite: Economics 300 and 301, and an introductory knowledge of multiple regression and linear programming. 1 unit.
- 436. Problems in Marketing Agricultural Products.** Examines selected economic problems in marketing agricultural products and discusses relevant theory and empirical methodologies for analyzing and interpreting research results; topics include: operational efficiency in marketing firms and industries; efficient allocation over space, form, and time; price-making institutions; and research in demand stimulation and selected issues in trade. Prerequisite: Agricultural Economics 362 and 363, and Economics 400; or equivalent. 1 unit.
- 437. Public Issues in Food Marketing.** Analyzes structure and economic behavior in food processing and distribution, including consideration of marketing costs, competition, food safety, consumer protection, and public regulation of the food industries. Prerequisite: Economics 400 or equivalent. 1 unit.
- 442. Agricultural Price Analysis.** Studies the methods used to analyze factors affecting agricultural prices; analyzes agricultural prices and price movements with respect to time, space, and form; and examines methods of price forecasting and techniques of time series analysis. Prerequisite: Agricultural Economics 362 or Economics 471, and Economics 400; or equivalent. 1 unit.
- 461. Multivariate Techniques in Agricultural Economics.** Basic theory and use of simultaneous systems of equations in agricultural economics, including identification, multipliers, and estimators; principal components, factor analysis, and models with limited dependent variables as these techniques apply to agricultural economics research. Prerequisite: Agricultural Economics 362 or equivalent. $\frac{1}{2}$ unit.
- 463. Natural Resource Economics.** Same as Economics, Environmental Studies, and Forestry 463. Emphasizes the role of public policy in natural resource use: theory of allocating renewable and non-renewable natural resources over time; effects of institutions on resource use; causes and consequences of technological change; natural resources and economic growth; and applications of concepts to current natural resource issues. Prerequisite: Economics 300 or equivalent. 1 unit.

- 464. Environmental Economics: Theory and Applications.** Same as Economics and Environmental Studies 464. See Economics 464.
- 470. Seminar in Family and Consumption Economics.** Same as Family and Consumer Economics 470. See Family and Consumer Economics 470.
- 491. Seminar and Special Topics.** All graduate students majoring in agricultural economics must register in the noncredit section of this course. In addition, students may register for credit for individual research or group instruction on special topics under the supervision of one or more staff members. 0 to 2 units.
- 499. Thesis Research.** Individual research under supervision of members of the graduate teaching staff in their respective fields. 0 to 4 units.

Rural Sociology

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 270. Population Issues.** Same as Sociology 270. See Sociology 270.
- 277. Rural Social Change.** Same as Sociology 277. Social forces retarding or accelerating change (traditions, beliefs, attitudes, innovations, social movements, and social planning) as related to rural social organizations and institutions. Field trip to be arranged; for costs see Timetable. Prerequisite: Sociology 100. 3 hours.
- 343. Social Change in Developing Areas.** Same as Sociology 343. Description and analysis of recent social and cultural changes occurring in new nations and developing economies; special attention given to problems of traditional social structure undergoing modernization; and social factors in economic growth, caste and class, nation-building, urbanization and population composition, education, family, and religion. Prerequisite: Sociology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies and Leisure Studies 344. See Environmental Studies 344.
- 346. Energy, Environment, and Society.** Same as Environmental Studies 346. See Environmental Studies 346.
- 378. Sociocultural Factors in African Economic Development.** Same as Anthropology 378. See Anthropology 378.
- 407. Techniques in Demographic Analysis.** Same as Sociology 407. See Sociology 407.
- 477. Seminar on Community Organization.** Same as Sociology 477. See Sociology 477.
- 487. Special Problems in Rural Sociology.** Same as Sociology 487. Prerequisite: One unit of graduate credit in sociology; consent of instructor. $\frac{1}{2}$ or 1 unit.

AGRICULTURAL ENGINEERING

(Including Agricultural Mechanization)

Head of Department: R. L. Pershing

Department Office: 338 Agricultural Engineering Science Building, 1208 West Peabody, Urbana

Agricultural Engineering

- 126. Engineering in Agriculture.** The role of the agricultural engineer in the development of agricultural production facilities; includes resources for production, design loads, material and equipment performance characteristics, and crop and livestock production facilities. Includes laboratory. Prerequisite: Credit or concurrent registration in Mathematics 120. 4 hours.

- 127. Production Systems in Agriculture.** Mathematical models of equipment performance; analysis of operational, power, weather, and economic constraints; and elementary design of equipment systems using concepts of probability and optimization. Prerequisite: Agricultural Engineering 126 and credit or concurrent registration in Computer Science 101. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 236. Machine Characteristics and Mechanisms.** Design and development concepts of agricultural and industrial machines; analysis and synthesis of tillage, planting, harvesting, and material handling mechanisms. Includes laboratory. Prerequisite: Agricultural Engineering 127 and Theoretical and Applied Mechanics 212. 3 hours.
- 256. Surveying Agricultural and Forest Lands.** Same as Forestry 256. Basic surveying procedures as applied to practices in soil and water conservation engineering, forest management, and forest engineering; water routing design. Includes laboratory. Prerequisite: Mathematics 114 and sophomore standing. 3 hours.
- 277. Design of Agricultural Structures.** Design of timber, concrete, and steel agricultural structures; engineering properties of wood, concrete, and steel materials; design of compression members, tension members, beams, and connections; complete design of a few structural frames. Includes laboratory. Prerequisite: Credit or concurrent registration in Civil Engineering 261. 3 hours.
- 287. Environmental Control for Plants and Animals.** Application of engineering and biological principles to controlling agricultural building environments. Design of environments to meet specific biological requirements are developed through the integration of fluids and thermodynamics principles for environmental control with the properties of animals and plants and their related biological needs. Includes laboratory. Prerequisite: Agricultural Engineering 127. 3 hours.
- 296. Honors Project.** A special problem in engineering is selected for bibliographical, theoretical, and/or experimental research. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 298. Undergraduate Seminar.** Professional engineering concepts; design methods; preparation and presentation of an undergraduate design thesis proposal. Thesis to be completed in Agricultural Engineering 299. Field trip. Prerequisite: Junior standing in engineering. 1 hour.
- 299. Undergraduate Thesis.** The agricultural engineering problem selected in Agricultural Engineering 298 is investigated and a detailed engineering report is prepared. Prerequisite: Agricultural Engineering 298; senior standing in engineering. 2 to 4 hours.
- 311. Instrumentation and Measurements.** Static and dynamic measurements; design of measurement systems; error and noise control; analog and digital signal processing; telemetry; measurement of agricultural and biological quantities. Prerequisite: Electrical Engineering 220 or 260. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. (Credit for optional lab is 1 hour or $\frac{1}{4}$ unit.) Credit is not given for both Agricultural Engineering 311 and either General Engineering 234 or Mechanical Engineering 261.
- 336. Design of Agricultural Machinery.** Design projects which utilize the principles of machine design, engineering analysis, and functional operation of machinery systems; projects are selected, concepts visualized and tested, and design layouts made; emphasizes unique aspects of agricultural machinery design in selection of drive trains and material conveyors and in weldment design. Includes laboratory. Prerequisite: Agricultural Engineering 236; credit or concurrent registration in Mechanical Engineering 270. 3 hours or $\frac{3}{4}$ unit.
- 340. Introduction to Applied Statistics.** Same as Agronomy, Animal Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
- 345. Statistical Methods.** Same as Animal Science and Forestry 345. See Animal Science 345.
- 346. Tractors and Prime Movers.** Engineering aspects of design and application of tractors for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; operator environment. Includes laboratory. Prerequisite: Mechanical Engineering 209 or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 356. Soil and Water Conservation Structures.** Hydrology and hydraulics; design, including construction practices and cost estimation, of structures for the conservation and quality control of soil and water; relationship of topography, soils, crops, climate, and cultural practices in the conservation and quality control of soil and water for agriculture. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 357. Land Drainage.** Design, construction, performance, and maintenance of surface, sub-surface, and open ditch agricultural drainage systems. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Engineering Properties of Food Materials.** Physical properties of foods and biological materials; design of processing equipment and the sensing and control of food processes; thermal, electromagnetic radiation, rheological, and other mechanical properties. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 and Chemical Engineering 371; or Theoretical and Applied Mechanics 221, Theoretical and Applied Mechanics 235, and Mechanical Engineering 209 or Mechanical Engineering 213; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 387. Grain Drying and Conditioning.** Psychrometric principles of air modification for dehydration and conditioning of moist products, emphasizing the drying of cereal grains; design of drying, cooling, and aeration systems. Includes laboratory. Prerequisite: Agricultural Engineering 127 or consent of instructor; Mechanical Engineering 209 recommended. 3 hours or $\frac{3}{4}$ unit.
- 396. Special Problems.** Individual investigation and report of any phase of agricultural engineering approved by the department. Prerequisite: Senior standing in engineering. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 400. Research Orientation.** Discussion of the philosophy and methods of research, thesis preparation, and publication of research findings. 0 units.
- 436. Dynamics of Farm Machine Elements.** Advanced study of the dynamics of farm machine elements with specific reference to functional operation, stresses, and fatigue life. Includes laboratory. Prerequisite: Agricultural Engineering 236 and 336, or equivalent. 1 unit.
- 490. Seminar.** Presentation and discussion of current research and literature in agricultural engineering. $\frac{1}{4}$ unit.
- 496. Problems in Agricultural Engineering.** Investigation and report on problems in farm machinery, farm power, rural electrification, soil and water control, rural housing, and farm structures. Prerequisite: Consent of head of department. 1 unit.
- 499. Thesis Research.** 0 to 4 units.

Agricultural Mechanization

- 100. Engineering Applications in Agriculture.** Examples, problems, discussions, and laboratory exercises pointing to present and potential engineering applications in agriculture; emphasis on farm power and machinery, soil and water control, farm electrification, and farm structures. Includes laboratory. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Agricultural Mechanics Shop: Construction Technology.** Selection, use, and maintenance of hand and power tools; shop safety; selection of building and roofing materials; concrete masonry construction; farm surveying. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
- 202. Welding Processes, Metallurgy, and Materials.** Selecting and using metal-arc, inert-gas, submerged arc, oxyacetylene welding and cutting processes for construction and maintenance of agricultural equipment. Includes laboratory. See Timetable for ma-

materials charge. Prerequisite: Chemistry 101; junior standing or consent of instructor. 3 hours.

- 203. Electric Wiring, Motors, and Controls.** Selecting and using wiring materials, electric motors and controls in agricultural lighting, heating, ventilation, and materials handling problems. Includes laboratory. See Timetable for materials charge. Prerequisite: Physics 140 or Agricultural Mechanization 100; junior standing or consent of instructor. 3 hours.
- 221. Farm Power and Machinery Management.** Performance, costs, application, selection, and replacement of farm tractors and field implements; optimization of mechanized agricultural field operations. Includes laboratory. Prerequisite: Agricultural Mechanization 100. 4 hours.
- 241. Farm Tractor Power.** Construction and performance of internal combustion engines; power transmission, control, fuel, electrical, and hydraulic systems; and analysis of methods and equipment for performance testing. Includes laboratory. Prerequisite: Physics 101 recommended. 3 hours.
- 250. Agricultural Mechanization Internship.** Supervised off-campus learning experience with a business firm engaged in production or technological service to agriculture. Prerequisite: Junior standing with a 3.0 cumulative grade point average; Agricultural Mechanization 221, 252, 272, or 281; and consent of the coordinator of program. 2 hours.
- 252. Mechanics of Soil and Water Conservation.** Principles of planning, constructing, and adapting soil conservation and drainage practices for Illinois farms, and the application of surveying to these practices. Includes laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
- 272. Farm Buildings.** Requirements of farm buildings; problem analysis and planning; building plans; materials; construction methods and costs. Includes laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
- 281. Grain Drying, Handling, and Storage.** Grain drying fundamentals, air-moisture relationships, grain drying systems for efficient energy use, fans, grain-handling devices and systems, planning of grain handling systems, grain standards, moisture measurement, grain storage, fungi and insect problems, aeration, processing and milling of corn and soybeans. Includes laboratory. Prerequisite: Junior standing. 3 hours.
- 299. Agricultural Mechanization Seminar.** The role of the mechanization of agriculture in society and the part of the individual graduate in this role; directed toward the study of the interplay of developments in agriculture and agricultural mechanization; topics selected from technical and popular journals. A tour of farms, industry, and business is required. Prerequisite: Junior standing. 1 hour.
- 300. Special Problems.** A technical agricultural problem is selected for study, investigation, and report, wherein a satisfactory solution does not require a background of engineering education. Prerequisite: Minimum grade point average of 3.5; consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 331. Farm Machinery Technology.** The role of forces, motions, and strengths in the operation and performance of common farm machinery mechanisms; study of mechanism illustrations, machinery testing, service problems, and other aspects of the equipment distribution industry. Includes laboratory. Prerequisite: Physics 101 recommended. 4 hours or 1 unit.
- 333. Agricultural Chemical Application Systems.** Hydraulic principles; liquid application systems including pumps, controls, and agricultural spray nozzles; granular application systems; safe storage, handling, and disposal of pesticides and fertilizers; federal and state legal requirements. Includes laboratory. Prerequisite: Agricultural Mechanization 221, or Agronomy 326, or Horticulture 242 or 262, or Plant Pathology 305 or 377, or Entomology 319 or 322. 3 hours or $\frac{3}{4}$ unit.
- 361. Development and Function of Family Housing.** Same as Family and Consumer Economics and Interior Design 361. Study of principles and problem solutions in family housing; basic functions, plan patterns, types, materials, and structure; economic influences, costs, and adaptations; personal and public interests. Includes laboratory.

Prerequisite: Interior Design 160 or consent of department (agricultural mechanization students, no prerequisite). 3 hours or $\frac{3}{4}$ unit.

- 372. Livestock Waste Management.** Principles and practices of managing wastes from livestock production facilities; includes collection, storage, transport, runoff control, odor control, aerobic and anaerobic treatment, utilization as crop nutrients, animal nutrients, and fuels, and regulations. Prerequisite: Junior standing and one 200-level animal production course. 3 hours or $\frac{3}{4}$ unit.
- 381. Electrical and Microcomputer Controls for Agriculture.** Microcomputer and electrical control applications; electrical fundamentals; solid-state devices; relays; sensors; motor types and characteristics; three-phase power; logic devices; analog/digital converters; single-board microprocessors and interfacing for agricultural control applications. Includes laboratory. Prerequisite: Agricultural Mechanization 100; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

AGRICULTURE

Program Administrator: J. R. Campbell

Program Office: 104 Mumford Hall, 1301 West Gregory, Urbana

- 100. Agriculture in Modern Society.** Analysis of agriculture in contemporary society and introduction to problems and challenges related to agriculture; includes a brief orientation to the University and the College of Agriculture. Required of all freshmen in agriculture. 1 hour.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Human Resources and Family Studies 268. Introduction to the organization, philosophy, financing, personnel, clientele, and programs of cooperative extension. Prerequisite: A course in the principles of psychology or sociology or consent of instructor. 3 hours.
- 269. Cooperative Extension: Summer Experience.** Same as Human Resources and Family Studies 269. Field experience to provide opportunity for students to become acquainted with the roles of county personnel, office organization, and programs in cooperative extension. A living allowance is paid to students during the course. Prerequisite: Agriculture 268 or consent of instructor. 4 hours. Offered in the summer session only.
- 298. International Experience.** Same as Human Resources and Family Studies 298. An international experience in agriculture or home economics related areas involving foreign travel and study without enrollment in another institution. Experience must be planned and approved in advance through consultation with a College of Agriculture faculty member. Prerequisite: Written consent of instructor; junior standing; not open to students on probation. 1 to 4 hours.
- 299. Agriculture Study Abroad.** Provides campus credit for study at accredited foreign institutions. Final determination of credit granted is made upon the student's successful completion of work. Prerequisite: Consent of major department, college, and Study Abroad Office. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 36 hours within one calendar year.
- 350. Education for Rural Development in Low Income Countries.** Same as Vocational and Technical Education 350. See Vocational and Technical Education 350.
- 369. Educational Programs in Cooperative Extension.** Same as Human Resources and Family Studies 369. The design and development of informal educational programs for youth and adults in an out-of-school setting. Prerequisite: Agriculture 268 or consent of instructor. 3 hours or 1 unit.

AGRONOMY

(Including Soils)

Head of Department: L. E. Schrader

Department Office: W-201 Turner Hall, 1102 South Goodwin, Urbana

Agronomy

- 121. Principles of Field Crop Science.** An introductory course: kinds, origin, taxonomy, morphology, and physiological and ecological bases of growth, reproduction, improvement, and utilization of corn, soybeans, small grains, forage crops, and sorghums; cropping and tillage practices and principles; and field-crop production hazards. 4 hours.
- 190. Field-Crop Scouting.** Workshop on the scouting of field crops for major pests and physiological problems; identification of major weeds, diseases, and insects of field crops. Lecture and lab. 1 hour. Offered during spring break.
- 220. Plant and Animal Genetics.** Same as Animal Science 220 and Horticulture 220. The principles of heredity in relation to plant and animal improvement. Prerequisite: Biology 110 and 111, or Plant Biology 100 and Biology 104. 4 hours.
- 290. Undergraduate Agronomy Seminar.** The course includes reports and discussions of crops and soils research. Prerequisite: Senior standing. 1 hour.
- 299. Undergraduate Thesis.** Individual research problems in agronomy under the direction of a faculty member in agronomy. Normally the student enrolls during the summer between the junior and senior years and during the fall semester of the senior year, or during both semesters of the senior year. Recommended for those who plan to do research and/or graduate study. Thesis problems should be discussed with the supervising faculty member in the semester preceding enrollment and must be approved by the Agronomy Undergraduate Thesis Committee before enrollment. An approved thesis must be presented for credit to be given. Prerequisite: Junior standing; minimum grade-point average of 4.0; consent of instructor. 2 to 5 hours. A maximum of 5 hours may be counted toward graduation.
- 300. Advanced Special Problems.** Individual problems in crops or soils. Graduate students majoring in agronomy do not receive graduate credit. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor. Approval of the agronomy teaching coordinator is required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours, or $\frac{1}{4}$ to 2 units.
- 318. Crop Growth and Production.** Crop production and management as influenced by environment, plant species, and cropping system; relates plant growth processes to management practices. Prerequisite: Soils 101 and Agronomy 121 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 319. Environment and Plant Ecosystems.** Same as Environmental Studies and Forestry 319. See Forestry 319.
- 321. Biological Control of Insect Pests.** Same as Entomology 321. See Entomology 321.
- 322. Forage Crops and Pastures.** Forages, their plant characteristics, ecology, and production; grasslands of farm and range as related to animal production and soil conservation. Prerequisite: Agronomy 121. 3 hours or $\frac{3}{4}$ unit.
- 323. Principles of Plant Breeding.** Same as Horticulture 323. Genetic and cytological variation in crop plants; the production and control of such variation in developing varieties and hybrids; and the maintenance of high quality seed stocks. Field trips; see Timetable for approximate cost. Prerequisite: Plant Biology 100; Agronomy 110 or equivalent. 4 hours or 1 unit.

- 324. Plant Breeding Methods.** Discussion of the application of current scientific tools and methods available to plant breeders for improving plants; emphasis on actual use of plant breeding methods and production of high quality seed. Field trip; see Timetable for estimated cost. Offered Summer Session only. Prerequisite: Agronomy 323. 2 hours or $\frac{1}{2}$ unit.
- 326. Weeds and Their Control.** Weeds, their introduction, methods of dissemination, reproduction, and control; a characterization of the common weeds of the Midwest. Prerequisite: Agronomy 121. 3 hours or $\frac{3}{4}$ unit.
- 330. Plant Physiology.** Same as Plant Biology 330. See Plant Biology 330.
- 332. Genetic Toxicology.** Same as Biology 332 and Environmental Studies 332. See Environmental Studies 332.
- 333. Plant Physiology Laboratory.** Same as Plant Biology 333 and Horticulture 333. See Plant Biology 333.
- 336. Perennial Grass Ecosystems.** Same as Horticulture 336. See Horticulture 336.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Animal Sciences, Food Science, Forestry, and Horticulture 340. Statistical methods involving relationships between populations and samples; collection, organization, and analysis of data; and techniques in testing hypotheses with an introduction to regression, correlation, and analyses of variance limited to the completely randomized design and the randomized complete-block design. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 4 hours or $\frac{3}{4}$ unit.
- 350. Crops and Man.** Interpretations of the role of crop plants in the development of cultures and civilizations; description of crops primarily in terms of their origins, evolution, and influences on man's technology, art, religion, and social and political institutions. Field trip; see Timetable for approximate cost. 3 hours or $\frac{3}{4}$ unit.
- 377. Diseases of Field Crops.** Same as Plant Pathology 377. See Plant Pathology 377.
- 400. Seminar.** Discussions of current literature in crops and soils. Required of all graduate majors in agronomy. Prerequisite: Graduate standing. 0 or $\frac{1}{4}$ unit.
- 418. Crop Growth and Development.** Study of the physiological processes involved in growth and development of crop plants and the interaction of physiological processes and the environment that influences productivity. Prerequisite: Agronomy 318 or 330. 1 unit.
- 422. Forage Quality and Utilization.** Nutritional chemistry of forage plants and the genetic, environmental, and post-harvest factors that influence it. Emphasis placed in the evaluation of forage quality using laboratory methods and feeding experiments. Offered in alternate years. Prerequisite: Agronomy 322 and Biochemistry 350. 1 unit.
- 423. Cytogenetic and Evolutionary Basis of Plant Breeding.** Nature and origin of crop species; genetic and cytogenetic basis for developing special plant materials and the use of such materials in breeding programs; and emphasis on discontinuous variation. Prerequisite: Agronomy 323 or equivalent, or consent of instructor. 1 unit.
- 424. Plant Biochemistry.** Same as Plant Biology 424 and Horticulture 424. Enzymes and pathways involved in plant intermediary metabolism. Basic cell physiology, bioenergetics, and hormonal regulation of metabolism. Prerequisite: Plant Biology 330 and Biochemistry 350. 1 unit.
- 426. Herbicide Behavior in Plants.** Study of the various chemicals used to inhibit plant growth, including mode of action, mechanisms of selective toxic action, relationship of chemical structure to toxicity, and fate and behavior in soils. Offered in alternate years. Prerequisite: Agronomy 330 and 326. 1 unit.
- 429. The Evolution of Agricultural Economies.** Same as Anthropology 429 and Geography 429. See Anthropology 429.
- 431. Plant Cell Metabolism.** Same as Biology, Forestry, Horticulture, and Plant Pathology 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Biology, Forestry, Horticulture, and Plant Pathology 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Biology, Forestry, Horticulture, and Plant Pathology 433. See Biology 433.

- 434. Regulation of Plant Development and Reproduction.** Same as Biology. Forestry, Horticulture, and Plant Pathology 434. See Biology 434.
- 440. Design and Analysis of Biological Experiments.** Statistical methods as tools for research; principles of designing experiments and methods of analysis for various kinds of designs, including factorial experiments, are considered from the viewpoint of when and how to use them. Prerequisite: Agronomy 340 or equivalent. $\frac{3}{4}$ unit.
- 441. Advanced Design and Analysis of Biological Experiments.** Same as Animal Sciences 441. Design and analysis of complex experiments; considers confounded factorials, lattices, and other incomplete block designs in terms of their characteristics, usefulness in biological research, and methods of analysis; and computational aspects of both regression and analysis of variance. Prerequisite: Agronomy 440 or equivalent. $\frac{3}{4}$ unit. Offered in alternate years.
- 442. Environmental Plant Physiology.** Same as Plant Biology 442. See Plant Biology 442.
- 444. Quantitative Aspects of Plant Breeding.** Studies the theoretical bases for plant breeding procedures with special emphasis on the relationship between type and source of genetic variability, mode of reproduction, and effectiveness of different selection procedures. Prerequisite: Agronomy 323 and 440, or equivalent. 1 unit.
- 445. Biochemical Genetics of Higher Plants.** The biochemical description of genetic phenomena including genetic systems, mutagenesis, selection methods, mutant characterization, evolution, maternal inheritance, ploidy, heterosis, tumors, and tissue culture genetics. Prerequisite: Agronomy 110 and Biochemistry 350, or equivalent. 1 unit. Offered in alternate years.
- 462. Origin of Variation in Plants.** Same as Plant Biology 462. Study of the principles of plant evolution; discussion of theoretical and descriptive aspects of origin of variation, mode of speciation, role of hybridization, natural and artificial selection, and adaptation. Prerequisite: Consent of instructor. 1 unit.
- 493. Advanced Studies in Agronomy.** Directed and supervised detailed study of selected problems or topics. Prerequisite: Consent of instructor. Study may be in any one of the following fields: (a) soil chemistry; (b) soil fertility; (c) soil physics; (d) soil classification and pedology; (e) soil mineralogy; (f) soil microbiology; (g) plant breeding and genetics; (h) plant physiology; (i) weed control; (j) crop morphology; (k) crop production and ecology; or (l) statistical techniques and data processing. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

Soils

- 101. Introductory Soils.** The nature and properties of soil including origin, formation, and biological, chemical, and physical aspects. Prerequisite: Chemistry 100 or equivalent. 4 hours.
- 301. Soil Survey with Emphasis on Illinois Soils.** Properties and methods used in distinguishing soils; characteristics and distribution of different soils in Illinois; and the cause of these differences and their influence upon proper soil use and management. Laboratory work includes instruction in mapping soils and the use of soil maps, and field trips to examine representative soils. See Timetable for approximate cost. Prerequisite: Soils 101 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 302. Soil Testing Practicum.** Chemical procedures useful in assessing soil/plant relationships for field crops; involves lectures on agronomic principles, field work on sampling, and laboratory time to perform soil tests, interpret the analytical results, and formulate a nutrient management program. Field trip; see Timetable for approximate cost. Prerequisite: Soils 101. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. 3 hours or $\frac{3}{4}$ unit credit requires additional laboratory work and consent of instructor.
- 303. Soil Fertility and Fertilizers.** Factors affecting the supply of available major, secondary, and minor elements in soils and their influence on crop production; evaluating fertilizer and lime needs; and fertilizer manufacture, sources, and application methods. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.

- 304. Soil Management and Conservation.** Application of principles of soil conservation and management to the solution of land-use problems; influence of soil characteristics on erosion control, cropping intensity, water management, and land-use planning. Field trip; see Timetable for approximate cost. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
- 305. Biochemical Processes in Soil and Water Environments.** Metabolic processes leading to chemical transformations in soil and water environments; implications for soil fertility and environmental pollution. Prerequisite: Microbiology 100; Chemistry 102. 3 hours or $\frac{3}{4}$ unit.
- 307. Soil Chemistry.** Emphasizes the inorganic reactions involved in soil development and plant nutrition in soils; topics discussed include colloid systems, properties of water, ion exchange equilibria, plant nutrient forms, and methods of analyses. Prerequisite: Soils 101; Chemistry 102. 3 hours or $\frac{3}{4}$ unit.
- 308. The Physics of the Plant Environment.** The physics of transport processes in the soil and aerial environment of plants; exchanges of energy and gases in crop canopies and the retention of flow of water, gases, solutes, and heat in soils. Prerequisite: Physics 101 or 106; one semester of calculus; and Soils 101 or consent of instructor. 4 hours or 1 unit.
- 311. Laboratory Methods for Soils Research.** Uses traditional wet chemical and instrumental techniques in the characterization of soil properties; includes atomic absorption spectroscopy, gas chromatography, specific ion electrodes, and other techniques in the study of soils. Lecture and laboratory. Prerequisite: Soils 101 and Chemistry 102. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 312. Rural Real Estate Appraisal.** Same as Agricultural Economics 312. See Agricultural Economics 312.
- 313. Soil Mineralogy.** Description and identification of common soil minerals and weathering of minerals; relationships of soil mineralogy to soil development, plant and animal ecology, and agricultural and technological use of soil. Prerequisite: Soils 101; Geology 101 or 107. 3 hours or $\frac{3}{4}$ unit.
- 402. The Chemistry of Soil Fertility.** The chemistry of the essential plant nutrients in soils, their reactions, and their quantitative relationship to plant growth. Prerequisite: Soils 101; Chemistry 122. 1 unit. Offered in alternate years.
- 403. Genesis, Morphology, and Classification of Soils.** Historical review of soil genesis and classification; morphology and genesis of diagnostic soil horizons and features; soil genesis processes and reactions; classification of soils; and characteristics, geography, and production potentials of major soil groups of the world. Prerequisite: Soils 301 or consent of instructor. 1 unit. Offered in alternate years.
- 411. Soil Physics.** The derivation and application of the fundamental physical principles and laws which govern the behavior of soils; emphasis on transport phenomena and physical characteristics of soils. Prerequisite: Mathematics 345, Soils 308, or consent of instructor. 1 unit. Offered in alternate years.
- 412. Soil Organic Matter.** Basic considerations in organic matter transformation; geochemistry of organic matter; nature and origin of humic substances; and reactions of organic matter in soils and sediments. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
- 414. Physical Chemistry of Clays and Soils.** Same as Mining Engineering 414 and Ceramic Engineering 414. The application of physical-chemical principles and concepts to surfaces and adsorption on surfaces; emphasis on silicate surfaces and water adsorption. Prerequisite: Chemistry 245 or 344, or consent of instructor. 1 unit. Offered in alternate years.

AIR FORCE AEROSPACE STUDIES

Head of Department: Colonel J. R. Pond

Department Office: 223 Armory Building, 505 East Armory, Champaign

- 102. Leadership Laboratory.** Prerequisite: Concurrent registration in any Air Force Aerospace Studies course, or consent of professor of aerospace studies. No credit. May be repeated.
- 111. The Air Force Role in National Security, I.** First-year survey designed to familiarize the student with the organization and mission of the U.S. Air Force and its relation to the total defense structure; examines resources and functions of the United States strategic forces. Prerequisite: Concurrent registration in Air Force Aerospace Studies 102. 1 hour.
- 112. The Air Force Role in National Security, II.** Continuation of Air Force Aerospace Studies 111. Examines resources and functions of United States strategic forces, general-purpose military forces, and aerospace support organizations. Prerequisite: Air Force Aerospace Studies 111 or consent of instructor, and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
- 121. The Development of U.S. Air Power, I.** Introduces the history of the development of air power: the impact of technology, politics, controversy, and military conflict on the evolution of doctrine and concepts for military air power from man's first flights through the organization of a separate Air Force in 1947. Prerequisite: Air Force Aerospace Studies 112 or consent of professor of aerospace studies; and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
- 122. The Development of U.S. Air Power, II.** Introduces the history of U.S. air power since 1947: the peaceful uses of air power; the doctrine, concepts and role of U.S. air power in conflicts since 1947 through the international significance of the U.S. Air Force today. Prerequisite: Air Force Aerospace Studies 121 or consent of professor of aerospace studies; and concurrent enrollment in Air Force Aerospace Studies 102. 1 hour.
- 231. Leadership and Management for the Professional, I.** Studies professionalism, leadership and management, including the meaning of professionalism and professional responsibilities; communication skills and their application in the Air Force; leadership theory, functions, and practices; management principles; problem solving; and management tools, practices, and controls. Prerequisite: Air Force Aerospace Studies 111, 112, 121, and 122, or consent of professor of aerospace studies; successful completion of the Air Force Officer Qualification Test and a military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
- 232. Leadership and Management for the Professional, II.** Continuation of Air Force Aerospace Studies 231. Studies military leadership and management fundamentals; uses the case study method to examine Air Force leadership/management situations. Prerequisite: Air Force Aerospace Studies 231, or consent of professor of aerospace studies; successful completion of Air Force Officer Qualification Test and military physical examination; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
- 241. National Security Forces in Contemporary American Society, I.** Studies the military as a profession; military ethics; civil-military interaction; laws of armed conflict; the actual use of governmental and military power, the evolution of National Security Policy in the U.S.; the actors from military to Congress and the President, in the making of foreign policy and security policy; development of strategy; DOD planning/budgeting; effective communication in the Air Force. Prerequisite: Air Force Aerospace Studies 232, or consent of professor of aerospace studies. 3 hours.
- 242. National Security Forces in Contemporary American Society, II.** In-depth study of military justice system; Air Force organization and policy decision-making system; Air Force operations organizations; acquisition systems; new officer orientation; effective communication techniques for Air Force officers. Prerequisite: Air Force Aerospace Studies 241 or consent of professor of aerospace studies. 3 hours.

ANATOMICAL SCIENCES

Head of Department: A. Horwitz

Department Office: 506 Morrill Hall, 505 South Goodwin, Urbana

- 211. Development of Form.** Introduction to the unifying concepts and evolutionary aspects of organismic development with emphasis on descriptive aspects of growth, differentiation, and organogenesis. Prerequisite: Biology 111 or equivalent. 3 hours. Students may not receive credit for both Anatomical Sciences 211 and Biology 108. (Counts for advanced hours in LAS.)
- 234. Functional Human Anatomy.** Studies the essentials of functional human anatomy with special reference to skeletal, muscular, splanchnic, circulatory, and nervous systems. Prerequisite: Biology 110 and 111, or Physiology 103; or consent of instructor. 5 hours. (Counts for advanced hours in LAS.)
- 290. Individual Topics.** Laboratory work and/or reading in fields selected in consultation with an appropriate faculty member. Prerequisite: 15 hours in Life Sciences courses including one course in Anatomical Sciences, and consent of instructor. 2 to 5 hours. May be repeated to a maximum of 6 hours.
- 307. Functional Neuroanatomy.** Examines the structural organization and function of the major systems of the nervous system. Prerequisite: Physiology 302, Biology 303, graduate standing, or consent of instructor. 4 hours or 1 unit.
- 312. Developmental Genetics.** Mechanisms underlying the genetic control of eukaryote development at the molecular and cellular levels. Prerequisite: Biology 151 or 210; Anatomical Sciences 211 or Biology 251; a course in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 315. Human Genetics.** Study of the techniques employed for genetic analysis of human traits; discussion of genetic mechanisms operative in human development, metabolism, and behavior; and genetics and human disease. Prerequisite: Biology 210; biochemistry and statistics recommended. 3 hours or $\frac{3}{4}$ unit.
- 319. Vertebrate Histology.** Microscopic anatomy of vertebrates with special reference to man; emphasis on developing an understanding of the structural organization of cells, tissues, and organs, together with functional relationships; and provides morphological approaches for comprehending and investigating biological problems at cellular and subcellular levels. Prerequisite: Biology 111 or 151, or equivalent and consent of instructor. 4 hours or 1 unit.
- 322. Anatomy of the Human Extremities.** Comprehensive study of the human extremities with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 323. Anatomy of the Human Thorax and Back.** Comprehensive study of the human thorax and back with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 324. Anatomy of the Human Abdomen and Pelvis.** Comprehensive study of the human abdomen and pelvis with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 325. Anatomy of the Human Neck and Head.** Comprehensive study of the human neck and head with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 350. Principles of Analytical Cytometry.** Theory and principles of flow cytometry analysis, cell sorting, and related methods of automated, high-speed analytical cytology. Laboratory applications in immunology, hematology, and cell cycle kinetics. Laboratory enrollment limited. Prerequisite: 4 semesters of biology and consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ to 1 unit. Students enrolled in laboratory receive 4 hours or 1 unit; all others receive 3 hours or $\frac{3}{4}$ unit.
- 412. Anatomical Sciences Seminar.** Invited speakers, faculty, and student presentations

and discussions on current research topics. Prerequisite: Graduate standing. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.

- 490. Individual Topics.** Individual topics in research and/or reading for graduate students, to be conducted under the supervision of faculty members in anatomical sciences; designed to allow students to become more familiar with specialized fields of study prior to committing themselves to a specific area for their graduate degree. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{4}$ to 4 units.

ANIMAL SCIENCES

Head of Department: W. R. Gomes

Department Office: 328 Mumford Hall, 1301 West Gregory, Urbana

- 100. Introduction to Animal Sciences.** A survey of beef and dairy cattle, companion animals, horses, poultry, sheep, and swine. Includes the importance of product technology and the basic principles of nutrition, genetics, physiology, and behavior as they apply to breeding, selection, feeding, and management. Lecture and lab. 4 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students. 4 hours.
- 109. Meat Purchasing and Preparation.** A general approach to meat utilization with emphasis on selecting, grading, cutting, and pricing meat for the home, restaurant, and food service industry; includes laboratory. When appropriate, field trips are taken to area commercial establishments; see Timetable for approximate cost. 2 hours. Offered in alternate years.
- 119. Meat Technology.** Student participation in the transformation of live animals through slaughter and carcass fabrication into food products for human consumption; includes laboratory. Purchase of personal equipment and a field trip are required; see Timetable for approximate cost. Prerequisite: Consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Special Problems.** Individual research in animal science. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor and head of department. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
- 201. Principles of Dairy Production.** Surveys the dairy industry; examines principles of breeding, selection, reproduction, feeding, milking and management dairy cattle. Prerequisite: Animal Sciences 100. 3 hours.
- 202. Domestic Animal Physiology.** A study of the basic physiology of domestic animals in relation to husbandry practices. Prerequisite: Animal Sciences 100 or one semester of animal biology, or equivalent. 4 hours.
- 203. Behavior of Domestic Animals.** Same as Ecology, Ethology, and Evolution 203. Introduction to concepts of animal behavior with emphasis on domestic animals; lecture and lab. Prerequisite: Biology 104 and Animal Sciences 100, or equivalent. 3 hours. Credit is not given for both Animal Sciences 203 and Ecology, Ethology, and Evolution 346.
- 204. Dairy Cattle Evaluation.** Evaluation of physical traits of dairy cattle in relation to economic value and genetic improvement; sire selection, mating systems, and breed families in relation to the organization of genetic improvement programs for dairy cattle; and lecture and laboratory. Prerequisite: Animal Sciences 100 or consent of instructor. 3 hours.
- 206. Light Horse Management.** The horse industry; anatomy, selection, breed types, gaits, nutrition and feeding, breeding and reproduction, health and disease, tack and equipment, training and showing, and housing of pleasure horses. Prerequisite: Sophomore standing. 3 hours.
- 207. Companion Animal Management.** Biological management of companion animals emphasizing the dog and cat as well as others such as the rabbit, the bird, and fish;

subject matter includes anatomy, breeds and breed types, selection, nutrition, reproduction, genetics, training, health and disease, equipment needs, and showing of small animals. 3 hours.

- 209. Meat Animal and Carcass Evaluation.** Principles and techniques of meat animal and carcass evaluation and their relationship to current practices in industry; includes demonstrations and student participation. Students planning to enroll in Animal Sciences 210 and 212 should take Animal Sciences 209 in their sophomore year. Prerequisite: Animal Sciences 100. 3 hours.
- 210. Meat Selection and Classification.** Characteristics associated with the value of carcasses and wholesale cuts from meat animals; grading and classification. Field trips to meat packing plants are required; see Timetable for approximate cost. Prerequisite: Animal Sciences 209. 2 hours.
- 211. Breeding Animal Evaluation.** The application of current scientific tools, methods, and performance programs available to livestock breeders for improving beef cattle, swine, sheep, and horses; emphasis on the changing nature of modern breeds of livestock as influenced by selection, economics, and consumer and market trends. Prerequisite: Sophomore standing; credit or concurrent registration in Animal Sciences 209 required for the food animal section only. 3 hours.
- 212. Advanced Livestock Evaluation.** Advanced instruction in evaluating meat animals for slaughter and selection of breeding animals; laboratory-discussion. Prerequisite: Animal Sciences 211 or consent of instructor. 3 hours.
- 220. Plant and Animal Genetics.** Same as Agronomy 220 and Horticulture 220. See Agronomy 220.
- 221. Animal Nutrition.** Principles of animal nutrition and their application to farm livestock and man. Credit is not given for both Animal Sciences 221 and 325. Prerequisite: Chemistry 102 or equivalent. 4 hours.
- 231. Comparative Physiology of Reproduction, Lactation, and Growth.** Introduces the growth, reproduction, and lactation of domestic animals with application to livestock production. Prerequisite: One course in animal biology, and Animal Sciences 100. 3 hours.
- 250. Animal Sciences Internship.** Supervised off-campus learning experience in a dairy-related enterprise. Prerequisite: Junior standing in animal sciences or agricultural sciences with animal sciences emphasis; good academic standing; consent of department head; Animal Sciences 100 and a 200-level course in animal sciences. 2 to 4 hours.
- 283. Beef Cattle and Swine Management.** Examines basic principles of beef cattle and swine management for students other than animal sciences majors. Prerequisite: Animal Sciences 100. 3 hours. Credit is not given for both Animal Sciences 283 and Animal Sciences 301 or 303.
- 290. Introduction to Metabolism in Domestic Animals.** Principles and regulation of metabolism in animals, emphasizing energy derivation and its relationship to domestic animal production. Prerequisite: Chemistry 102 and credit or concurrent in Animal Sciences 221. 3 hours.
- 298. Senior Seminar.** Reports and discussions of topics relevant to animal agriculture. Prerequisite: Senior standing in animal sciences. 1 hour.
- 299. Animal Management Field Studies.** Field studies of farms and service industries; discusses and demonstrates management practices on commercial farms. Trip normally taken during spring break; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Animal Sciences 100. 1 hour. May be repeated to a maximum of 4 hours.
- 300. Dairy Herd Management.** The technology of modern milk production practices; application of principles in nutrition, physiology, economics, health and hygiene, waste management, and facilities design for efficient dairy herd management systems. See Timetable for approximate cost of field trip. Appropriate for students in veterinary medicine interested in large animal practice. Prerequisite: Animal Sciences 221 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 301. Beef Production.** The principles of feeding and management of beef cattle; financial aspects of beef production; and diseases, parasites, and breeding difficulties of beef

- cattle. Lectures, demonstrations, and discussions. Prerequisite: Animal Sciences 221 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ or $\frac{3}{4}$ unit).
- 302. Sheep Science.** A study of the sheep as a biological entity and of factors which influence its responses; examination of the industry which utilizes the sheep's productive potential and of the role of sheep and the industry in animal agriculture and world welfare. Students may register for 3 hours credit without laboratory, or 4 hours or $\frac{1}{4}$ unit with laboratory. Prerequisite: Animal Sciences 221 or equivalent. 3 or 4 hours, or $\frac{3}{4}$ unit.
- 303. Pork Production.** Applies science and technology to the selection, breeding, feeding, housing and management of swine in a production enterprise; emphasizes use of research findings in decision making. Prerequisite: Animal Sciences 220, 221, and 307; and Animal Sciences 230 or 330. 3 hours or $\frac{1}{4}$ unit. Credit is not given for both Animal Sciences 283 and 303.
- 304. Poultry Management.** The application of science and technology in solving the breeding, feeding, housing, and various management problems encountered in commercial egg and poultry meat production. 3 hours credit without, or 4 hours or $\frac{3}{4}$ unit with individual study and conference. Prerequisite: Animal Sciences 221 or 325, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ unit.
- 305. Genetics and Animal Improvement.** Principles of heredity and their application to the problems of animal improvement. Prerequisite: Agronomy 220 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ unit).
- 307. Environmental Aspects of Animal Management.** Animal-environmental interactions (including thermal, air, microbic, photic, sound, and behavioral factors) as bases for prescribing practical environments for production of animals. Prerequisite: Animal Sciences 202. Courses in physiology, nutrition, microbiology, and genetics respectively are recommended. 3 hours or $\frac{3}{4}$ unit.
- 308. Physiology of Lactation.** Examines the anatomy, development, and physiology of the mammary gland; environmental, endocrine, and biochemical factors that affect milk yield and composition. Prerequisite: Animal Sciences 231. 4 hours or 1 unit.
- 309. Meat Science.** Fundamental biological principles that influence growth, composition, processing, preservation, and quality of meat and meat products. Prerequisite: Chemistry 102; Microbiology 100 and 101, or 200 and 201. Field trip required; see Timetable for approximate cost. 4 hours or 1 unit.
- 310. Immunogenetics and Immunophysiology.** Same as Biology 310. Blood groups, genetics of immunoglobulins, the T-cell receptor, immunoevolution, lymphocyte differentiation, the major histocompatibility complex, disease resistance, immune-endocrine interactions, and involvement of the immune system in fertility, nutrition, and aging. Prerequisite: Biology 210 and 307 and Animal Sciences 202. 4 hours or 1 unit.
- 316. Population Genetics.** Same as Biology 316. Mathematical theory of the genetics of populations: estimation of gene frequency, Hardy-Weinberg principle, systems of mating, relationship between relatives, and forces that change gene frequency; applications to man, animals, and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of population genetics. Prerequisite: Agronomy 220, or Biology 210 and college algebra, or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 317. Quantitative Genetics.** Same as Biology 317. The mathematical theory of the genetics of quantitative traits: properties of random-mating populations; estimation of repeatability, heritability, and genetic correlation; genetic results of selection; selection methods; correlated response; and selection for more than one trait. Application to animals and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of quantitative genetics. Prerequisite: Animal Sciences 316; and credit or concurrent registration in Animal Sciences 345, or Agronomy 440, or Biology 373; or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Nutrition and Digestive Physiology of Ruminants.** Physiology and microbiology of digestion in the ruminant, and biochemical pathways of utilization of the absorbed nutrients for productive purposes. Prerequisite: Animal Sciences 221. 3 hours or $\frac{3}{4}$ unit.
- 323. Advanced Swine Management.** Applies principles of swine management and pork production, including participation in the operation of a farrow-to-finish pork produc-

- tion unit. Prerequisite: Animal Sciences 303, senior standing, and consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 325. Principles of Animal Nutrition.** Principles of animal nutrition and their application to veterinary practice; designed primarily for students in veterinary medicine. Lecture and laboratory. Credit is not given for both Animal Sciences 325 and 221. Prerequisite: Biochemistry 350, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 331. Physiology of Reproduction in Domestic Animals.** Examines anatomy and physiology of reproduction and application to animal production; discusses topics that include endocrinology, ovarian and testicular function, estrous cycles, fertilization, implantation, pregnancy, and environmental and management factors influencing reproduction. Prerequisite: Animal Sciences 231 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. Livestock Marketing.** Same as Agricultural Economics 332. See Agricultural Economics 332.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
- 341. Human Evolution, II.** Same as Anthropology 341. See Anthropology 341.
- 345. Statistical Methods.** Same as Agricultural Engineering 345 and Forestry 345. Design and analysis of experiments: multiple regression, method of fitting constants, factorial experiments with unequal subclass numbers, analysis of covariance, experimental design; computer applications to agricultural experiments using statistical packages. Prerequisite: Agronomy 340, or Mathematics 263, or equivalent. 4 hours or 1 unit.
- 346. Animal Behavior.** Same as Anthropology and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
- 347. Animal Behavior Laboratory.** Same as Anthropology 347 and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
- 350. World Animal Agriculture.** Surveys the role of animal agriculture and associated activity in relation to resources and environment in representative geographic and cultural areas of the world; provides orientation for agriculturally oriented study tours such as Agriculture 299 and similar international experiences. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 385. Gastrointestinal and Methanogenic Microbial Fermentations.** Fundamental aspects of the ecology of microorganisms and their biochemical activities related to the anaerobic degradation of organic matter; emphasizes anaerobic ecosystems of the mammalian gastrointestinal tract and methanogenic organic residue fermentations (animal wastes, sediments). Prerequisite: Biochemistry 350 or Biochemistry 352 and 353, and Microbiology 100; or Microbiology 200 or 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 400. Animal Sciences Graduate Seminar.** Discussion of current literature in animal sciences. Required of all graduate majors in animal sciences. Sections offered in animal breeding and genetics, environmental management, meat science and muscle biology, behavior, nonruminant nutrition, reproductive physiology and ruminant nutrition. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 401. Animal Bionomics.** Discussion of the current literature and research techniques pertaining to adaptation of domestic animals to their environments. Prerequisite: Animal Sciences 307 or consent of instructor. $\frac{1}{2}$ unit.
- 402. The Microbiology and Physiology of Ruminant Nutrition.** Physiological and microbiological aspects of ruminant digestion and their influence on the metabolism of the extraruminal tissues; interpretation of nutritive requirements in terms of rumen microbial activities; and evaluation of research techniques. Prerequisite: Biochemistry 350 or equivalent. $\frac{3}{4}$ unit. Offered in alternate years.
- 403. Techniques in Animal Nutrition Research.** Discusses and applies methods of laboratory analysis and animal experimentation frequently used in nutrition research. Prerequisite: Courses in nutrition, physiology, and biochemistry and consent of instructor. $\frac{3}{4}$ unit.
- 404. Concepts in Nonruminant Nutrition.** A review of current literature in nonruminant nutrition. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 408. Physiology and Biochemistry of Milk Secretion.** Biological structure and function

of lactating mammary tissue, ruminant and nonruminant; emphasizes mammary secretory cell biochemical pathways, ultrastructure, and transport mechanisms pertaining to milk synthesis. Prerequisite: Animal Sciences 308 and Biochemistry 350, or equivalent; or consent of instructor. $3/4$ unit.

- 409. Muscle Biology.** Microstructure and chemical composition of muscle tissue; chemistry and biosynthesis of muscle and connective tissue proteins; and biochemical aspects of muscle contraction and rigor mortis. Prerequisite: Biochemistry 350 and 355. $1/2$ unit.
- 410. Current Topics in Nutritional Research.** Same as Food Science 410 and Nutritional Sciences 410. See Nutritional Sciences 410.
- 411. Chemistry of Nutritional Processes.** Same as Food Science 411 and Nutritional Sciences 411. See Nutritional Sciences 411.
- 412. Advanced Endocrinology.** Same as Physiology 412 and Veterinary Biosciences 412. See Physiology 412.
- 415. Linear and Non-Linear Statistical Models for Biologists.** Same as Forestry 415. Studies advanced statistical methods: survey sampling; fixed, random, and mixed linear models with unequal numbers; categorical data; non-linear deterministic and stochastic models; growth curves and time series. Examines applications to biology and agriculture. Prerequisite: Mathematics 130 and Animal Sciences 345, or equivalent. 1 unit. Offered in alternate years.
- 416. Statistical Genetics and Breeding Plans.** Selection theory, including maternal effects, multivariate selection, constrained and nonlinear cases, and retrospective indexes; estimation of genetic parameters from mixed and random models, including the unbalanced case; and applications to economic and laboratory species. Prerequisite: Animal Sciences 317, Biology 373, or Agronomy 440; and Mathematics 315 or consent of instructor. $3/4$ unit. Offered in odd-numbered years.
- 417. Advanced Quantitative Genetics.** Same as Biology 417. Advanced theory of the genetics of quantitative traits; lectures, student presentations, and discussions on selected readings; and application to biological systems. Prerequisite: Animal Sciences 317 or Agronomy 444; or consent of instructor. 1 unit. Offered in alternate years.
- 420. Comparative Protein and Energy Nutrition.** Physiological aspects of protein and amino acids, fats and fatty acids, and carbohydrates as applied to higher animals; includes classification, digestion, absorption, utilization, metabolism, and dietary deficiencies and excesses. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. $3/4$ unit.
- 421. Minerals and Vitamins in Metabolism.** Nutritional implications and metabolic roles of minerals and vitamins in animal metabolism. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. $3/4$ unit.
- 431. Advanced Reproductive Endocrinology.** Same as Physiology 431 and Veterinary Biosciences 431. The reproductive endocrinology of domestic and laboratory animals. Topics include neuroendocrinology; chemistry, metabolism, and action of hormones; regulation of gonadal function; endocrine changes during puberty, aging, pregnancy, and parturition; external factors affecting reproduction; infertility; and hormones and behavior. Prerequisite: Animal Sciences 331, Physiology 312, Biochemistry 350, or equivalent. $3/4$ unit.
- 432. Advanced Reproductive Physiology.** Comparative physiology of production of domestic and laboratory animals, including gametogenesis, fertilization, embryonic development, and factors influencing reproduction. Prerequisite: Animal Sciences 331 and Biochemistry 350; or equivalent. $3/4$ unit.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Physiology 433 and Veterinary Biosciences 433. Introduces laboratory methods involving surgery, collection and handling of blood and tissues for research, gamete and embryo recovery and manipulation, techniques of hormone measurements, and directed individual research problems. Prerequisite: Animal Sciences 431. $1/2$ unit.
- 441. Advanced Design and Analysis of Biological Experiments.** Same as Agronomy 441. See Agronomy 441.
- 444. Immunobiological Methods.** Same as Veterinary Pathobiology 444. See Veterinary Pathobiology 444.

- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Biophysics and Veterinary Biosciences 463. See Veterinary Biosciences 463.
- 481. Animal Biochemical Laboratory Techniques.** Theory and application of biochemical laboratory techniques to research in the animal-oriented biological sciences; isolation, characterization, and analysis of biological compounds including enzymes, metabolic intermediates, and cellular components; and determination of metabolic pathways and processes. Offered in even-numbered years. Prerequisite: Biochemistry 355 and consent of instructor. 1 unit.
- 493. Advanced Studies in Animal Sciences.** Directed and supervised study of selected topics in Animal Sciences. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 unit.
- 499. Thesis Research.** 0 to 4 units.

ANTHROPOLOGY

Head of Department: T. J. Riley

Department Office: 109 Davenport Hall, 607 South Mathews, Urbana

- 102. Introduction to Anthropology: The Origin of Man and Culture.** An introduction to and survey of human origins and early man, physical anthropology, race and racism, archaeology, and the beginning of human civilization. Recommended though not required to be taken with Anthropology 103 as a survey of the field of anthropology. Credit is not given for both the Anthropology 102-103 sequence and Anthropology 110. 4 hours.
- 103. Introduction to Cultural Anthropology.** Survey of cultural anthropology; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are manifest in contemporary traditional and Western societies; gives attention to distinctive theoretical anthropological approaches and to anthropological perspectives of culture change. 4 hours. Credit is not given for both Anthropology 103 and 104; in addition, credit is not given for both the Anthropology 102-103 sequence and 110.
- 104. Introduction to Cultural Anthropology (Honors).** Survey of cultural anthropology for honors students; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are seen among contemporary human societies with diverse ways of life; and also gives some attention to distinctive theoretical approaches and to problems of culture change. 3 hours. Credit is not given for both Anthropology 104 and 103; in addition, credit is not given for the Anthropology 102/104 sequence and 110.
- 105. Introductory World Archaeology.** Using archaeological data, traces our prehistoric heritage and the processes which led to the evolution of agriculture, settled villages, and civilization in many areas of the world; lectures range from *Australopithecus* to *Homo sapiens* and from Sumeria and Egypt to Mexico, Peru, and the United States. 3 hours.
- 107. Archaeology of Ancient Egypt.** Survey of Egyptian archaeology from prehistoric times through the New Kingdom; includes lectures on modern archaeological techniques developed in Egypt to presentations on the history, life, gods, and architecture of this ancient civilization. Anthropology 102 or 105 is recommended. 3 hours.
- 109. Sociobiology: The Evolution of Social Behavior.** Same as Ecology, Ethology, and Evolution 109. See Ecology, Ethology, and Evolution 109.
- 110. General Anthropology.** A concentrated alternative to the Anthropology 102-103 sequence, introducing fundamental concepts in human biology, prehistory, linguistics, and culture and society through a survey of the whole field of general anthropology. Designed to prepare prospective concentrators and other serious students for more advanced anthropology courses. Credit is not given for both Anthropology 110 and the Anthropology 102-103 sequence. 4 hours.
- 115. Other Peoples' Calendars.** Reviews developments in the study of time, emphasizing

archaeoastronomy, ethnoastronomy, and the comparative analysis of calendar systems and calendrical rituals. 3 hours.

132. **Culture, Aging, and Maturity.** Comparative study of human maturity, aging, and death as they are given form and meaning in different cultural and social settings. 3 hours.
141. **Race: The Concept in Anthropology.** Examines the biological concept of race as applied and misapplied to *Homo sapiens* by anthropologists and others from the 18th century to the present and of the origin, nature, and significance of so-called racial variation. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Ecology, Ethology, and Evolution and Human Development and Family Ecology 143. Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. 3 hours. Credit is not given for both Anthropology 143 and 144.
144. **Biological Bases for Human Behavior (Honors).** Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. Special for honors students—emphasizes a “hands on” laboratory-demonstration approach. 3 hours. Credit is not given for both Anthropology 144 and 143.
157. **The Archaeology of Illinois.** Traces the prehistory of Illinois from the first entry of people into the region more than 13,000 years ago until the 17th century and the beginning of historical records; examines subsequent cultural changes up to the 19th century and statehood from an archaeological and ethnohistorical perspective. 3 hours.
161. **Black Folk Culture.** Same as Afro-American Studies 161. A topical introduction to Pan-Africanist thought and ideology as expressed in the folklore, literature, music, and sociocultural movements of Afro-Americans in the New World. 4 hours. May be repeated to a maximum of 8 hours.
165. **Native North Americans.** Surveys Native North American peoples and cultures from the time of European contact to the present with emphasis on contemporary issues and their historical antecedents. 4 hours.
168. **Indian Civilization and Society.** Same as History 168. An introductory survey course on an interdisciplinary basis dealing with the evolution of Indian religion, politics, culture, and social organization. 4 hours.
169. **South Asia in the Modern Period.** Same as History 169. See History 169.
179. **Culture and Ecology in Human Health.** An overview of health and illness in human societies emphasizing interactions among stress, adaptability, and culture. Case studies of differing cultural and ecological settings, past and present, and of differing health care systems are related to alternative theories of health and illness, including contemporary cosmopolitan medicine. 3 hours.
182. **Peoples and Cultures of South America.** South America considered as a theater of conflict and cultural experimentation among Native American, African, and Iberian peoples; their survival and transformation as reported in selected ethnographies and eyewitness sources; and some modern theories and controversies about their experience. 4 hours.
183. **Archaeology and the Public.** An examination of the roles of archaeology in society; topics include public service archaeology, “colonial” and “national” archaeologies, the role of the archaeologist in Euro-American conceptions of the American Indian, and the archaeologist as creator and dispeller of myths. 3 hours.
186. **Southeast Asian Civilizations.** Same as Asian Studies 186 and History 172. Overviews the cultural and institutional history of the Indianized states and Vietnam, with attention to dominant commercial, political, religious, artistic, and social traditions of Southeast Asia. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Comparative Family Organization.** Same as Human Development and Family Ecology 210. See Human Development and Family Ecology 210.

- 220. Introduction to Archaeology.** An introduction to the problems of studying past cultures: special attention given to the ranges of techniques available and the adequacy of various methodologies as bases for sound inference about the structure of extinct cultures. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours.
- 222. Introduction to Modern Africa.** Same as African Studies, Political Science, and Sociology 222. See African Studies 222.
- 230. Introduction to Social Anthropology and Ethnology.** An introduction to the anthropological study of contemporary human societies: emphasis on the comparative study of social organization, interpersonal relations, cultural ecology, and processes of sociocultural change, but also includes some consideration of the method and theory of ethnological field research. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.
- 240. Introduction to Biological Anthropology.** The past and present evolution of man and his populational and individual biological variation: topics include genetic principles relevant to human evolution, primate phylogeny and behavior, fossil evidence for human evolution, and the origin and significance of biological diversity in modern man. Prerequisite: Anthropology 102, 110, or 143; or an introductory life sciences course; or consent of instructor. 3 hours.
- 243. Natural History and Social Behavior of the Great Apes.** Same as Ecology, Ethology, and Evolution 243. Examines the social organization, mating patterns, and group structure of free-ranging chimpanzees, gorillas, and orangutans. Presents historical perspective focusing on misconceptions which have colored our understanding of ape social behavior: addresses questions concerned with learning potential, food sharing, social cooperation, aggressive behavior, self-awareness, and the appropriateness of the apes as models for understanding human behavior. Prerequisite: Anthropology 102, 143, or an equivalent course in animal behavior; or consent of instructor. 3 hours.
- 244. Anthropology of Play.** Same as Kinesiology 244. See Kinesiology 244.
- 246. Vertebrate Social Organization.** Same as Ecology, Ethology, and Evolution, Psychology, and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 250. Introduction to Primitive Technology.** Introduction to the technology of nonindustrial societies: relationships of technology to society; and influence of social and cultural factors on technological innovation. Uses ethnographic, historical, and archaeological data. 3 hours.
- 258. People of the Ice Age.** Explores a vast period of human prehistory--2 million to 10,000 years ago--before the first cities arose and before people domesticated plants and animals in the Old World; uses archaeological and paleoanthropological data to understand past life ways as well as reasons for change through time in human adaptation. Prerequisite: Anthropology 102. 3 hours.
- 259. Spanish-Speaking Peoples in the United States.** Introduction to the Spanish-speaking population of the United States, including demography, history, economics, and aspects of the sociocultural milieu; emphasis on Mexican-Americans and Puerto Ricans, although other Spanish-speaking groups are also considered. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours.
- 260. Peoples of the World: Introduction to Ethnography.** The study and criticism of ethnographic descriptions of exotic ways of life, both as scientific reporting and as a literary art form. Readings include examples from several major culture areas: Africa, the Americas, the Middle East, Oceania, southern and eastern Asia, and Western civilization. Prerequisite: Anthropology 102, 103, or 110, or consent of instructor. 3 hours.
- 261. Afro-American Societies and Cultures.** Same as Afro-American Studies 261. Designed to examine the breadth of the black Americas in South America, Central America, the Caribbean (including Spanish, Gallic, Dutch, and English subareas), and Canada, with specific comparisons to rural and urban United States; the African slave trade with reference to black-white relations in the trade; the development of Creole cultures in West Africa and in Spain and subsequent cultural elaboration in the New World; conditions of slavery, slave revolts, migrations of black people in the New

- World; and examination of selected ethnographic material. Prerequisite: Anthropology 102, 103, or 110, or consent of instructor. 4 hours.
- 262. Cultural Images of Women.** Same as Women's Studies 262. Perceptions of women, their perceptions of themselves, and their varying roles and statuses in several contemporary societies in diverse countries; supervised ethnographic observation of women's behavior. 3 hours.
- 270. Introduction to Linguistic Anthropology.** Introduction to linguistic anthropology as a major subdiscipline within the field of anthropology; problems of elicitation and analysis of language as faced by anthropologists; and the role of language in the other major subdisciplines: biological, archaeological, and social anthropology. Prerequisite: Anthropology 103 or 110 or Linguistics 200, or consent of instructor. 3 hours.
- 278. Hunter-Gatherers Today.** Introduces students to contemporary hunter-gatherers with a particular emphasis on critical evaluation of ethnographic, ethnohistoric, and ethnoarchaeological sources; examines economic, social, and political aspects of this lifestyle in different environments, and emphasizes questions of cultural change. Prerequisite: Anthropology 103 or 110. 3 hours.
- 280. Personal Anthropology.** Anthropological approaches and methods related to the student's everyday life situation; explanation and use of ritual, ideology, myth, communication, media images, rites of passage, structure, symbols, and other concepts so that the student may develop a more critical understanding of contemporary American society and his or her position in it. 3 hours.
- 289. Comparative Muslim Societies.** Same as History 289 and Religious Studies 289. See Religious Studies 289.
- 290. Individual Study.** Supervised reading and research on anthropological topics chosen by the student with staff approval. Especially (but not exclusively) for students who are preparing for a summer field-work project, or who have some justifiable reason for doing independent study, but who do not qualify for the honors (departmental distinction) courses. Prerequisite: Junior or senior standing; 12 hours in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 291 or 293.
- 291. Honors Individual Study.** Individual study and research projects for those students who are candidates for departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Preparation and completion of a senior honors thesis, research paper, or equivalent project for those students who are candidates for high or highest departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Topics are given on a one-time-only, experimental basis. Faculty offer special topics in their areas of expertise that provide an opportunity for undergraduates to be exposed to some of the most current developments in faculty research. 1 to 3 hours.
- 297. Honors Seminar.** Each seminar considers a topic or issue of current interest in anthropology. Prerequisite: Anthropology 102 and 103 or Anthropology 110, two additional anthropology courses, a grade-point average of 4.25 in anthropology courses, and consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 300. Introduction to Linguistic Structure.** Same as Linguistics 300. See Linguistics 300.
- 307. Introduction to Mathematical Linguistics.** Same as Linguistics 307. See Linguistics 307.
- 308. Comparative Primate Anatomy.** Same as Veterinary Biosciences 307. See Veterinary Biosciences 307.
- 315. Area Studies in Ethnomusicology.** Same as Music 317. See Music 317.
- 316. Anthropology of Music.** Same as Music 316. See Music 316.

- 317. Anthropological Study of Verbal Art.** Analysis of several genres of verbal art (for example, riddles, stories, proverbs, nonsense, and oral literatures) from the perspective of contemporary theory, emphasizing cross-cultural data. Prerequisite: Introductory courses in literary criticism, general anthropology, or analysis of literary texts; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 318. Anthropological Research Design.** Lecture and laboratory on the design and implementation of anthropological research; emphasizes different approaches to framing questions and designing research, sampling, questionnaire design, research ethics, data collection techniques, coding and general problems of quantification. Prerequisite: Anthropology 220, 230, 240, or 260 and a course in statistics; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 319. War and Peace in Cross-Cultural Perspective.** Examines theories and case studies of the causes, functions, meanings, and pursuit of war and peace, conflict and cooperation, in diverse cultures; gives attention to the roles of culture contact, ethnicity, imperialism, colonization, and emerging nationalism in promoting conflict and cooperation. Prerequisite: Anthropology 103 and 110. 3 hours or $\frac{3}{4}$ unit.
- 320. Political Anthropology.** The analysis of political behavior and the comparison of political systems from an anthropological perspective; emphasis on local-level political processes and the evolution of governmental forms. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 321. Social Organization and Structure.** An introduction to anthropological concepts of social organization and structure; considers kinship theory, descent and alliance systems, social stratification, nonkin association, social networks, group identification and boundaries, structural-functional interpretations of society, and the meaning of social or cultural structure. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Economic Anthropology.** Covers the emergence of economic anthropology as a sub-discipline; considers various definitions of economics with their implications for the study of human society; emphasizes the relationship between social organization and economic life from the perspectives of classical studies in anthropology and their contemporary interpretations. Prerequisite: Anthropology 230. 3 hours or 1 unit.
- 324. Late Cenozoic Geology.** Same as Geology 324. See Geology 324.
- 328. North American Archaeology.** Methods, techniques, and results of archaeology in North America; focuses on divergent approaches to the regional archaeology of North America; and surveys and synthesizes the archaeology of the subcontinent. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 329. The Philosophy of Social Science.** Same as Philosophy 375 and Sociology 325. See Philosophy 375.
- 331. Aboriginal North America.** Deals with three major topics: the nature and structure of aboriginal North America as a cultural province and its ecological base; distinctive and common features of American Indian cultures; and responses to the stresses of white contact. Selected type cultures and their adaptations to varying ecological situations are examined in detail. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 332. Native Peoples of Lowland South America.** Develops cross-cultural understanding of contemporary native peoples in the moist tropics of South America and provides relevant historical, cultural, and ecological information necessary to comprehend their enduring lifeways and adaptive versatility. Ecology, social organization, cosmology, power, ritual, and cultural transformation in selected areas provides case studies leading to novel interpretations of the "state of the art" of South American ethnology. Prerequisite: Anthropology 103 or 182; or consent of instructor. 3 hours or 1 unit.
- 333. South American Indians of the Andean Region.** A survey of Andean cultures at the time of the Spanish conquest, of their subsequent history, and of modern Indian culture in the Andean countries. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 337. Behavior Genetics Laboratory.** Same as Psychology 347 and Ecology, Ethology, and Evolution 352. See Psychology 347.

- 338. Exploring and Analyzing Data.** Same as Statistics 300. See Statistics 300.
- 339. Anthropological Theory in Contemporary Perspective.** An exploration of current theory in social and cultural anthropology, with emphasis on examining theories in the light of contemporary ideas about theoretical adequacy and of the historical development of anthropological thought; designed especially for anthropology concentrators and anthropology graduate students. Prerequisite: Anthropology 230 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 340. Human Evolution, I.** Principles of evolution and a survey of the evolution of man and his progenitors from the early primates through the Pleistocene epoch; emphasis on evolutionary theory as applied to man and interpretation of the fossil record. Prerequisite: Anthropology 240 or an introductory zoology course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Human Evolution, II.** Same as Animal Science 341. The principles of human genetics; anthropological aspects of race and race formation; and hereditary and environmental factors in the biological variation of modern man. Prerequisite: Anthropology 240 or an introductory zoology course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 342. Behavior-Genetic Analysis.** Same as Ecology, Ethology, and Evolution 350 and Psychology 342. See Psychology 342.
- 343. Introduction to Primate Morphology and Behavior.** Same as Ecology, Ethology, and Evolution 344. Survey of primate social behavior and the classification, morphology, and distribution of living and extinct species; emphasis on interrelationships with aspects of anthropological study. Prerequisite: Anthropology 240 or Ecology, Ethology, and Evolution 246; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Field and Laboratory Techniques in Biological Anthropology.** Supervised participation in biological anthropology research projects; techniques, methods, and procedures discussed and practiced under actual field or laboratory working conditions. Normally taken concurrently with Anthropology 345. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 345. Analysis of Research Data in Biological Anthropology.** Analysis, interpretation, evaluation, and organization of field and laboratory data in biological anthropology; preparation of written reports on research. May be taken concurrently with Anthropology 344 or subsequently. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 346. Animal Behavior.** Same as Animal Science and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
- 347. Animal Behavior Laboratory.** Same as Animal Science and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
- 348. The Prehistory of Africa.** The study of cultural development in Africa from the appearance of hominids to the time of European domination. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 349. South American Culture History, I.** An examination of the factors influencing the initial peopling of South America; the spread and diversification of hunting and gathering economies; and the development and spread of the tropical forest cultural pattern. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 350. South American Culture History, II.** An examination of the factors leading to the rise of civilization in the central Andes, including the evolution of agricultural systems, the elaboration of technology, and the emergence of extensive and complex political units. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 351. Archaeological Surveying: Techniques and Applications.** Familiarization with methods used in the location and recording of archaeological sites, including techniques of mapping especially adapted to the needs of archaeology; attention given to means of presenting results and interpreting data derived from this work; and work both in the field and in the laboratory. Prerequisite: Anthropology 102 or 110; or consent of instructor. 3 hours or 1 unit.
- 352. Theory and Methods of Lithic Analysis.** Lecture and laboratory on the principles

and techniques of stone and bone artifact manufacture, identification, classification, metrical analysis, interpretation, and integration with other classes of archaeological evidence. Emphasis on the use of lithics to test human behavioral models. Prerequisite: Anthropology 220. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 354. Field Techniques in Archaeology.** Participation in archaeological excavations; techniques, methods, and procedures discussed and practiced under actual working conditions. Normally taken concurrently with Anthropology 355. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 355. Laboratory Techniques in Archaeology.** Laboratory work including processing, classifying, dating, interpretation, evaluation, and preparation of written reports of archaeological research. May be taken concurrently with Anthropology 354 or subsequently. Prerequisite: Anthropology 102 or 110, or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
- 356. Human Osteology.** Identification of human skeletal material and basic techniques of measurement; methods of determining age, sex, race, and stature from the human skeleton; and analysis of skeletal populations. Prerequisite: Anthropology 102 or 110; or a course in anatomy, physiology, or introductory zoology and consent of instructor. 3 hours or 1 unit.
- 357. Midwestern Archaeology.** A detailed study of the midwestern archaeological area covering the broad cultures with regional variations considered chronologically and stressing their interrelationships. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 360. Peoples and Cultures of Oceania.** Same as Asian Studies 360. A survey of the Pacific Islands; regional geography, human ecology, culture history, and ethnography of Melanesia, New Guinea, Polynesia, New Zealand, Micronesia, and Australia; and some consideration of Pacific ethnohistory and the role of Oceania in the modern world. Prerequisite: Anthropology 102 and 103, or 110; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 361. Peoples and Cultures of Mexico and Guatemala.** A survey of the peoples and cultures of Middle America with special emphasis upon Mexico and Guatemala; begins by placing Middle America geographically, historically, and culturally within the broader Latin American scene; countries first viewed as a whole and then selected ethnographic studies of specific communities considered for comparative purposes. The Caribbean is not included in this survey. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 363. Religion in Anthropological Perspective.** Same as Religious Studies 363. An introduction to the study of magical and religious beliefs and practices in tribal and peasant societies; considers theories of the nature, origin, and function of magic and religion; myth, ritual, and symbolism; the relationship between great folk religious traditions; and socioreligious movements. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 364. Field Work in Cultural Anthropology.** Supervised participation in field research in ethnography, ethnology, linguistics, or social anthropology; techniques, methods, and procedures discussed and practiced under actual working conditions. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. Normally taken concurrently with Anthropology 365. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 365. Analysis of Field Data in Cultural Anthropology.** Analysis, interpretation, evaluation, and organization of field data in cultural anthropology; preparation of written reports on research in ethnography, ethnology, linguistics, or social anthropology. May be taken concurrently with Anthropology 364 or subsequently. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
- 367. Cultures of Africa.** Culture and social organization in traditional African societies with emphasis on the politics, kinship, and religion of a small sample of societies illustrating the main cultural variations found in sub-Saharan Africa; some discussion

of ecological factors and ethnic group relations in precolonial times. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 368. Peoples and Cultures of India.** Same as Asian Studies 368. A description and analysis of the social, economic, and religious life of the tribal and peasant peoples of contemporary India considered against the background of Indian geography, population, language distribution, the caste system, and highlights of Indian cultural development. Prerequisite: Anthropology 168 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 369. Asian Systems of Social Stratification.** Same as Asian Studies 369. Explores the characteristics of traditional processes of social stratification in the principal regions of high civilization in Asia: South Asia (India, Sri Lanka, Nepal), Southeast Asia (Burma, Thailand, Vietnam, Indonesia), and East Asia (China, Japan, Korea). Prerequisite: Anthropology 168 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Language, Culture, and Society.** Same as Communications 370 and Linguistics 370. An examination of the social and cultural functions of language with particular emphasis on the application of linguistic methods and findings to selected problems in the social sciences. Prerequisite: Anthropology 230, or one course in communications or linguistics, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 372. The Anthropological Study of Art.** A review of the anthropological approach to art with emphasis on structural analysis and the relationship of the artist to his culture; consideration of problems of stylistic development within the framework of cultural dynamics and a survey of the major art styles outside of the Western tradition and the Orient. Prerequisite: Three hours of anthropology or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 373. Theory and Method in the Cross-Cultural Study of Individual Behavior.** Same as Psychology 373. See Psychology 373.
- 375. The Prehistory and Archaeology of Mexico.** Discusses the ancient cultures and civilizations of Mexico as reconstructed from archaeological data; begins with the earliest evidence of human occupation and traces the development of agricultural societies and ultimately large urban civilizations to c. 1300 A. D. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
- 376. The Aztec and Maya Civilizations.** Discusses two ancient civilizations, the Aztecs of Mexico and the Maya of Guatemala; uses archaeological data and documentary sources to reconstruct political and social organization, religion, writing systems, calendars, agricultural techniques, and aspects of the daily life of the people. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
- 378. Emergence of Old World Civilizations.** Uses archaeological data to trace the transition from egalitarian hunter-gatherer societies to food producing hierarchical states in the Old World between 14,000 and 3,000 years ago; focuses on economic, social, and political change in Mesopotamia, Egypt, the Indus Valley, and China that gave rise to ancient empires. Prerequisite: Anthropology 102 or 105; Anthropology 220 or 258. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 379. Medical Anthropology: The Culture of Health and Illness.** An introduction to concepts and social aspects of health, illness, and curing in different cultures with consideration also of the interaction between folk and modern medicine in developing nations and the delivery of health care as an international social problem. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 380. Symbolic and Interpretive Anthropology.** Focus on recent developments in symbolic and interpretive anthropology; topics covered include writing the ethnographic text, subject-object relations, critical reflection on fieldwork, construction of the self, dialogism, practice, performance, narrative, power, and representation. Prerequisite: Anthropology 321 and 363, or similar courses in anthropology, the social sciences, or the humanities, and consent of instructor. 4 hours or 1 unit.
- 382. Siberian Culture History and Ethnology.** Same as Geography 382. An ecological analysis of historic and present-day Siberian cultures, with comparisons to arctic America. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Self and Society in Japan.** Same as Asian Studies 383. The lifecourse and the growth

of the self in modern Japanese civilization. Prerequisite: Anthropology 230 or a course in East Asian history, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

384. Modern Chinese Society and Culture. Same as Asian Studies 384. See Asian Studies 384.

385. Anthropology of Education. Same as Educational Psychology 385 and Educational Policy Studies 385. See Educational Policy Studies 385.

386. Peoples and Cultures of Mainland Southeast Asia. Same as Asian Studies 386. The culture, cultural history, and social systems of mainland Southeast Asia: Burma, Thailand, Cambodia, Vietnam, Laos, Assam Hills, upland southwestern China, and Malaya; emphasis on the interaction of complementary ethnic types in the context of local ecology and the Hindu-Buddhist systems of religion and politics of the lowland states. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

387. Peoples and Cultures of Insular Southeast Asia. Same as Asian Studies 387. A survey of the cultures and social systems of Indonesia, Malaysia, and the Philippines in the context of the region's history and geographical, economic, political, and religious situation. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

388. Prehistory of Oceania. Same as Asian Studies 388. Archaeology and physical anthropology of the Pacific Islands; early hominids in Australia and New Guinea; evolution and genetics of Oceania populations; origins of Pacific Islanders; traditional voyaging; and settlement and culture history of aboriginal Australia, Melanesia, Micronesia, and Polynesia. Prerequisite: Anthropology 220, 240, or 360. 3 hours, or $\frac{3}{4}$ or 1 unit.

389. Hominid Evolution in East Asia. Examines human evolution and prehistory in the Far East (China and Southeast Asia); considers paleontological, paleocultural, and geologic data in order to reconstruct the anatomical and paleocultural adaptation of Pleistocene hominids in Asia. Prerequisite: Anthropology 240. 3 hours or $\frac{3}{4}$ unit.

394. Human Paleopathology. Comprehensive study of the evidence of human disease in antiquity, emphasizing diagnosis of skeletal pathologies, and the anthropological interpretation of historic and prehistoric disease patterns. Prerequisite: Anthropology 356, a course in human anatomy, or equivalent. 3 hours or $\frac{3}{4}$ or 1 unit.

398. Combined Graduate and Undergraduate Seminar. A research seminar on specialized topics in anthropology. Prerequisite: Consent of instructor. 4 hours or 1 unit. May be repeated.

400. Introduction to General Linguistics. Same as English as a Second Language 402 and Linguistics 400. See Linguistics 400.

429. The Evolution of Agricultural Economies. Same as Agronomy 429 and Geography 429. The problems concerning the development of the several basic food crop economies studied from the point of view of geographical environment, the available archaeological and ethnographic evidence, and agronomy and plant genetics; regional emphasis varies from year to year. Prerequisite: Consent of instructor. 1 unit.

440. Problems in Physical Anthropology. A seminar designed to involve students in the theoretical and methodological approaches to problem areas in physical anthropology. May be repeated for additional credit. Prerequisite: Anthropology 340, 341, or 343; consent of instructor. 1 unit.

443. Problems in Primate Behavior and Ecology. Same as Ecology, Ethology, and Evolution 443. Group discussions and individual presentations of research reports and problems in fields of primate ethology, ecology, evolution, and related subjects; topics vary each semester. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated.

450. Seminar in Anthropology. Analysis of selected topics of special interest in anthropology. $\frac{1}{2}$ or 1 unit. May be repeated for up to 2 units per semester.

451. Social Structure. Intended to deepen training of advanced students in the descriptive techniques and methods of structural and functional analysis currently employed by social anthropologists. Prerequisite: Consent of instructor. 1 unit.

452. Research Problems in Archaeology. Seminar oriented to current research problems in archaeology, designed to acquaint students with theoretical and methodological

aspects of particular problems and to develop a critical perspective of archaeological research. May be repeated. Prerequisite: Consent of instructor. 1 unit.

- 453. The Formal Analysis of Kinship Systems.** A survey of a variety of the world's systems of kinship, marriage, and family organization; concentration on the distinctive properties of kinship systems as a species of social structure, on the formal apparatus for describing and understanding them and their functions, and on the theory of kinship that arises from the use of such formal apparatus. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.
- 454. Ritual and Power in Social Life.** A systematic examination of the relationship between power structure and ritual by reference to anthropological theory and through consideration of select ethnographies; social stratification, social networks, cultural symbolism, and ethnicity. Prerequisite: Consent of instructor. 1 unit.
- 467. Kinship and Social Organization in Africa.** Explores a variety of systems of kinship and social organization in sub-Saharan Africa; covers classic statements on African kinship, which provide a foundation of modern kinship theory, as well as contemporary critiques. Then explores the nature of political authority and stratification systems; presents topical and theoretical issues as well as selected case studies. Prerequisite: Graduate standing. 1 unit.
- 489. Readings in Anthropology.** Individual guidance in intensive readings in the literature of one or more subdivisions of the field of anthropology, selected in consultation with the adviser in accordance with the needs and interest of the student. Prerequisite: One semester of graduate work in anthropology; consent of adviser. $\frac{1}{2}$ or 1 unit.
- 490. Individual Topics in Anthropology.** Supervised individual investigation or study of a topic not covered by regular courses. The topic selected by the student and the proposed plan of study are approved by the adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. 1 to 4 units.
- 499. Thesis Research.** Preparation of theses. 0 to 4 units.

ARCHITECTURE, SCHOOL OF

Director: R. A. Forrester

School Office: 106 Architecture Building, 608 East Lorado Taft, Champaign

- 171. Architectural Design, I.** Formal fundamentals of architectural design; formal vocabulary, principles, and concepts of architectural design; basic design methods; skills development in sketching, drafting, rendering, layout, diagramming, modeling, and lettering; and creative problem solving in two- and three-dimensional exercises. Prerequisite: General Professional Courses in Art and Design 187 or equivalent and sophomore standing. 3 hours.
- 172. Architectural Design, II.** Functional fundamentals of architectural design; functional vocabulary, principles, and concepts of architectural design; basic design and programming methods; skills development in drafting, modeling, layout, rendering, and sketching; and creative problem solving in two- and three-dimensional exercises. Prerequisite: Architecture 171; General Professional Courses in Art and Design 188 or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Senior Honors in Architecture.** For candidates for honors in architecture. Independent guided study and research in a selected area of architecture. Prerequisite: Senior standing in architecture, a University grade-point average of 4.0 or, in special cases, consent of Director of School. 3 hours (summer session, 1 to 3 hours). May be repeated to a total of 6 hours with consent of Director of School.
- 210. Introduction to the History of Architecture.** Visual and cultural analysis of selected buildings, urban spaces, and cities, from ancient Greece to modern times; emphasizes the architectural traditions of Western Civilization, especially as they affect the built environment of America and the Middle West. Prerequisite: Sophomore standing or consent of instructor. 3 hours.

- 220. Introduction to Architectural Theory.** Overview of the purpose and means of architecture in relation to other human endeavors and the goals of society; professional alternatives; introduction to research, cognitive processes in design, information handling, communication, and evaluation. Prerequisite: Consent of instructor. 3 hours.
- 231. Anatomy of Buildings.** First course in Administration, Communication, and Technology; introduces building science and the profession of architecture; emphasizes the anatomy of buildings, including function, physical makeup, and working principles of various building systems, components and materials, their inter-relationships and design implications. Prerequisite: Sophomore standing or consent of instructor. 4 hours.
- 232. Construction of Buildings.** Second course in Administration, Communication, and Technology; emphasizing the processes of project execution from the initiation of design to completion of construction; includes in-depth study of construction of the building and its systems, materials and methods, and their implications for decision making. Prerequisite: Architecture 231 or consent of instructor. 4 hours.
- 241. Environmental Technology, I.** The integration of environmental control systems in architecture. Includes factors affecting comfort, health, safety, and energy conservation; the fundamentals of atmospheric conditioning of buildings and the equipment and controls systems for varying functions and sizes of buildings; and water supply, waste sewage, and storm-water disposal systems for buildings. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
- 242. Environmental Technology, II.** The integration of environmental control systems in architecture. Includes the nature of light illumination and vision, quality and quantity, and sources; integration of illumination and architecture; power distribution systems and equipment; and the nature of sound and architectural acoustics, room acoustics, and sound isolation. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
- 251. Statics and Dynamics.** Introduction to basic statics and dynamics with emphasis on architectural applications. Prerequisite: One year of calculus and analytical geometry. 4 hours.
- 252. Strength of Materials and Design Applications.** Introduction to strength of materials with emphasis on architectural applications. Prerequisite: Architecture 251. 4 hours.
- 271. Architectural Design, III.** The building in its environmental setting; introductory building design and site planning theory; principles of energy efficient building design; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 172; General Professional Courses in Art and Design 189 or equivalent. 3 hours.
- 272. Architectural Design, IV.** Buildings in the community setting; introductory urban design and site planning theory; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 271. 3 hours.
- 299. Study in Versailles, France.** Study in the University of Illinois Architectural Program at Versailles, France. Prerequisite: Concurrent registration in the full-time program at Versailles through the Chicago or Urbana-Champaign Campus. 0 hours.
- 300. Independent Studies in Urban Design.** The individual study of selected topics involving the history, design, and function of significant European cities. Prerequisite: One year of history of architecture or history of art; consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 301. Independent Study.** Independent guided study and investigation in a selected area of architecture. Prerequisite: Junior standing in architecture, written proposal approved by sponsoring faculty member and approval of Director of School. 0 to 4 hours, or 0 to 1 unit.
- 310. Ancient Architecture.** Architecture and urban design in ancient Egypt, Greece, and Rome. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 311. Early Christian and Byzantine Architecture.** Architecture and urban design of the early Christian era, the Byzantine Empire, southeastern European lands under Byzantine cultural influence, and medieval Russia; from circa 300 to circa 1500. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 312. Medieval Architecture.** The development of Romanesque and Gothic architecture and urban design. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 313. Renaissance Architecture.** Developments in architecture, urban design, and garden art in Italy and northern Europe in the fifteenth through the sixteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Baroque and Rococo Architecture.** Developments in architecture, urban design, and garden art in Italy, France, Germany, and England in the seventeenth and eighteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 315. Modern European Architecture.** The evolution of continental and British architecture and urban planning from 1750 to the present; includes some allusion to Japanese and American architecture of the same period. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
- 316. Modern American Architecture.** The development of American architecture and urban planning from the seventeenth century to the present. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Seminar on Great Modern Architects and Their Work.** Seminar on selected topics addressing the philosophy, theory, personality, and work of famous architects since the mid-eighteenth century. Prerequisite: Architecture 210; and Architecture 315 or 316, or equivalent; and consent of instructor. 3 hours or 1 unit.
- 318. History of the Urban Environment.** Examines the evolution of town planning and urban design in Western civilization from prehistory to the present; studies cultural and technical advancements affecting the form of the urban environment. 3 hours or $\frac{3}{4}$ unit.
- 319. Historic Building Preservation.** Introduces historic preservation: legal, financial, and administrative assistance, graphic examination of restored buildings and sites, and application of conservation technology. 3 hours or $\frac{3}{4}$ unit.
- 323. Social and Behavioral Factors for Design.** A research-oriented introduction to existing social and behavioral knowledge, methods, and tools for relating man to his physical and social environment, with implications for theories and a philosophy of architectural design. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 330. Architectural Practice.** The role of the architect, professional ethics, and the conduct of professional practice; legal aspects of architectural practice and building construction; business management, operational procedures, financial planning, and cost control; and the administration of construction contracts and professional construction management. Prerequisite: Professional degree candidacy or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 331. Design Development and Construction Documents.** Network diagram scheduling of professional services; preliminary project investigations of site conditions and facilities, building law, and economic considerations; the integration of materials, structure, mechanical equipment, illumination, and acoustics; design development outline specifications and drawings; the production planning, scheduling, and budgeting for working drawings and specifications; and preparation of portions of these documents. Prerequisite: Architecture 241, 242, and 352. 3 hours or $\frac{3}{4}$ unit.
- 335. Computer Applications in Architecture, I.** Introduces the application of computer-aided design to architecture: programming methods using FORTRAN, database concepts using the Relational Information Management (RIM) system, and basic computer graphics concepts using the Graphic Compatibility System (GCS) graphic package. Prerequisite: Computer Science 102 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.
- 336. Computer Applications in Architecture, II.** Applies advanced computer-aided design to architecture: advanced programming methods using FORTRAN, advanced database concepts using the Relational Information Management (RIM) system, and advanced computer graphics concepts using the Graphic Compatibility System (GCS)

- graphic package. Prerequisite: Architecture 335 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.
- 342. Energy Management in Architecture.** Energy management; energy alternatives; and the influence of energy regulation on the architectural design, operation, maintenance, use, and re-use of buildings. Prerequisite: Architecture 241 and 242. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. Students seeking 4 hours or 1 unit credit must participate in research teams pursuing prearranged topics related to the course of study.
- 351. Theory and Design of Metal Structures.** Analysis and design of structures in metal. Beams; open-web joists; metal deck; columns; riveted, bolted, and welded trusses; plate girders and connections; lateral loads and bracing; and design of a simple steel frame building. Prerequisite: Architecture 252. 4 hours or 1 unit.
- 352. Theory of Reinforced Concrete.** Concrete materials; behavior of reinforced concrete construction; behavior and design of structural elements, one-way slabs, beams, and girders; columns; ACI code requirements; and introduction to continuity in reinforced concrete structures. Prerequisite: Architecture 252. 4 hours or 1 unit.
- 353. Reinforced Concrete Design.** Selection, design, and comparison of reinforced concrete floor systems for buildings; study and design of columns and footings; and prestressed concrete. Prerequisite: Architecture 352. 4 hours or 1 unit.
- 354. Structural Planning.** General problems in the selection and design of structural systems for buildings; methods of analysis; site explorations, soils, and foundations; bracing; and special systems. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
- 355. Structural Analysis.** Advanced problems in the analysis of statically determinate structures; general theories and methods of analysis of statically indeterminate structures by geometric and energy methods; and introduction to theory of plastic design. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
- 371. Architectural Design, V.** Intermediate building and environmental design; issue-oriented building problems; urban design theory; intermediate building design and site planning theory; human-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 272. 6 hours. No graduate credit.
- 372. Architectural Design and Construction Documentation.** Schematic design, design development, and construction documents of a small scale (10,000 square feet) public building emphasizing the integration of the basic elements of building, structural, and environmental technologies. Prerequisite: Architecture 371; credit or concurrent registration in Architecture 241 and 242. 6 hours. No graduate credit.
- 373. Architectural Design Studio.** Design studies of intermediate size building types; planned communities; civic and social facilities at the community and urban scale; and collaboration among the several disciplines involved in planning the human habitat: urban planning, landscape architecture, sociology, and economics. Prerequisite: Architecture 372. 6 hours or $1\frac{1}{2}$ units.
- 374. Architectural Design Studio.** Research and individual comprehensive design study for a selected architectural project; special emphasis on site development and the integration of construction technology, structure, and environmental systems. Prerequisite: Architecture 373, or consent of instructor. 6 hours or $1\frac{1}{2}$ units.
- 379. Urban Housing.** Examines issues affecting the design of urban housing including the perceptions and needs of residents, the needs of special user groups, and the roles of governments; reviews selected principles of housing in other countries. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 398. Directed Research in Architecture.** Participation in ongoing research projects which may include energy management, environmental perception, facilities development, building science, and other topics. Prerequisite: Approval of written proposal by instructor and Director of School. 4 hours or 1 unit. Students may register in different sections of this course to a maximum of 8 hours or 2 units.
- 399. Off-Campus Study.** Provides opportunity for approved off-campus study. A detailed proposal for study off campus must be submitted for approval to the appropriate committee in the School prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the Director of School. Prerequisite: Senior or graduate

standing in architecture and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.

411. Seminar in History of Ancient and Medieval Architecture. Seminar on topics in ancient, early Christian, Byzantine, and Medieval Architecture. Prerequisite: Architecture 310, 311, or 312, or equivalent as determined by the instructor. 1 unit.

413. Seminar in History of Renaissance and Baroque Architecture. Seminar on topics in European architecture from the fifteenth through the eighteenth centuries. Prerequisite: Architecture 313 and 314, or equivalent as determined by the instructor. 1 unit.

415. Seminar on the Architectural History of American Communities. Advanced historic study of the architectural design and aesthetics of individual buildings and their relationship to each other in selected small-scale American communities. Prerequisite: Architecture 316 or equivalent, and consent of instructor. 1 unit.

417. Seminar in the Development of Contemporary Architectural Thought. An examination of the development of the philosophy of significant modern and contemporary architectural writers and architects in relation to their projects and executed work. Prerequisite: Architecture 315 and 316, or equivalent as determined by the instructor. 1 unit.

418. Recording Historic Buildings. Examines techniques for recording historic buildings and sites: measuring, photographing, and drawing to Historic American Building Survey standards; taking field notes and investigating public records to document reports. Prerequisite: Architecture 319 and demonstrated ability in architectural graphics; or consent of instructor. $\frac{3}{4}$ unit.

430. Architectural Management Theory. Application of the systems approach and organization theory to the study of organizational behavior in the architectural process; the sources and objectives of dynamic change in that process; and the effects of the change. 1 unit.

431. Administration of Construction. Critical analysis of that phase of architectural practice related directly to the construction of buildings; the building industry; policy, organization, procedures, and techniques for construction management; the architect, engineer, management and cost consultants, contractor, and the owner; and administration of the construction contract and professional construction management. Prerequisite: Architecture 330 or consent of instructor. $\frac{3}{4}$ or 1 unit. Students taking the course for 1 unit are required to perform independent study which results in a written paper and formal class presentation.

432. Architectural Administration. Critical analysis of that part of professional practice related to the organization of the architectural firm and the conduct of the internal aspects of business; administrative policy, management functions, and procedures; and general development, contract negotiation, production, personnel, insurance, financial planning, accounting, and cost control. Prerequisite: Architecture 330 or consent of instructor. $\frac{3}{4}$ or 1 unit.

434. Building Economics. Principles of economics as they apply to individual and large-scale building projects; factors affecting the cost of buildings, including the building market, building investment and finance, land acquisition, government assistance, and taxation; first costs, operating costs, and ultimate costs; cost analysis and cost models; and construction costs, estimates, and cost control. Prerequisite: Architecture 330 or consent of instructor. 1 unit.

438. Architectural Problems in Organization Theory. Individual or group examination and analysis of the application of the theory of complex organizations in the architectural process; analysis of the interaction of architectural and other building organizations as subsystems; and investigation of this interaction through research or project analysis. Prerequisite: Architecture 430 or consent of instructor. Concurrent registration in an architectural studio course not permitted. 1 or 1 $\frac{1}{2}$ units.

439. Architectural Process Internship. Individual internship for one summer session or one semester in an approved office of practice in the architectural process; analysis of this work in coordinated university course work. Residence at the university is not required during internship. Prerequisite: Consent of joint program advisory committee. 1 or 1 $\frac{1}{2}$ units.

- 451. Advanced Structural Analysis.** Advanced theory and methods of analysis of statically indeterminate structures: secondary stresses: torsion: buckling and stability: and advanced theory and application of plastic design in building structures. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
- 452. Foundation Engineering.** Soil mechanics and site exploration: design of spread footings, combined footings, piles, and caissons: and foundation walls and retaining walls in reinforced concrete. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
- 453. Advanced Reinforced Concrete Design.** Critical review of the analysis, methods, and specifications involved in the design and behavior of reinforced concrete structures for buildings, including tall buildings, plates, and shells: computer applications. Prerequisite: Architecture 355; credit or concurrent registration in Architecture 451 or consent of instructor. 1 unit.
- 454. Advanced Steel Design.** Advanced topics in the design of steel structures: critical study of the AISC specification: design of steel members and their connections: composite structures: and the analysis and design of continuous structures and tall buildings. Prerequisite: Architecture 451 or consent of instructor. 1 unit.
- 455. Prestressed Concrete Design.** Theory and design of prestressed concrete structures: and suspension shell structures. Prerequisite: Architecture 453 or consent of instructor. 1 unit.
- 456. Advanced Structural Planning.** Study of the loads, functional and spatial requirements, and construction problems in the selection and design of structural systems for buildings: cost estimates: and integration of mechanical and electrical equipment. Prerequisite: Architecture 452 and 453; credit or concurrent registration in Architecture 454 and 455, or consent of instructor. 1 unit.
- 461. Housing Environments Design Studio, I.** Emphasizes comprehensive design studies on individually selected housing problems: the study process includes programmatic development, environmental analysis, definitive design development and comprehensive project documentation. Prerequisite: Architecture 374 and 466. 1 to 2 units.
- 462. Housing Environments Design Studio, II.** Terminal design studio studies on individually selected housing problems: emphasizes definitive design development and process documentation for final project in the Master of Architecture Housing Environments option. Prerequisite: Architecture 461. 1 to 2 units.
- 463. Methods of Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 463. Introduction to methods and techniques of systematically generating social and behavioral information relevant to the programming, design, and evaluation of physical environments. Prerequisite: Graduate standing in architecture, landscape architecture, or urban and regional planning. 1 unit.
- 464. Conducting Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 464. See Landscape Architecture 464.
- 465. Design/Behavior Studio.** Same as Landscape Architecture 465. See Landscape Architecture 465.
- 466. Problems and Processes in Housing Design.** Analyzes issues confronting architects in the design of housing environments: emphasizing new and emerging problems: examines processes in problem solutions. Prerequisite: Concurrent registration in Architecture 374 or consent of instructor. 1 unit.
- 467. Critical Issues in Designing for the Elderly.** Examines issues related to the design of housing and community facilities for older people: stresses the development of strategies for design decision making and a comprehensive theoretical knowledge base for understanding how the design of the environment affects the aged. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
- 468. Site and Environmental Issues in Housing Design.** Examines issues involving housing environments as related to site, landscape, land planning, and buildings: also examines design values, processes, analysis techniques, and standards involving natural and human-made interactions. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
- 471. Architectural Design Studio.** Definitive design of various building types with optional choices related to the student's particular interests, talents, and capacities: emphasis

- on human need, structural, mechanical, and tectonic integration. Prerequisite: Architecture 374 or consent of instructor. 1 to 2 units.
- 472. Architectural Design Studio.** Continuation of Architecture 471. Prerequisite: Architecture 471 or consent of instructor. 1 to 2 units.
- 476. Architectural Design Seminar.** Presentations and discussions relative to various areas of architectural and environmental design concerns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 3 units.
- 477. Theory of Architecture.** A review of principles of architectural design; factors in programming architectural requirements; design development; and evaluation and criticism. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 478. Architectural Criticism.** Analysis and criticism of selected buildings; individual reports and discussions. Prerequisite: Architecture 477 or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 479. Architectural Design Methods.** Examination of the architectural design process; identification, investigation, and evaluation of design methods. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 1 unit.
- 481. Urban Design Studio, I.** Same as Landscape Architecture 481. Design of large building types and building complexes; megastructures; and collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 374; credit or concurrent registration in Urban Planning 326 or consent of instructor. 1 to 2 units.
- 482. Urban Design Studio, II.** Same as Landscape Architecture 482. Design development studies of central business districts, movement systems, and residential communities; collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 481, Urban Planning 326, or consent of instructor. 1 to 2 units.
- 488. Urban Design Seminar.** Analysis and criticism of urban development projects; individual reports and discussions. Prerequisite: Architecture 374, Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 491. Special Problems in Architectural History and Preservation.** Individual investigation of the work of particular architects, of specific buildings, and of the architecture of periods or regions; comparative studies; and aesthetic problems. Prerequisite: 12 hours of architectural history or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 493. Special Problems in Architectural Administration and Building Construction.** Studies of building projects at large and small scales; investigations in feasibility and cost control, material and system selection, construction techniques and processes, legal and business procedures, and related aspects of professional practice; and independent study or study in conjunction with architectural and urban design projects. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 495. Special Problems in Structural Theory and Design.** Individual or group investigation and study in architectural engineering application; research in economy and design in correlation with architectural, mechanical, and structural requirements. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 3 units. May be repeated to a maximum of 3 units.
- 496. Special Problems in Housing Environments.** Individual investigation or research in housing environments involving special issues such as energy conscious design, human-environmental relations, aesthetic theory, government policy, and cultural patterns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
- 497. Special Problems in Architectural Design.** Individual investigation of building types and systems, aesthetic theories, and other problems in architectural design. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 4 units.
- 498. Special Problems in Urban Design.** Individual investigation of problems at the community and urban scale; collaboration with other disciplines. Prerequisite: Credit or concurrent registration in Architecture 481 or Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.

- 499. Thesis Research.** Prerequisite: Consent of instructor and graduate program coordinator. 0 to 4 units. May be repeated to a maximum of 4 units.

ART AND DESIGN, SCHOOL OF

(Including Introduction to Art and Design, General Professional Courses in Art and Design, Art Education, Cinematography, Crafts, Graphic Design, History of Art, Industrial Design, Painting, Photography, Printmaking, and Sculpture)

Director of School: E. C. Wicks

School Office: 143 Art and Design Building, 408 East Peabody, Champaign

Introduction to Art and Design

- 103. Introduction to Studio Arts.** Introductory studio experiences with a variety of art materials and techniques accompanied by visitations to artists' studios and museum tours. Not open to students majoring in art and design. 3 hours. Credit is not given for both Introduction to Art and Design 103 and 190.
- 105. Introduction to Watercolor Painting.** A basic watercolor class that includes an introduction to the tools, materials, and techniques of the medium: landscape, still life, and figure experiences. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
- 106. Introduction to Oil Painting.** Elementary oil and acrylic painting and sketches from still life and landscape; includes basics such as stretching canvas, preparing surfaces, and varied painting techniques. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
- 107. Elementary Drawing.** A basic drawing course using a variety of media and techniques, including charcoal, conte, pencil, pen and india ink, and studies in perspective, line, value, composition, and the figure. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
- 108. Ikebana: The Japanese Art of Flower Arrangement.** Introduces Japanese arts and cultural heritage through Ikebana (Japanese flower arranging). 2 hours.
- 109. Sumi-E (Japanese and Chinese Black-ink Painting).** Introduction to the ancient abstract Chinese art of black-ink painting; through the study and practice of Chinese and Japanese Sumi-E students discover the foundation of twentieth-century visual arts and discuss the philosophy of Chinese and Japanese art. 2 hours.
- 140. Introduction to Art.** A broadly based conceptual foundation for a critical understanding of the visual arts in contemporary society. Not open to students in art and design and architecture. 3 hours.
- 150. Beginning Sculpture.** Clay modeling from the human figure; casting in plaster and other materials as well as production of sculpture involving materials other than plaster and clay. Not open to students majoring in art. 2 hours.
- 185. Design, I.** Design elements and principles with emphasis on color and painting exercises; uses a variety of media to explore the different aspects of design, emphasizing two-dimensional problems. Not open to students majoring in art and design. 3 hours.
- 186. Design, II.** A second course in design with emphasis on graphic communication; students gain experience using modern graphics equipment. Not open to students majoring in art and design. Prerequisite: Introduction to Art and Design 185. 3 hours.
- 190. Recreational Crafts, I.** Introduction to design and execution in crafts particularly adapted to work with children in schools, playgrounds, and summer camps. Primarily for recreation majors in physical education. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

- 209. Japanese Tea Ceremony and Zen Aesthetics.** The tea ceremony and culinary arts of Japan practiced as the physical discipline necessary for Zen aesthetic experience. Prerequisite: Introduction to Art and Design 108 or 109. 2 hours. May be repeated to a maximum of 4 hours.

General Professional Courses in Art and Design

- 113. Orientation to Art and Design.** An overview of art and design professions in today's society. 0 hours.
- 117. Drawing, I.** Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
- 118. Drawing, II.** Continuation of General Professional Courses in Art and Design 117. Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 117. 3 hours.
- 119. Design, I.** Theory and practice in the elements of two-dimensional design and the study of color. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
- 120. Design, II.** Theory and practice in the elements of three-dimensional design. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 119. 3 hours.
- 121. Drawing Theory.** Orthographic, oblique, and isometric projections and perspective. 2 hours.
- 122. Drawing Theory.** Continuation of General Professional Courses in Art and Design 121, including the science of shades, shadows, and reflections in perspective drawing. Prerequisite: General Professional Courses in Art and Design 121. 2 hours.
- 187. Freehand Drawing.** For students in architecture: drawing three dimensional form and space. Intense investigation of perspective in freehand drawing; drawing in class and outside sketchbook assignments from nature, including the human figure in pencil, pen, and other media. Prerequisite: Enrollment in Architecture curriculum. 2 hours.
- 188. Watercolor.** For students in architecture. Introduction to watercolor and color theory; continued practice of freehand drawing, composition, and outside sketching from nature. Prerequisite: General Professional Courses in Art and Design 187 and enrollment in architecture curriculum. 2 hours.
- 189. Art Studio.** For students in architecture. Introduction to ideas in art, different media, art experiences from representational to abstract; flat and three dimensional; continued work in sketchbook from nature. Prerequisite: General Professional Courses in Art and Design 188; enrollment in architecture curriculum. 2 hours.
- 191. Unit One Studio/Seminar in Art and Design.** Topics vary; consult Timetable or Unit One office. 1 to 3 hours. May be repeated as topics vary.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 391. Individual Studio Problems.** Directed independent creative activity or research. Prerequisite: Junior or graduate standing; consent of instructor, student's advisor, and Associate Director of the School. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 398. Art and Design Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see Timetable for medium/topic. Prerequisite: Junior, Senior, or Graduate standing in art and design, or consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topics vary.
- 493. Seminar: Introduction to Methods and Criticism.** Prerequisite: Graduate standing in art. $\frac{1}{4}$ to 1 unit.

Art Education

- 203. Art in the Elementary Grades, I.** Introductory laboratory experiences with the elements of design in the visual arts and with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. 3 hours.
- 204. Art Education Laboratory.** Examines methods and studio activities for elementary and secondary schools with a variety of appropriate materials and processes; includes techniques, art activities, and practical application for teaching exceptional students, including learning disabled. 2 hours. Must be repeated for a total of 4 hours.
- 205. Art in the Elementary Grades, II.** A continuation of laboratory experiences begun in Art Education 203 with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. Prerequisite: Art Education 203. 3 hours.
- 206. Practicum in Teaching Art.** Supervised teaching of art to children augmented by a seminar; includes classroom preparation and evaluation. Prerequisite: Art Education 207 or consent of instructor. 4 hours.
- 207. Art Curriculum Development and Practicum in the Elementary Schools.** Early field experience in local elementary schools one half day weekly; includes identification, instruction, methods, and practicum on the psychology of the exceptional child. Prerequisite: Art education major; sophomore standing. 3 hours.
- 208. Organization of Public School Art Programs.** The selection and arrangement of content for different educational levels; study and evaluation of curricula, equipment, and supplies; and program supervision. Prerequisite: Art Education 207 or junior standing in art, or consent of instructor. 3 hours.
- 280. Professional Seminar in Art Education.** Examines responsibilities, methods, and techniques specific to teaching art in elementary and secondary schools; includes the psychology of the exceptional child in conjunction with methods of instruction and student teaching experience. Prerequisite: Art Education 204 and 207; concurrent registration in Educational Practice 238 and 242, art education sections only. 4 hours.
- 290. Senior Honors in Art Education.** Independent guided research and study for honors. Prerequisite: Senior standing in art education, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Problems in Art Education.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 389. Aesthetic Inquiry and Criticism in Art Education.** Studies the theories of art, techniques of criticism, the meaning of artistic expression, and their relationship to the visual arts and art education. Prerequisite: Advanced standing in art education curriculum or consent of instructor. 4 hours or 1 unit.
- 390. Advanced Art for Elementary Grades.** Advanced laboratory experiences in two-dimensional visual art techniques for elementary teachers, supervisors, and principals. Prerequisite: Art Education 205 or consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated for a maximum of 4 hours or 2 units.
- 489. Issues in Art Education.** A study of fundamental issues affecting education in the visual arts; examines and explores the educational implications of the nature and value of art, the nature of the artist, and the development of the child as an artist and connoisseur. 1 unit.
- 490. Curriculum Development in Art.** An analysis of curriculum organization in the visual arts; particular emphasis given to a range of curriculum positions in education and general research related to curriculum design. Prerequisite: Consent of instructor. 1 unit.
- 491. Special Problems in Art Education.** Individual direction in research and in creative activity; thesis. 1/2 to 2 units.
- 499. Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in art education. 0 to 4 units.

Cinematography

- 180. Introduction to Cinematography.** Introduction to the principles and techniques of cinematography as applied to individual expression. 3 hours.
- 280. Basic Cinematography.** Fundamentals of the theory and practice of motion pictures as an art form, with emphasis on principles, tools, and techniques. Prerequisite: Cinematography 180 or consent of instructor. 3 hours.
- 291. Individual Cinematography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 380. Cinematography.** Theory and practice of motion pictures as an art form; emphasis on individual creative production. Anticipated cost to the student for each semester is \$75 to \$200. Costs should be discussed with the instructor before enrollment. Prerequisite: Cinematography 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 12 hours or 4 units.
- 491. Special Problems in Cinematography.** Directed individual creative activity or research. Prerequisite: Graduate standing in cinematography. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Crafts

- 160. Jewelry, I.** The design and execution of simple jewelry and related metal forms, including study of characteristics of base and precious metals through forming, fabrication, decoration, and finishing processes. 2 hours.
- 161. Jewelry, II.** Continuation of Crafts 160; further experience and experimentation with manipulative techniques, materials, and processes, emphasizing the lost wax casting technique. Prerequisite: Crafts 160. 2 hours.
- 170. Ceramics, I.** The design and production of pottery by hand methods. Work covers the basic processes of forming, decorating, and firing. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
- 171. Ceramics, II.** Advanced work in studio pottery, including expanded experience in forming methods and glaze compounds. Prerequisite: Crafts 170. 2 hours.
- 260. Jewelry, III.** The design and production of jewelry and metal work for majors in crafts with further experience in manipulative techniques such as casting, electroforming, surface decoration, enamelling, complex construction, and forming. Prerequisite: Crafts 160 and enrollment in the crafts curriculum. 3 hours.
- 261. Jewelry, IV.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style through advanced techniques of hollowware, complex construction, enamelling, electroforming and plating, forging, and the use of varied materials. Prerequisite: Crafts 260. 3 hours.
- 262. Metal Technology.** Understanding of the working properties of a number of nonferrous metals, their alloys, and their patination; such areas as electroforming on organic and inorganic materials, working with rigid and thermosetting plastics, and experimentation with little known processes of metalwork to be subjects of individual research. Prerequisite: Junior standing in crafts or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 264. Jewelry, V.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style and ability to work independently with regular faculty consultation. Prerequisite: Crafts 261. 5 hours.
- 265. Jewelry, VI.** Continuation of Crafts 264; emphasis on experimentation and development of personal style, a portfolio, and a senior exhibition. Prerequisite: Crafts 264. 5 hours.
- 270. Ceramics, III.** Introduction to ceramic design for developing basic skills in designing and producing clay products by various hand processes including throwing, hand-

- building, and casting. Prerequisite: Junior standing in curriculum in crafts. 3 hours.
- 271. Ceramics, IV.** Introduction to ceramic glaze calculation; concern with the understanding and application of the knowledge of glaze calculation in a creative way and with applications of creative experiments in glaze and clay bodies. Prerequisite: Crafts 270. 3 hours.
- 272. Clay Technology.** An introduction to the nature and understanding of basic inorganic raw materials in relation to ceramic processes; laboratory testing of clay types, bodies, slips of earthenware, stoneware, and porcelain temperatures. Prerequisite: Junior standing in art and design or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 274. Ceramics, V.** The application of the combined skills of throwing and creative glaze procedures to produce thrown ceramic products with the emphasis on creative experimentation; also covers plaster and mold making as a creative procedure in producing clay products. Prerequisite: Crafts 271. 5 hours.
- 275. Ceramics, VI.** Technical and creative research in ceramic design, with emphasis on reappraisal of the traditional media and the traditional limited production method used by artist potters. Prerequisite: Crafts 274. 5 hours.
- 288. Glass, I.** The design and production of glasswork by the offhand methods; work covers the basic processes of blowing and molding. Prerequisite: Industrial Design 134; junior standing in art or consent of instructor. 2 hours.
- 289. Glass, II.** Advanced work in glassworking by the offhand methods including blowing, casting, fuming, and acid etching. Prerequisite: Crafts 288. 2 hours.
- 290. Senior Honors in Crafts.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in crafts, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Crafts Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 364. Metal.** For graduate students not specializing in crafts; an additional creative experience for students who are aesthetically advanced in another medium. Prerequisite: Consent of instructor and associate director of school; open only to seniors and graduate students in art and design curricula other than crafts. 2 hours or 1/2 unit. May be repeated to a maximum of 2 units.
- 374. Ceramics.** Ceramic design with emphasis on the development of professional style and personal expression. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 2 units. May be repeated to a total of 6 hours.
- 384. Glass.** Advanced glass design with emphasis on professional development and personal style. Prerequisite: Consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
- 491. Special Problems in Crafts.** Directed individual creative activity or research. Prerequisite: Graduate standing in crafts. 2 to 2 units. May be repeated to a maximum of 5 units.
- 498. Ceramic-Glass-Metal Laboratory.** Individually directed research and personal expression in ceramic, glass, or metal medium. Prerequisite: Enrollment in the M.F.A. program with a major in ceramics, glass, or metal, or consent of departmental graduate committee. 1/2 to 2 units. May be repeated.

Graphic Design

- 100. Design History Survey.** Studies the history of design from 1850 to the present, showing the relationships between graphic design, industrial design, interiors, and architecture; gives attention to major historical movements as well as to the emergence of modern and contemporary design. Prerequisite: Sophomore standing in graphic design curric-

ulum or consent of instructor; concurrent registration in Graphic Design 120 by students in graphic design. 3 hours.

- 120. Visual Organization.** Introduces the discipline and function of graphic design; explores the organization and structure of two-dimensional space as context for visual communication; includes practical exercises in visual perception, visual organization, and visual communication. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 100 by students in graphic design. 3 hours.
- 130. Production.** Basic information and current methods in the production of multiple printed communications, including printing processes, papermaking, binding and other practices, and the preparation of art work for the various methods of reproduction; field trips required. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 140 by students in graphic design. 3 hours.
- 140. Typography.** Introduces the discipline, function, and tradition of typography as it relates to visual verbal communication; explores both technical and formal aspects. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 130 by students in graphic design. 3 hours.
- 210. Photo/Graphics.** Explores the design potential of photographic and related processes in the generation of imagery for visual communication, employing in-camera, darkroom, and graphic arts equipment manipulations. Prerequisite: Concurrent registration in Graphic Design 230 or 240. 3 hours.
- 220. Image Making.** The understanding and application of the image-making process in graphic design, with emphasis on hand-generated images; covers historical, cultural, and technological influences on concept, content, and visual style. Prerequisite: Graphic Design 130 and 140; concurrent registration in Graphic Design 230 or 240. 3 hours.
- 230. Methodology.** Goal-directed graphic design problem of thinking and research which precede the making of design; develops systems for objective problem solving. Prerequisite: Junior standing in graphic design curriculum; Graphic Design 130 and 140. 3 hours.
- 240. Advanced Typography.** Further exploration of typographic form and manipulation of variables which affect content, stresses the importance of typographic composition as an integral component of contemporary visual communication design. Prerequisite: Graphic Design 230. 3 hours.
- 290. Senior Honors in Graphic Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in graphic design; a cumulative grade-point average of 4.0; and consent of instructor, advisor, and associate director of the school. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Graphic Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 370. Advanced Graphic Design, I.** Research in, and analysis and synthesis of, complex visual problems; emphasizes modular sequence, symbolic systems, and image making for visual communication. Students prepare comprehensive portfolio and consider professional requirements encountered by the designer in the visual communications industry. Prerequisite: Graphic Design 240; for graduate credit, consent of graphic design program chair. 3 hours or $\frac{3}{4}$ unit.
- 380. Advanced Graphic Design, II.** Continuation of Graphic Design 370. Prerequisite: Graphic Design 370; for graduate credit, consent of graphic design program chair. 3 hours or $\frac{3}{4}$ unit.
- 467. Graphic Design Laboratory.** Individually directed research in the studio with concentration in graphic design. Prerequisite: Enrollment in the M.F.A. program in graphic design or consent of departmental graduate committee. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
- 491. Special Problems in Graphic Design.** Directed individual creative activity or research. Prerequisite: Graduate standing in graphic design. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

History of Art

101. **Introduction to Non-Western Art: East Asia.** Cultural analysis of the interrelated fields of architecture, sculpture, and painting, and other humanistic studies of East Asian civilizations; emphasizes India, China, and Japan. 3 hours.
110. **Introduction to Non-Western Art: Africa, the Americas, and Oceania.** Highlights of visual arts traditions in black Africa, pre-Columbian America, and the South Pacific; a cross-cultural analysis of non-Western aesthetic systems and forms with a focus on thematic problems rather than style surveys. 3 hours.
111. **Ancient and Medieval Art.** The development of the visual arts in Western Europe and the Near East in their cultural contexts from prehistoric times until the early fifteenth century; includes Egyptian, Greek, Roman, and medieval art and architecture. 4 hours.
112. **Renaissance and Modern Art.** The development of the visual arts in Western Europe and the United States in their cultural contexts from the early fifteenth century to the present. 4 hours.
115. **Art Appreciation.** A broad introduction to the visual arts; surveys media representing the major cultural and historical periods, both Western and non-Western. In addition to required lectures and readings, campus art collections and exhibitions are visited periodically. 3 hours.
116. **Masterpieces of Art.** Studies selected Western and non-Western masterpieces of art and architecture, considered both as aesthetic objects and as expressions of the ideals and beliefs of the societies for which they were created. 3 hours.
210. **African Art and Society, I.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multi-media framework and a social-religious context; surveys the art styles of the Dogon, Senufo, Mende, and Ashanti peoples. 3 hours.
211. **African Art and Society, II.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multi-media framework and a social-religious context; focuses on Yoruba art and surveys the art traditions of southeastern Nigeria, Cameroons, Gabon, Central Africa, and East Africa. 3 hours.
215. **Greek Art.** Same as Classical Civilization 217. Survey of architecture, sculpture, and painting of the Greek world from the geometric period to the beginning of the Christian era. 3 hours.
216. **Roman Art.** Same as Classical Civilization 218. Survey of architecture, sculpture, and painting of the Roman world from republican times to the age of Constantine, with brief treatment of later Roman art leading to Byzantine. 3 hours.
217. **The Development of the Ancient City.** Same as Classical Civilization 231. See Classical Civilization 231.
218. **Ancient Greek Sanctuaries.** Same as Classical Civilization and Religious Studies 232. See Classical Civilization 232.
219. **The Classical Tradition in Art from the Renaissance to the Modern Age.** Examines the effect of the art of classical antiquity upon the works of some of the greatest artists from the Renaissance to the modern age; discusses works of art as much as possible in the language of comparison employed by their creators and the poets and critics of their time. 3 hours.
222. **Medieval Art.** The arts of Byzantium and Western Europe from the early Christian era to the Renaissance. 3 hours.
230. **Italian Renaissance Art.** Architecture, painting, sculpture, and minor arts of Italy during the Renaissance. 3 hours.
231. **Northern Renaissance Art.** Architecture, painting, sculpture, and minor arts of Europe outside Italy in the fifteenth and sixteenth centuries. 3 hours.
235. **Baroque and Rococo Art.** Studies European painting, sculpture, and graphic work during the period 1580 to 1750 with emphasis on major masters such as Bernini, Caravaggio, Poussin, Rembrandt, Rubens, Velazquez, and Watteau. 3 hours.
240. **Art of the Nineteenth Century.** Architecture, painting, sculpture, and minor arts of France, Germany, Spain, and England in the nineteenth century. 3 hours.

- 241. Twentieth-Century European Art.** A survey of the major artists and artistic movements in European painting and sculpture from postimpressionism to the present. 3 hours.
- 250. American Art.** Surveys American art and architecture from the colonial period to the present. 3 hours.
- 289. Senior Honors in Art History-BA.** Independent guided research and study in a selected area of art history for candidates for the Bachelor of Arts in Art History with departmental distinction. Prerequisite: Senior standing in the Art History curriculum, a cumulative grade-point average of 4.25, an art history grade-point average of 4.5, and consent of instructor, department advisor, and associate director of the school. 2 to 5 hours. May be repeated to a maximum of 5 hours. (Counts for advanced hours in LAS.)
- 290. Senior Honors in Art History-BFA.** Directed independent research and study for honors. Prerequisite: Senior standing in FAA art history, a cumulative grade-point average of 4.0, and consent of instructor, advisor, and associate director of the school. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Art History Topics.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 301. Chinese Art.** History of Chinese art from earliest times to the present. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 302. Japanese Art.** History of Japanese art from earliest times to the twentieth century. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 303. Intellectual Artists of China.** Studies selected artists including struggling recluses, fantasists, eccentrics, and individualists; examines the aesthetic and expressive content of their works within the content of their social and intellectual environment. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 304. Space and Design in Japanese Art and Architecture.** Studies basic design principles in Japanese painting, pottery, costumes, architecture, gardens, and other crafts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 310. West African Art.** A study in depth of West African art styles in time perspective and cultural context, with a special interest in the use of interdisciplinary source materials. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 311. Traditional Art of Pacific Ocean Cultures.** A survey of traditional art in Polynesia, Melanesia, and Micronesia, including New Zealand and Australia; emphasizes major style areas and their historical and cultural significance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 315. The Archaeology of Greece.** Same as Classical Civilization 343. See Classical Civilization 343.
- 316. The Archaeology of Italy.** Same as Classical Civilization 344. See Classical Civilization 344.
- 317. The Ancient Ideal in Art and Literature.** Same as Classical Civilization 332 and Comparative Literature 306. See Classical Civilization 332.
- 321. Early Christian and Early Medieval Art.** Christian art of the Roman Empire, the art of early Medieval Europe (including England and Ireland), and of the Eastern Mediterranean from the third to the eighth centuries. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 322. Byzantine and East Christian Art.** The arts of Byzantine, the Crusader States, and Russia from the ninth to the fifteenth centuries. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Romanesque Art.** Art and architecture of the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 324. Gothic Art.** The arts of western Europe from the end of the Romanesque period until the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 325. Medieval Manuscripts and Early Printed Books.** Surveys manuscript illumination and early book production from 300 to 1500 A.D.; topics include techniques of manuscript illustration and printing production in such masterpieces as the Vatican Virgil, the Utrecht Psalter, the Book of Kells, the Tres Riches Heures, the Gutenberg Bible, and Brant's Ship of Fools. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 330. Problems in Italian Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of Italy during the Renaissance selected for intensive study; special emphasis given to the study of the lives of artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 331. Problems in Northern Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of France, Germany, Spain, and England during the Renaissance selected for intensive study; special emphasis given to the study of the lives of the artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 332. Italian Art of the Sixteenth Century.** Painting, sculpture, and minor arts in Italy from 1520 to 1590. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 335. Baroque Art in Italy and France.** Studies painting, sculpture, and graphic work in Italy and France during the period 1580-1700 emphasizing such major masters as Bernini, Caravaggio, the Carracci, Cortona, La Tour, and Poussin. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 336. The Age of Rembrandt and Rubens.** Studies seventeenth-century art in the Low Countries with extensive treatments of the careers of Rubens and Rembrandt. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 337. Spanish Art from El Greco to Goya.** Studies art and architecture in Spain from the sixteenth through the nineteenth centuries, with emphasis on the masters of the Golden Age; includes El Greco, Velazquez, Zurbaran, Montanes, Ribera, Cano, Murillo, and Goya. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 340. Romantic Art.** Studies English, French, and German art from the end of the eighteenth century through 1840; focuses on revivalist movements, historicism, landscape art, and changing conceptions of art and artist during the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Realism to Post-Impressionism.** Studies European art from 1850 to 1900, with emphasis on French painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 342. German and Austrian Painting of the Late Nineteenth and Early Twentieth Centuries.** A survey of modern German and Austrian painters and pictorial movements from the 1890s to the period of Hitler, with special emphasis on the expressionist period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 343. The Art Nouveau in Europe.** A survey of the principal artists and artistic currents in the applied arts during the 1890s in Europe; emphasis on individual figures, with an attempt to define the common stylistic and theoretical assumptions of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. The Beginnings of Modernism: European Art from Post-Impressionism to World War I.** The pioneer movements in modern painting and sculpture, emphasizing the work and ideas of individual major figures. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Twentieth-Century Art in Europe: 1915-1945.** A study of the leading personalities and movements in European painting, sculpture, and architecture, with emphasis on painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 346. Recent American Painting and Sculpture.** A critical survey of developments since World War II with emphasis on questions of quality and personal content and with

consideration of the most current tendencies. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

350. **Realism and Romanticism in American Art, 1776-1876.** Studies the two major directions of art in the United States from independence to the centennial, with focus on major figures and the scientific and philosophical movements which influenced them. Prerequisite: One year of art history or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **Early American Modernism.** Examines American art, particularly painting and sculpture, 1876-1940, against its cultural background and the relation of the American artist to Europe in an attempt to isolate the roots of Modernism in the United States. Prerequisite: One year of art history or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **History of Photography.** Examines a history of photography from its origin to the present, including both documentary and artistic approaches; considers relationships with other arts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
361. **Old Master Drawings.** An historical and critical survey of drawings from the late Middle Ages to the end of the nineteenth century; emphasis on drawings by artists such as Pisanello, Leonardo, Michelangelo, Raphael, Rembrandt, Rubens, Watteau, Goya, Degas, and Van Gogh. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Historiography of Art and the History of Art Criticism.** Origins and the development of the history of art criticism. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
366. **Introduction to Art Museology.** Survey of the art museum as a professional institution, its history, and present orientation; designed to acquaint prospective graduate students with the field of museum operation and to serve as background for students entering graduate courses in special fields of art museum practice (museology). Prerequisite: Consent of instructor. 4 hours or 1 unit.
391. **Topics in Art History.** Variable content; consult the Timetable for current topics. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated as topics vary.
401. **Seminar in Chinese Art.** Investigation of selected phases, concepts, and problems of the art of China; intensive reading and reports. Prerequisite: History of Art 301 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
402. **Seminar in Japanese Art.** Investigation of selected phases, concepts, and problems of the art of Japan; intensive reading and reports. Prerequisite: History of Art 302 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
410. **Seminar: African Art.** An intensive investigation of selected problems in the sculpture and other arts of Negro Africa. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
422. **Studies in Medieval Art.** Research seminar in subjects selected from the art and architecture of the medieval period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
430. **Seminar in Renaissance Art.** Special problems in the history of Renaissance art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
435. **Seminar in Baroque Art.** Research seminar in problems selected from the art of seventeenth-century Europe. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
440. **Seminar in the Art of the Period 1750-1900.** An intensive study of selected problems in European art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
441. **Seminar in Modern Art.** Investigation of special problems in the history of twentieth-century art. Students present reports of their research. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
446. **Seminar in Contemporary Art.** Intensive study of selected problems or artists. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.

- 450. Seminar in American Art.** Investigation of selected problems in the history of American art. Prerequisite: History of Art 350 and 351, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 465. Seminar: Studies in the Development of Art History and Criticism.** The relation of art history and criticism: changing standards and criteria; intensive reading of selected critical works; and the writing of art criticism. Prerequisite: Consent of instructor. 1 unit.
- 466. Art Curatorial Techniques.** An intensive course in the role, responsibilities, and duties of the art museum curator; demonstration and practice of curatorial techniques in researching; documenting, acquiring, transporting, handling, and conservation of works of art. Prerequisite: History of Art 366. 1 unit.
- 467. Art Museum Administration and Education.** Two aspects of art museum work: (1) administration, covers trustee relations, methods of serving the public, fund raising, budgeting, staff organization, and program planning; (2) museum education. Students receive practice in the preparation of educational exhibitions and related educational materials. Prerequisite: History of Art 366. 1 unit.
- 468. Art Museum Internship.** Introduction to actual supervised practice in one specialized department in an art museum: curatorial, educational, or administrative department. Prerequisite: History of Art 466 and 467. 1 unit.
- 492. Individual Readings in the History of Art.** Directed readings in special fields or aspects of history of art not provided in depth by the current course offerings. Prerequisite: Consent of instructor. Sections A and B may be taken simultaneously. Registration allowed for each section is $\frac{1}{2}$ to 1 unit.
- 499. Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in history of art. 0 to 4 units.

Industrial Design

- 133. Design Workshop.** Fundamentals of three-dimensional design. Primarily for students majoring in the industrial design curriculum. Prerequisite: General Professional Courses in Art and Design 118, 120, and 121. 2 hours.
- 134. Introduction to Industrial Design.** Fundamentals of two and three dimensional design as applied to industrial design. Prerequisite: Industrial Design 133 and General Professional courses in Art and Design 122. 3 hours.
- 175. Design Methodology.** Introduction to problem solving methods, project organization, and project programming for designers; lectures and discussions include techniques for stimulating creative problem solving and task analysis; research paper required. Prerequisite: Sophomore standing in industrial design, or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 270. Drawing and Rendering.** Perspective drawing using color pastels, markers, and other media with emphasis on quick delineation. Prerequisite: Concurrent registration in Industrial Design 275, 276, 277, or 278; or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 271. Materials and Processes, I.** Use and manipulation of basic materials in modern industry. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
- 272. Materials and Processes, II.** Continuation of Industrial Design 271. Prerequisite: Industrial Design 271. 3 hours.
- 275. Industrial Design, I.** Designing of objects for manufacture by the machine industries. Field trip required. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
- 276. Industrial Design, II.** Continuation of Industrial Design 275. Field trip required. Prerequisite: Industrial Design 275. 3 hours.
- 277. Advanced Industrial Design, I.** Prerequisite: Industrial Design 276. 4 hours.
- 278. Advanced Industrial Design, II.** Prerequisite: Industrial Design 277. 4 hours.

- 280. Professional Practices.** Focuses on the preparation of a design portfolio and resume; examines operations of professional design offices; and includes presentations and discussions by visiting designers. 2 hours.
- 290. Senior Honors in Industrial Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in industrial design, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the school. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Industrial Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 477. Industrial Design Laboratory.** Individually directed research in the drafting room or workshop with concentration on industrial design. Prerequisite: Enrollment in the M.F.A. program in industrial design or consent of departmental graduate committee. $1\frac{1}{2}$ to 3 units. May be repeated.
- 491. Special Problems in Industrial Design.** Directed individual creative activity or design. Prerequisite: Graduate standing in industrial design. $1\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Painting

- 125. Life Drawing.** Prerequisite: General Professional Courses in Art and Design 118. 2 hours.
- 126. Life Drawing.** Prerequisite: Painting 125. 2 hours.
- 141. Beginning Painting, I.** Painting in oil from arranged groups. Prerequisite: Freshman standing in art. 2 hours.
- 142. Beginning Painting, II.** Continuation of Painting 141. Prerequisite: Painting 141. 2 hours.
- 143. Painting Composition, I.** Problems of non-literal content for painters, with special consideration of materials and techniques. Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
- 144. Painting Composition, II.** Continuation of Painting 143 with special emphasis on formal organization in painting. Prerequisite: Painting 143. 2 hours.
- 201. Watercolor, I.** Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
- 202. Watercolor, II.** Continuation of Painting 201. Prerequisite: Painting 201. 2 hours.
- 225. Intermediate Drawing.** Study from life in drawing media. Prerequisite: Painting 126 and junior standing in art. 2 hours.
- 226. Intermediate Drawing.** Continuation of Painting 225. Prerequisite: Painting 225. 2 hours.
- 229. Anatomical Drawing.** Advanced drawing emphasizing human anatomy including the skeletal and muscular structure of the human figure. Prerequisite: General Professional Courses in Art and Design 118 and Painting 126. 3 hours.
- 231. Intermediate Composition.** Prerequisite: Painting 126, 142, and 144. 3 hours.
- 232. Intermediate Composition.** Prerequisite: Painting 231. 3 hours.
- 233. Advanced Composition.** Prerequisite: Painting 226, 232, and 244. 3 hours.
- 234. Advanced Composition.** Prerequisite: Painting 233. 3 hours.
- 243. Figure Painting.** Painting in oil from the head and full figure. Prerequisite: Painting 126 and 142. 2 hours.
- 244. Figure Painting.** Continuation of Painting 243. Prerequisite: Painting 243. 2 hours.
- 245. Advanced Painting and Drawing.** Advanced creative study from nature and the model in various painting and drawing media. Prerequisite: Painting 226, 232, and 244. 3 hours.
- 246. Advanced Painting and Drawing.** Continuation of Painting 245. Prerequisite: Painting 245. 3 hours.

- 290. Senior Honors in Painting.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in painting, a cumulative grade-point average of 4.0; and consent of instructor, advisor, and associate director of the school. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Painting Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 380. Drawing.** Advanced drawing in several media. Prerequisite: For undergraduates, consent of instructor; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.
- 381. Painting.** Advanced painting in oil and other media. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Painting 142 or equivalent; for graduates, consent of departmental graduate committee. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a total of 2 units.
- 382. Painting Materials and Techniques.** Study of the materials and techniques used in the various media: oil, watercolor, tempera, gouache, encaustic, etc. Prerequisite: Painting 142 or graduate standing in art. 2 hours or $\frac{1}{2}$ unit.
- 491. Special Problems in Painting and Drawing.** Directed individual creative activity or research. Prerequisite: Graduate standing in painting. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 495. Painting Laboratory.** Professional and experimental painting with emphasis on the development of maturity of style and personal expression. Prerequisite: Enrollment in the M.F.A. program in painting. $\frac{1}{2}$ to 3 units.

Photography

- 115. Basic Photography.** Investigates basic elements comprising a photograph: explores the photogram, tone, and texture as expressive media; and works with the camera, exposure meter, and film and print developing in black and white. See Timetable for average cost; student must furnish camera. Prerequisite: Freshman standing in art and design; open to others during on-campus registration. 3 hours.
- 215. Photography, II.** Uses hand held cameras (35mm and $2\frac{1}{4}$) and black and white processes to express ideas and emotions with emphasis on the development of a personal aesthetic. See Timetable for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 216. View Camera and Studio.** Includes work with camera movements, black and white exposure, and development relationships as tools of creative expression; covers basic lighting techniques and studio procedures. Most equipment furnished. Prerequisite: Photography 215 or consent of instructor. 3 hours.
- 220. Color Photography.** Explores the potential of color prints and transparencies as media for creative expression. See Timetable for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 230. Alternative Photographic Processes.** Explores cyanotype (blue printing), Van Dyke, gumprinting, and other less common processes as methods of creative expression. Prerequisite: Photography 115. 3 hours.
- 231. Generative Systems.** Problem solving in current image generating technology such as electrostatics, offset lithography, computer graphics, and basic video; uses available systems hands-on for creative expression. Prerequisite: Photography 215 or 230; or consent of instructor. 3 hours.
- 290. Senior Honors in Photography.** Independent creative activity, guided study, or research. Prerequisite: Senior standing in photography, cumulative grade point average of 4.0, consent of instructor, advisor, and associate director of the school. 2 to 5 hours. May be repeated to a maximum of 6 hours.
- 291. Individual Photographic Problems.** Directed independent creative activity or re-

search. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.

- 315. Photography, III.** Explores creative expression through the medium of photography. Students select format and process (i.e., black and white, color, mixed media) based on prior experience; group critiques held frequently; initial opportunity to experiment in personally selected directions which will be refined and amplified in Photography 316. Prerequisite: Photography 215; History of Art 357; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ unit.
- 316. Advanced Photography.** Concentrated use of photographic processes for creative expression with emphasis on professionalism and the production of a photographic portfolio. Prerequisite: Photography 216 and 315; and minimum one other photography elective course. 3 hours or 1 unit.
- 350. Photography Seminar.** Advanced study of photographic issues and literature. Discusses aesthetics, criticism, and current imagery, as well as photography's relationship to other media. Prerequisite: Photography 115, or History of Art 357; or consent of instructor. 3 hours or 1 unit.
- 360. Video for Artists, I.** Explores the potential of video as a medium for creative expression and communications within the context of visual art. See current Timetable for average student materials cost; camera, recording, and editing equipment are furnished. Prerequisite: Junior standing in art; Photography 115 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 361. Video for Artists, II.** Explores advanced concepts and techniques of video as a medium of creative expression and communication within the context of visual art. See current Timetable for average student material cost; camera, recording, and editing equipment are furnished. Prerequisite: Photography 360. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 486. Photography Studio.** Individually directed research; personal expression through the photographic medium. Prerequisite: Enrollment in M.F.A. program and major in photography/cinematography, or consent of the departmental graduate committee. $\frac{1}{2}$ to 2 units. May be repeated.
- 491. Special Problems in Photography.** Directed individual creative activity or research. Prerequisite: Graduate standing in photography. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

Printmaking

- 271. Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Sophomore standing in art and design or consent of instructor. 2 hours.
- 272. Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Printmaking 271. 2 hours.
- 281. Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Sophomore standing in art and design or consent of instructor. 2 hours.
- 282. Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Printmaking 281. 2 hours.
- 291. Individual Printmaking Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 371. Etching.** Advanced work in various printmaking techniques. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Printmaking 272 or

equivalent: for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.

- 381. Lithography.** Laboratory course in lithography. Course of study includes a complete development of the process, exploiting its potential as a fine art medium. Prerequisite: For undergraduates, Printmaking 282; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.
- 491. Special Problems in Printmaking.** Directed individual creative activity or research. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 497. Print Workshop.** Intaglio, relief, and planographic print media: includes etching, engraving, aquatint, wood, paper, and plastic relief printing, and lithography. Prerequisite: Graduate standing in art. $\frac{1}{2}$ to 3 units.

Sculpture

- 151. Sculpture.** Anatomical and ornamental forms: plaster molds and models; and wood and stone sculpture. Prerequisite: Freshman standing in art. 2 hours.
- 152. Sculpture.** Continuation of Sculpture 151. Prerequisite: Sculpture 151. 2 hours.
- 228. Introduction to Handmade and Cast Paper.** Introduces the techniques of hand-making paper of various materials and of casting paper as sculpture, including molding techniques, investigations into various uses, and applications of the two techniques. 3 hours.
- 253. Intermediate Sculpture, I.** A free, experimental, and creative use of permanent and impermanent sculpture materials; clays, wood, pastelines, and plasters. Prerequisite: Sculpture 152. 2 hours.
- 254. Intermediate Sculpture, II.** Special projects in stone carving and malleable sheet metal; lead, copper, brass, and aluminum. Prerequisite: Sculpture 253. 2 hours.
- 255. Sculpture Materials and Techniques, I.** Special projects for cast bronze: model preparations, investments, melting, pouring, chasing, and developing of patinas. Prerequisite: Sculpture 152; junior standing in curriculum in sculpture. 3 hours.
- 256. Sculpture Materials and Techniques, II.** Special projects in terra cotta: use of various clays; preparation and construction methods; special problems in casting methods and materials; kiln operation; fuels; and glazing. Prerequisite: Sculpture 255. 3 hours.
- 257. Advanced Sculpture, I.** Introduction to plastics and welded metals: projects utilizing the special qualities of these materials. Prerequisite: Sculpture 254. 2 hours.
- 258. Advanced Sculpture, II.** Projects in permanent materials: special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 257. 2 hours.
- 259. Advanced Sculpture Materials and Techniques, I.** Projects in various permanent materials: special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 256. 3 hours.
- 260. Advanced Sculpture Materials and Techniques, II.** Continuation of Sculpture 259. Prerequisite: Sculpture 259. 3 hours.
- 290. Senior Honors in Sculpture.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in sculpture, a cumulative grade-point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Sculpture Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the school. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 328. Handmade and Cast Paper.** Examines advanced techniques of handmaking paper of various materials and of casting paper as sculpture: includes sheet forming, studies of molding techniques, plant fibers, and dyes appropriate for papermaking. Prerequisite: Sculpture 228 or graduate standing in art and design curricula. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.

- 391. Advanced Sculpture Techniques.** Advanced work in various sculptural media. Prerequisite: Consent of instructor. 2 hours, or $\frac{1}{2}$ to 1 unit.
- 428. Advanced Papermaking.** Artistic applications of hand paper making with emphasis upon individual aesthetic expressions. Prerequisite: Sculpture 328 or graduate standing in art and design. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 3 units.
- 491. Special Problems in Sculpture.** Directed individual creative activity or research. Prerequisite: Graduate standing in sculpture. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 496. Sculpture Laboratory.** Experience at a professional level in sculptural techniques including metals casting, welding, stone carving, wood carving, clay modeling, and ceramic sculpture, with emphasis on the development of creative achievement. Prerequisite: Enrollment in the M.F.A. program in sculpture or consent of departmental graduate committee. 1 to 3 units.

ART EDUCATION

(See Art and Design)

ASIAN STUDIES

(Including Chinese, Japanese, and Korean)

Director of Center for East Asian and Pacific Studies: B. Karsh

Center Office: Room 201, 1208 West California, Urbana

All 200-level language courses, Chinese 301 and 302, Japanese 301 and 302, and Korean 301 and 302 are open to freshmen.

Asian Studies

- 104. Asian Mythology.** Same as Religious Studies 104. See Religious Studies 104.
- 122. History of East Asian Religions.** Same as Religious Studies 122. See Religious Studies 122.
- 132. Zen.** Same as Religious Studies 132. See Religious Studies 132.
- 135. Korean Personalities.** Same as Korean 135. See Korean 135.
- 150. Introduction to Japanese Culture.** Same as Japanese 150. See Japanese 150.
- 175. Masterpieces of East Asian Literature.** Same as Chinese 175, Japanese 175, and Comparative Literature 175. Study of major works in the literary traditions of China and Japan, including haiku, Noh, Tale of Genji, kabuki, Tang poetry, Dream of the Red Chamber, Ming theatre, and the colloquial tale. No knowledge of Chinese or Japanese language required. 3 hours.
- 185. Kabuki.** Same as Fine and Applied Arts 185. See Fine and Applied Arts 185.
- 186. Southeast Asian Civilizations.** Same as Anthropology 186 and History 172. See Anthropology 186.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Japanese Literature in Translation, I.** Same as Comparative Literature 211 and Japanese 205. See Japanese 205.
- 206. Japanese Literature in Translation, II.** Same as Comparative Literature 212 and Japanese 206. See Japanese 206.
- 207. Classical Chinese Literature.** Same as Chinese 207. See Chinese 207.
- 208. Chinese Popular Literature.** Same as Chinese 208. See Chinese 208.

- 218. Japanese Hero Types.** Same as Comparative Literature and Japanese 218. See Japanese 218.
- 219. Women in Japanese Literature.** Same as Comparative Literature and Japanese and Women's Studies 219. See Japanese 219.
- 238. Hiroshima/Nagasaki and the Literature of Survival.** Same as Comparative Literature and Japanese 238. See Japanese 238.
- 261. Family and Community in China and Japan.** An introduction to Chinese and Japanese societies at the family, village, and city levels; examines traditional marriage, child-rearing, women's roles, farming, and community leadership as well as modern trends in these areas using a variety of documentary, fictional, and visual sources. 3 hours.
- 262. Popular Culture in China and Japan.** An introduction to the popular cultural traditions of China and Japan; examines popular morality, cosmology, religion, secret societies, the "way of the samurai," body and health (acupuncture, meditation, Zen, T'ai-chi chuan), aesthetics (poetry, painting, tea ceremony), and the world of the courtesan using a variety of documentary, fictional, and visual sources. 3 hours.
- 265. Contemporary Korean Society.** Same as Sociology 265. Introduces contemporary Korean society: the twentieth-century struggle of Korea for an individual identity; the Korean road to modernization and its significance for the United States and the developing world. 3 hours.
- 266. Tracing Turkish Traditions.** Examines tradition formation among Turkish-speaking peoples over the past 2,000 years with varied cultural contexts, from China to the Balkans, Siberia to India, Central Asia to Asia Minor and North Africa. Interdisciplinary in nature—including, but not limited to anthropology, fine arts, history, literature, religion—with selected topics. 3 hours.
- 267. History of Korea. Same as History 267.** An historical examination of the Korean experience, from the earliest times to the present day: basic political, social, economic patterns; examination of the cultural and intellectual tradition; Korea's historical role in Asia; the Korean colonial experience; Korea in the modern world. 3 hours.
- 285. Premodern Japanese History.** Same as History 285. See History 285.
- 286. Modern Japanese History.** Same as History 286. See History 286.
- 287. Introduction to Buddhism.** Same as Religious Studies 287. See Religious Studies 287.
- 288. Religion in Asian Society.** Same as Religious Studies 288 and Sociology 288. A comparative study of the inter-influences of religion and society of Asian countries concentrating on the problems of social change and development with special attention to the religions and social systems of major Asian nations such as Iran, India, China, and Japan. 3 hours.
- 290. Individual Study.** Directed readings in the languages and literatures of East Asia, South Asia, Southeast Asia, or the Near East. The area selected depends on the student's interest. Prerequisite: Consent of instructor. 2 to 4 hours.
- 291. Honors Tutorial.** A tutorial in the civilizations of East Asia, South Asia, Southeast Asia, or the Near East. The geographical area or nation and discipline depend on student interests. All students submit a substantial paper. Prerequisite: Prior completion of two honors activities, prior completion of work in Asian studies, and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 6 hours.
- 295. Topics in Asian Religions.** Same as Religious Studies 295. See Religious Studies 295.
- 298. Colloquium in Asian Studies.** Prerequisite: Junior standing. 3 hours. (Counts for advanced hours in LAS.)
- 303. Japanese Society.** Same as Sociology 327. See Sociology 327.
- 311. The Chinese Novel.** Same as Chinese and Comparative Literature 311. See Chinese 311.
- 312. Modern Chinese Literature in Translation.** Same as Chinese and Comparative Literature 312. See Chinese 312.
- 315. Modern Japanese Fiction in Translation.** Same as Comparative Literature and Japanese 315. See Japanese 315.

- 325. Modern Japanese Drama.** Same as Japanese 325 and Theatre 320. See Japanese 325.
- 328. Sociology of Asian Religions.** Same as Religious Studies and Sociology 328. See Sociology 328.
- 337. Government and Politics of China.** Same as Political Science 337. See Political Science 337.
- 338. Governments and Politics in the Middle East.** Same as Political Science 338. See Political Science 338.
- 345. Tutorials in East and Southeast Asian Languages.** Tutorials at the elementary, intermediate, and advanced levels in special Asian languages not regularly offered are available with the consent of the director of the Center for East Asian and Pacific Studies. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of director of the Center for East Asian and Pacific Studies. 2 to 5 hours, or $\frac{1}{2}$ to 1 unit. May be repeated up to six semesters successively, but no more than 4 units of graduate credit may be accumulated in any one language.
- 347. Governments and Politics of Southeast Asia.** Same as Political Science 347. See Political Science 347.
- 348. Government and Politics of Japan.** Same as Political Science 348. See Political Science 348.
- 349. Governments and Politics of South Asia.** Same as Political Science 349. See Political Science 349.
- 350. East Asian Bibliography and Research Methods.** Introduces research methods and reference works for East Asian studies through practical exercises and assignments. Students registering for 2 hours or $\frac{1}{2}$ unit (Part I) use only Western sources; students registering for 4 hours or 1 unit (Parts I and II) use Chinese or Japanese sources for the second part of the course. Prerequisite: (Part II) Chinese 204 or Japanese 204; Part I requires no prerequisite. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 360. Peoples and Cultures of Oceania.** Same as Anthropology 360. See Anthropology 360.
- 362. Asian Prehistory.** Same as Anthropology 362. See Anthropology 362.
- 366. Japanese Cinema.** Same as Humanities 366. See Humanities 366.
- 368. Peoples and Cultures of India.** Same as Anthropology 368. See Anthropology 368.
- 369. Asian Systems of Social Stratification.** Same as Anthropology 369. See Anthropology 369.
- 371. Comparative Social Institutions.** Same as Sociology 371. See Sociology 371.
- 380. Buddhist Meditation.** Same as Religious Studies 384. See Religious Studies 384.
- 383. Self and Society in Japan.** Same as Anthropology 383. See Anthropology 383.
- 384. Modern Chinese Society and Culture.** Same as Anthropology 384. Studies the culture and society of modern China and its socialist transformation after 1949; emphasizes rural society and peasant culture. Prerequisite: One course in East Asian Studies or Anthropology; or consent of instructor. 3 hours or 1 unit.
- 385. Chinese Foreign Policy.** Same as Political Science 389. See Political Science 389.
- 386. Peoples and Cultures of Mainland Southeast Asia.** Same as Anthropology 386. See Anthropology 386.
- 387. Peoples and Cultures of Insular Southeast Asia.** Same as Anthropology 387. See Anthropology 387.
- 388. Prehistory of Oceania.** Same as Anthropology 388. See Anthropology 388.
- 437. Problems in Chinese Politics and Government.** Same as Political Science 437. See Political Science 437.
- 448. Problems in Japanese Politics and Government.** Same as Political Science 448. See Political Science 448.
- 450. Seminar in Asian Studies.** Seminar on selected Asian and Middle Eastern topics. The topic will vary with the instructor and the seminar may be repeated for a maximum of 3 units. Prerequisite: Consent of instructor. 1 unit.
- 490. Individual Study and Research in Special Topics.** Supervised individual investigation or study of a topic not covered by regular course offerings. The topic selected by the student and the proposed plan of study must be approved by the Asian Studies

curriculum adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 3 units.

Chinese

- 101. Elementary Chinese, I.** An introduction to Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 102. Elementary Chinese, II.** Second term of spoken Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Chinese. Prerequisite: Chinese 101. 5 hours.
- 175. Masterpieces of East Asian Literature.** Same as Asian Studies 175, Japanese 175, and Comparative Literature 175. See Asian Studies 175.
- 203. Intermediate Chinese, I.** First term of second year of the Chinese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Chinese 102 or 301, or equivalent. 5 hours.
- 204. Intermediate Chinese, II.** Concentration on ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on ability to read ordinary simple text in Chinese. Prerequisite: Chinese 203 or equivalent. 5 hours.
- 207. Classical Chinese Literature.** Same as Asian Studies 207. Surveys Chinese literary works from the classical tradition (history, philosophy, poetry, literary criticism) with attention to intellectual and artistic values. No knowledge of Chinese is required. 3 hours.
- 208. Chinese Popular Literature.** Same as Asian Studies 208. Surveys Chinese popular literary works written in the vernacular language (short story, novel, and drama), with attention to cultural and artistic values. No knowledge of Chinese is required. 3 hours.
- 211. Chinese Calligraphy.** Brief history of Chinese calligraphy; practice of regular and grass forms with Chinese brush pens. Prerequisite: Chinese 102 or equivalent. 1 hour.
- 301. Intensive Chinese, I.** Intensive introduction to the spoken and written Chinese language; emphasizes the introduction of basic vocabulary and sentence patterns. This course is equivalent to Chinese 101 and 102. For all students who have no previous Chinese and who want to learn at a rapid rate. 10 hours or 2 units.
- 302. Intensive Chinese, II.** Continuation of Chinese 301. Emphasizes conversation and reading. This course is equivalent to Chinese 203 and 204. Prerequisite: Chinese 102 or 301, or equivalent. 10 hours or 2 units.
- 305. Advanced Chinese, I.** Continuation of intermediate-level Chinese with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 204 or 302. 5 hours or 1 unit.
- 306. Advanced Chinese, II.** Continuation of Chinese 305 with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 305. 5 hours or 1 unit.
- 307. Introduction to Literary Chinese.** An introduction to literary language, style, and structural patterns as reflected in the Confucian classics and other literary, philosophical, and historical texts. Prerequisite: Chinese 102 or equivalent. 3 hours or 1 unit.
- 308. Readings in Literary Chinese.** Readings in texts selected from the Confucian classics and other literary, philosophical, and historical texts. Attention is given to linguistic and intellectual patterns and to problems of translation. Prerequisite: Chinese 307 or equivalent. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 309. Social Science Readings in Chinese.** Reading and translation of selected Chinese texts in the social sciences with emphasis on specialized terminology and prose style. Prerequisite: Three years of modern Chinese. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 311. The Chinese Novel.** Same as Asian Studies and Comparative Literature 311. Reading

and analysis of representative pieces of Chinese fiction from the fourth century B.C. to 1900 with emphasis on the development of Chinese fiction, its place in the literary tradition, and its role in society. No knowledge of Chinese is required. 3 hours or 1 unit.

- 312. Modern Chinese Literature in Translation.** Same as Asian Studies and Comparative Literature 312. Reading and analysis of representative selections from Chinese literature since the May 4 Movement, with special attention to the relationship between literature and ideology in twentieth-century China. No knowledge of Chinese is required. 3 hours or 1 unit.
- 321. Oral Chinese, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 204 or 302, or equivalent. 3 hours or 1 unit.
- 322. Oral Chinese, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 321 or consent of instructor. 3 hours or 1 unit.
- 330. Introduction to Far Eastern Linguistics.** Same as Japanese, Korean, and Linguistics 330. See Linguistics 330.
- 390. Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 399. Study Abroad.** Lectures, seminars, and practical work in Chinese language, literature, and civilization and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5. 0 credit.
- 415. Premodern Fiction and Drama.** Close readings and analysis of selected pre-twentieth-century Chinese works written in the pre-modern vernacular language. Prerequisite: Chinese 308. 1 unit.
- 417. Studies in Literary Chinese Texts.** Close reading and analysis of selected Chinese texts written in the Chinese literary language with emphasis on poetry and artistic prose. Prerequisite: Chinese 308. 1 unit.

Japanese

- 101. Elementary Japanese, I.** An introduction to Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 102. Elementary Japanese, II.** Second term of spoken Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Japanese. Prerequisite: Japanese 101. 5 hours.
- 150. Introduction to Japanese Culture.** Same as Asian Studies 150. A topical introduction to Japanese cultural and aesthetic life with attention to cultural and aesthetic patterns as they are reflected in literature, language, and the arts. 3 hours.
- 175. Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175 and Comparative Literature 175. See Asian Studies 175.
- 203. Intermediate Japanese, I.** First term of second year of the Japanese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Japanese 102 or 301, or equivalent. 5 hours.
- 204. Intermediate Japanese, II.** Concentration on ability to engage in reasonably fluent discourse in Japanese, on comprehensive views of formal grammar, and on ability to read simple ordinary written Japanese. Prerequisite: Japanese 203 or equivalent. 5 hours.
- 205. Japanese Literature in Translation, I.** Same as Asian Studies 205 and Comparative Literature 211. A survey of Japanese literature from earliest times to around 1600 A.D.; readings in prose, poetry, and drama in English translation. 3 hours.

- 206. Japanese Literature in Translation, II.** Same as Asian Studies 206 and Comparative Literature 212. A survey of Japanese literature from around 1600 A.D. to recent times; readings in prose, poetry, and drama in English translation; and lectures and papers. 3 hours.
- 218. Japanese Hero Types.** Same as Asian Studies and Comparative Literature 218. Analysis of Japanese hero and heroine archetypes in comparison with their Western counterparts: from shaman ruler, Don Juan, samurai romantics, feudal paragons, to modern superfluous hero and self-destructive hollow man; no knowledge of Japanese required. Discussion with readings and films. 3 hours.
- 219. Women in Japanese Literature.** Same as Asian Studies and Comparative Literature and Women's Studies 219. Critical study of Japanese women's history as represented in literature, emphasizing religio-social-literary significance, male view of women, female roles, and universal experience of growing up female; no knowledge of Japanese required. Readings and discussion. 3 hours.
- 238. Hiroshima/Nagasaki and the Literature of Survival.** Same as Asian Studies and Comparative Literature 238. Examination of the ways in which the Japanese have tried to come to terms with the experience of nuclear war through a study of memoirs, novels, essays, plays, and films; draws comparison with other literature of survival like that produced after the Nazi Holocaust. Readings in English. 3 hours.
- 301. Intensive Japanese, I.** An intensive introduction to spoken and written Japanese; emphasis on basic grammatical patterns and vocabulary. Equivalent to Japanese 101 and 102; for students who have no previous Japanese and who want to learn at a rapid rate. 10 hours or 2 units.
- 302. Intensive Japanese, II.** Continuation of Japanese 301. Emphasis on conversation and reading. Equivalent to Japanese 203 and 204. Prerequisite: Japanese 102 or 301, or equivalent. 10 hours or 2 units.
- 305. Advanced Japanese, I.** Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 204 or 302; or consent of instructor. 5 hours or 1 unit.
- 306. Advanced Japanese, II.** Continuation of Japanese 305. Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 305 or equivalent. 5 hours or 1 unit.
- 309. Social Science Readings in Japanese.** Readings in Japanese social science materials, including articles from newspapers, periodicals, and learned journals. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 315. Modern Japanese Fiction in Translation.** Same as Asian Studies and Comparative Literature 315. Critical study of selected 20th century writers with an emphasis on cultural background, world view, human relationships, esthetic theories, Japanese and Western traditions, and universal literary issues. Requires no knowledge of Japanese; readings and films. Prerequisite: Junior standing or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 325. Modern Japanese Drama.** Same as Asian Studies 325 and Theatre 320. Examination of the Japanese Modern Theatre movement from 1887 to the present through representative plays and relevant documents. Readings in English; no knowledge of Japanese required. Prerequisite: Two semesters of literature or theatre at the 200-level or above; or consent of instructor. 3 hours or 1 unit.
- 330. Introduction to Far Eastern Linguistics.** Same as Chinese, Korean, and Linguistics 330. See Linguistics 330.
- 390. Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 399. Study Abroad.** Lectures, seminars, and practical work in the Japanese language, literature, and civilization, and in other academic areas appropriate to the student's

course of study. Prerequisite: Junior standing and a grade point average of 3.50. 0 to 16 hours, or 0 units.

Korean

- 101. Elementary Korean, I.** An introduction to Korean, including conversation with a native Korean-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 102. Elementary Korean, II.** Second term of spoken Korean, including conversation with a native Korean-speaking tutor under the direction of linguist instructor; studies formal grammar based on conversational materials; and includes some work on written Korean. Prerequisite: Korean 101. 5 hours.
- 135. Korean Personalities.** Same as Asian Studies 135. Surveys Korean culture as exemplified by celebrated legendary, fictional, and historical personalities: founding heroes, virtuous generals, fighting monks, fanatics, martyrs and rebellious rulers, queens, concubines and courtesans, poets, kings, and mad princes; illustrates recurring themes and patterns in Korean culture. No knowledge of Korean required. 3 hours.
- 203. Intermediate Korean, I.** First term of second year of the Korean language, including drill for advanced conversational fluency; introduces a variety of styles and levels of discourse and usage; and increases study of the written language and formal grammar. Prerequisite: Korean 102 or 301. 5 hours.
- 204. Intermediate Korean, II.** Second term of second year of the Korean language including drill for more advanced conversational fluency; more variety of styles and levels of discourse and usage; more formal grammar and an introduction of basic Chinese characters. Prerequisite: Korean 203. 5 hours.
- 301. Intensive Korean, I.** Intensive introduction to spoken and written Korean; emphasizes the introduction of basic vocabulary and grammar. Equivalent to Korean 101 and 102; for students who have not previously studied Korean and want to learn at a rapid rate. 10 hours or 2 units. Credit may not be received for both Korean 301 and either Korean 101 or 102.
- 302. Intensive Korean, II.** Continuation of Korean 301; continuing practice of conversation and reading; and introduction to Korean texts written in mixed script. Equivalent to Korean 203 and 204. Prerequisite: Korean 301 or 102. 10 hours or 2 units. Credit may not be received for both Korean 302 and either Korean 203 or 204.
- 305. Advanced Korean, I.** Concentrates on the ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on the ability to read ordinary texts in Korean, including some Chinese characters. Prerequisite: Korean 204 or 302. 3 hours or $\frac{3}{4}$ unit.
- 306. Advanced Korean, II.** Continuation of Korean 305; emphasizes rapid reading, fluent conversation, learned vocabulary and idiom acquisition, and reading of newspapers. Prerequisite: Korean 305. 3 hours or $\frac{3}{4}$ unit.
- 309. Social Science Readings in Korean.** Reading and analysis of selected Korean texts in the social sciences, emphasizing specialized terminology and prose style. Prerequisite: Korean 306 or equivalent; registration in a program of studies dealing with East Asia. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 330. Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Linguistics 330. See Linguistics 330.
- 399. Study Abroad.** Lectures, seminars, and practical work in Korean language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5; Korean 102 or equivalent, or consent of the Asian Studies advisor. 0 to 16 hours, or 0 units. May be repeated to a maximum of 32 hours per academic year.

ASTRONOMY

Head of Department: R. Allen

Department Office: 349 Astronomy Building, 1011 West Springfield, Urbana

- 100. Perspectives in Astronomy.** A one-semester introduction to astronomy. The nature of science; sun, planets, and moons; origin of the solar system; nature and evolution of stars; exploding stars; stellar remnants, including dwarfs, neutron stars, and black holes; molecules in space; galaxies and quasars; past and future of the universe; and life in the universe. Lectures and observation. 3 hours. Credit is not given to students with credit in Astronomy 101, 102, or 300; not open to students with credit in Physics 102, 107, or equivalent.
- 101. Descriptive Astronomy.** The first semester of a two-semester introduction to astronomy. Introductory survey of the universe; structure and motions of the earth and moon; planetary motions; physical nature of the planets; comets and meteors; and origin and evolution of the solar system. Lectures, discussion, and observation. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300; not open to students who have credit in Physics 102, 107, or equivalent.
- 102. Descriptive Astronomy.** The stars: distances, motions, and dimensions; atoms and radiation; structure, origin, and evolution of stars; structure of the Milky Way; and galaxies and the structure of the universe. Lectures, discussion, and observation. Prerequisite: Astronomy 101, or consent of instructor. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300.
- 110. Black Holes.** Studies evolution of our understanding of the force of gravity from Aristotle to Einstein; the nature of gravity as curved space; properties of black holes and gravitational waves; stellar evolution and the formation of black holes; models of black holes as energy sources for active galactic nuclei and quasars; black holes and cosmology. Non-mathematical treatment. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
- 111. Life in the Universe.** Reviews the nature and evolution of the physical Universe emphasizing the constraints thus imposed on possible abodes of life; the nature, origin, and evolution of life on Earth and implication for the possibility of extraterrestrial life; the search for life on other planets of the solar system; and the possibility of and search for life beyond the solar system. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
- 113. The Sky.** Examines the visual aspects and phenomena of the sky; astronomical lore and history. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
- 140. Astronomy and Civilization.** Examines the importance of astronomy in early western cultures; studies the impact of developing astronomical and physical discoveries and theories on western civilization, as well as the reverse impact of society on astronomy and physics. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. General Astronomy.** A survey of astronomy for students having some background in physics. The approach is primarily descriptive, but mathematical techniques are used where needed. The chief topics are orbits and gravitation; the bodies of the solar system; the nature and evolution of the stars; galaxies; and the structure of the universe. Prerequisite: Physics 102, 107, or equivalent; or consent of instructor. 3 hours. Credit is not given to students who have credit in Astronomy 101, 102, or 300.
- 290. Individual Study.** Individual study at an advanced undergraduate level. Prerequisite: Consent of adviser and of staff member who supervises the work. 2 to 4 hours.
- 300. Astronomy for Teachers.** A general course in astronomy designed for teachers which includes classical astronomy, modern developments, and aspects of the space program; discussion of available curriculum materials for elementary and secondary teaching and some practice given in telescopic observation. 4 hours or 1 unit. Credit is not given to students with credit in Astronomy 100, 102, or 210, or to astronomy majors. Graduate credit is given only to students in elementary and secondary teacher training programs.

- 304. Astrophysics, I.** Introduction to astrophysical problems, with emphasis on underlying physical principles: includes the nature of stars, equations of state, stellar energy generation, stellar structure and evolution, astrophysical neutrinos, binary stars, white dwarfs, neutron stars and pulsars, and novae and supernovae. Prerequisite: Physics 108, or consent of instructor. 3 hours or 1 unit.
- 305. Astrophysics, II.** Introduction to astrophysical problems: includes fundamentals of solar system astrophysics, elements of physical cosmology, and such additional topics as galactic nuclei, quasars, cosmic ray nuclei, the interstellar medium, and cosmic electrodynamics. Prerequisite: Astronomy 304, or consent of instructor. 3 hours or 1 unit.
- 314. Observational Astronomy.** Introduction to astronomical equipment: optical photography, photometry, and spectroscopy; radio astronomy; astronomical coordinate systems and transformations; determination of latitude, longitude, and time; and introduction to error theory and data analysis. Practical experience with the 12-inch refractor. Lectures and laboratory. Prerequisite: Astronomy 102 or 210; Mathematics 240, 241, or 245; or consent of instructor. 4 hours or 1 unit.
- 321. Galactic Astronomy.** Galactic structure: the observational data: stars in the solar neighborhood: the solar motion: stellar statistics and distribution: stellar populations: interstellar matter and spiral structure: and the whole galaxy. Prerequisite: Astronomy 102 or 210; Astronomy 305 or consent of instructor. 3 hours or 1 unit.
- 322. Extragalactic Astronomy.** Galactic dynamics. Galaxies: distances: structural features: groups and clusters: radio galaxies and quasars: and spatial distribution and motions. Prerequisite: Astronomy 321 or consent of instructor. 3 hours or 1 unit.
- 333. Solar System Astrophysics.** Planetary orbits and perturbations: physical perturbations; physical parameters of the planets; planetary interiors, atmospheres, magnetospheres, and surface layers; the satellites; asteroids and comets; meteors, meteorites, and tectites; interplanetary grains and gas; and problems of origin and evolution. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 396. Seminar in Astronomy.** Lectures on topics of current interest in astronomy and astrophysics: for advanced undergraduates and graduates. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours, or $1/2$ to 1 unit.
- 401. Stellar Atmospheres.** Physical characteristics of stellar atmospheres as derived from spectroscopic observations; radiation transfer; theory and observations of the continuous spectrum: limb darkening: formation of absorption lines: line profiles: curves of growth: relative chemical abundances: and emission features. Prerequisite: Consent of instructor. Desirable background includes some familiarity with atomic physics, advanced calculus, and general astronomy. 1 unit.
- 402. Theoretical Astrophysics.** Same as Physics 402. See Physics 402.
- 404. Stellar Structure and Evolution.** Same as Physics 404. Relationship between observable features of stars and the physical processes that occur in their interiors: topics include matter and radiation in stars (equations of state, modes of energy flow, nuclear energy production, and element synthesis); structure of stars during all phases prior to the supernova or planetary nebula stage: stellar pulsations with reference to Cepheids and RR Lyrae variables; and properties of white dwarfs, neutron stars, and contact binaries. Prerequisite: Physics 361 and 382, Physics 402, or consent of instructor. 1 unit.
- 405. Diffuse Matter Astrophysics.** Same as Physics 405. Interstellar gas: balance of microscopic processes, large scale structure, interaction with stars, dynamics, heating, ionization, and cooling; continuous and discrete radiation processes, excitation mechanisms, propagation of radiation, molecule formation, dust grains, star formation, magnetic fields, and cosmic rays. Prerequisite: Consent of instructor. 1 unit.
- 406. High Energy Astrophysics.** Same as Physics 406. Survey of nuclear processes in astrophysical environments: topics include nuclear energy generation, thermonuclear reactions, weak interactions and neutrino astrophysics, nucleosynthesis, superheavy nuclei, cosmochronology, and mechanisms of nova and supernova explosions. Prerequisite: Physics 402 or consent of instructor. 1 unit.

- 407. Radiation Hydrodynamics.** Dynamics of radiating fluids, i.e., fluids in which radiation dominates energy and/or momentum transport in the flow; emphasis on underlying physical principles with examples from astrophysics; numerical methods. Prerequisite: Astronomy 401 or consent of instructor. Familiarity with basic concepts of radiation transport, fluid mechanics, and tensors desirable. 1 unit.
- 424. General Relativity and Cosmology.** Same as Mathematics 460 and Physics 424. See Physics 424.
- 490. Individual Study.** Individual study or nonthesis research. Prerequisite: Consent of adviser and of staff member who supervises the work. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 4 units.
- 496. Seminar in Special Topics.** Prerequisite: Consent of instructor. 0 to 4 units.
- 499. Thesis Research.** 0 to 4 units.

ATMOSPHERIC SCIENCES

Head of Department: M. Mak

Department Office: 102 Atmospheric Sciences Building, 105 South Gregory, Urbana

- 100. Introduction to Meteorology.** Introduces the student to the basic concepts and principles of atmospheric science in a descriptive format; emphasizes the physics responsible for changes in the weather; uses current weather information to illustrate textbook material. 3 hours. Credit may not be received for both Atmospheric Sciences 100 and 222.
- 101. Weather Analysis Laboratory.** Introduces the scientific tools used by the meteorologist to diagnose current weather conditions and to forecast the weather; includes data analysis, map exercises, and the preparation of real-time weather forecasts. Prerequisite: Credit or concurrent registration in Atmospheric Sciences 100. 1 hour.
- 120. Severe and Unusual Weather.** Analyzes the world's most extreme weather-related events in terms of their scientific basis and their economic, human, and historical consequences; examples include blizzards, major cold waves, hurricanes and tornadoes, flash floods, droughts, and major air pollution events. Utilizes the department's weather data and computational facilities when appropriate. 3 hours.
- 199. Undergraduate Open Seminar.** Special topics each semester. 1 to 5 hours. May be repeated.
- 222. Weather Processes.** Introduction to the mean state of the atmosphere, the fundamental physics of weather processes, and the mechanisms producing daily weather changes, both qualitative and quantitative in nature. Prerequisite: Mathematics 242. 3 hours. Credit may not be received for both Atmospheric Sciences 222 and 100.
- 301. Principles of Atmospheric Physics.** Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere, and the formation of clouds and precipitation. Prerequisite: Mathematics 242 or 245; consent of instructor. 4 hours or 1 unit.
- 302. Principles of Atmospheric Dynamics.** Same as Physics 302. An introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of the neutral atmosphere. Prerequisite: Mathematics 343; consent of instructor. 4 hours or 1 unit.
- 310. Satellite Meteorology.** Reviews the theory and practice of observing the atmosphere using satellite-borne instrumentation; applications include weather analysis and forecasting using visible and infrared images, and the measurement of basic atmospheric variables such as temperature, moisture, wind, and precipitation. Prerequisite: Atmospheric Sciences 222 or 301; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 397. Topics in Atmospheric Sciences.** Special topics in atmospheric sciences at an advanced undergraduate level. Prerequisite: Advanced undergraduate standing and consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.

- 401. Synoptic Meteorology.** Examines the observed behavior of the atmosphere through the application of physical and hydrodynamical principles to analyses of real meteorological data; develops concepts for studying atmospheric circulations, particularly extratropical cyclones and anticyclones. Laboratory work includes the development of diagnostic techniques suitable for a better understanding of the current weather. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
- 405. Numerical Methods in Fluid Dynamics.** Same as Computer Science 405. Intended to give the student practical numerical techniques for solving those linear and nonlinear differential equations which appear frequently as initial and boundary value problems in hydrodynamics and dynamic meteorology. Prerequisite: Mathematics 343 or consent of instructor. 1 unit.
- 406. Dynamical Weather Prediction.** Describes the principles and methods of simulating and predicting large-scale atmospheric motions on the basis of hydrodynamics and thermodynamics. Prerequisite: Atmospheric Sciences 302. 1 unit.
- 408. Atmospheric General Circulation.** Reviews the observed general circulation of the earth's atmosphere; discusses the balance requirements of mass, momentum, and energy conservation; illustrates, by means of different mathematical modelings and laboratory physical modeling, the important processes which determine the earth's and other planets' general circulation; and considers theories of climatic changes. Prerequisite: Atmospheric Sciences 301 or equivalent, and Atmospheric Sciences 302. 1 unit.
- 411. Atmospheric Convection.** Atmospheric convection processes from the classical Benard-Rayleigh theory of convection to the structure and dynamics of isolated clouds, organized cloud systems, and ensembles of cumulus clouds; interactions of cumulus clouds with their environment. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
- 421. Precipitation Physics.** Develops an understanding of precipitation processes through cloud observations, microphysics, dynamics, and comprehensive theoretical models; includes growth by condensation, coalescence, and riming; and studies ice crystals, hail, and weather modification. Prerequisite: Atmospheric Sciences 301. 1 unit.
- 431. Boundary Layer Meteorology.** Comprehensive review of processes in the lowest layer of the atmosphere based on the statistical mechanics of turbulent motions; emphasizes the effects of earth's rotation, mean wind shear, stratification, thermal stability, interaction with the free atmosphere, and surface roughness; and includes applications for the numerical prediction of diurnal changes of the boundary layer structure, transports of momentum, heat, and moisture and pollution dispersion. Prerequisite: Atmospheric Sciences 302, Theoretical and Applied Mechanics 335, or equivalent. 1 unit.
- 441. Dynamics of Climate and Climate Change.** Global aspects of climate and climate change; empirical studies of the observed climate system; the heat budget, general circulation of the atmosphere, role of oceans and cryosphere, interannual variability, and causes of climate change; climate modeling; and long range forecasting and possible future trends. Prerequisite: Atmospheric Sciences 301 and 302, or consent of instructor. 1 unit.
- 451. Atmospheric Radiation.** Physical concepts and various methods of analysis of radiation scattering by atmospheric molecules, particulates, and clouds; infrared radiative transfer in a stratified inhomogeneous atmosphere; radiation and ozone photochemistry in the stratosphere; and remote temperature and composition sensing techniques using satellite radiation data. Prerequisite: Atmospheric Sciences 301 or Astronomy 380. 1 unit.
- 490. Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $1/2$ to 2 units.
- 491. Seminar in Atmospheric Sciences.** Seminar on topics of current interest; see Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 497. Special Topics in Atmospheric Sciences.** Lecture course in topics of current interest; subjects such as tropical meteorology, aerosol physics and geophysical fluid dynamics will be covered in semester offerings on a regular basis. Prerequisite: Consent of instructor. 0 to 1 unit.
- 499. Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units.

AVIATION

Director of Institute: H. L. Taylor

Institute Office: Terminal Building, University of Illinois Willard Airport, Savoy 61874

- 101. Private Pilot, I.** An introductory course in partial preparation for FAA Private Pilot certification; includes instruction in aerodynamics, airplane systems, airport and airplane operations, federal regulations, and airplane safety; and includes 27 hours of inflight training (21 hours dual, 5 hours solo, 1 hour flight exam) and 6 hours in a flight simulator. Private Pilot certification requires completion of Aviation 120. 3 hours.
- 102. Orientation Refresher.** An intermediate course to provide additional aeronautical proficiency in the primary trainer and serve as an introduction to other types of aircraft; emphasis on airplace utility and safety; eighteen hours of flight, four hours of flight simulator training, and five hours of flight discussion directed to airplane operation. Prerequisite: Credit or concurrent registration in Aviation 101, or consent of director. 0 credit.
- 120. Private Pilot, II.** Second course in preparation for FAA Private Pilot certification; includes instruction in airplane operation, navigation, night flying, and meteorology; and includes 36 hours of inflight training (19 hours dual, 15 hours solo, 2 hours flight exams), and 6 hours in a flight simulator. Students successfully completing final examinations will be issued a Private Pilot Certificate. Prerequisite: Credit or concurrent registration in Aviation 101. 3 hours.
- 121. Private Pilot, IIA.** A special course for the student who is entering the University Pilot Training Program with a Private Pilot Certificate and who desires to continue in the commercial-instrument sequence (Aviation 130, 140, etc.); includes instruction in airplane operations, navigation, and meteorology; and includes 17 hours of inflight instruction (minimum of 12 hours dual, maximum of 4 hours solo, and a 1 hour flight exam), and 3 hours in a flight simulator. Prerequisite: Private Pilot Certificate (minimum of 60 hours of flight). 2 hours.
- 130. Commercial-Instrument, I.** The first of a series of advanced flight courses in preparation for an FAA Commercial Pilot Certificate; reviews cross-country flight with emphasis on local instrument flying procedures; and includes $40\frac{1}{2}$ hours of lecture-discussion on instrument flying, navigation, advanced maneuvers, and flight physiology, and 32 hours of flight ($12\frac{1}{2}$ dual, 16 solo, and $3\frac{1}{2}$ pilot-in-command to include 1 flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 120, consent of director. 3 hours.
- 140. Commercial-Instrument, II.** The second in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; IFR/VFR local and cross country. Includes $40\frac{1}{2}$ hours of lecture discussion on advanced maneuvers, aerodynamics, and navigation and 28 hours of flight ($5\frac{1}{2}$ dual, 12 solo, and $10\frac{1}{2}$ pilot in command to include one flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 130. 3 hours.
- 142. Reciprocating Powerplant Theory.** Examines operating principles of a broad range of reciprocating aircraft powerplants; includes power development and efficiency calculations, design, and manufacturing techniques, and select engine systems. 3 hours.
- 143. Materials and Processes, I.** A study of materials and processes used in the maintenance of aircraft; includes theory and practice in precision measurement, identification and use of hardware, safetying techniques, identification of materials used in aircraft plumbing systems, and nondestructive inspection methods. 3 hours.
- 144. Turbine Powerplant Theory.** Examines operating principles of broad range of aviation gas-turbine powerplants; includes power development and efficiency calculations, design and manufacturing techniques, operations, and select engine systems. 3 hours.
- 145. Aircraft Electrical Systems.** A study of the physical principles that apply to present-day aerospace vehicles; includes AC and DC electrical theory, power sources, transmission, measurement, solid state devices, integrated circuits, and problems in aircraft electrical circuits. 3 hours.
- 147. Introduction to Federal Aviation Regulations.** A study of regulations, directives,

- and specifications governing the manufacture, operation, and maintenance of aircraft, and the control of air traffic as well as the qualifications and certification of personnel and equipment engaged in aircraft operation and maintenance. 3 hours.
- 152. Powerplant Systems, I.** Theory and operating principles of the ignition, starting, and electrical power generating components and systems used with aircraft turbine and reciprocating powerplants. Prerequisite: Aviation 142 and 145. 4 hours.
- 153. Aircraft Materials and Processes, II.** A survey of materials used in the manufacture of structural components of aerospace vehicles; emphasis on the sources, manufacturing processes, physical properties, and working characteristics of various ferrous and non-ferrous metals. 2 hours.
- 154. Powerplant Systems, II.** Theory of operation, design, and maintenance procedures for fixed pitch and controllable propellers; includes a study of propeller governing and control systems for reciprocating and turboprop engines. Prerequisite: Aviation 145. 3 hours.
- 155. Aerodynamics and Load Planning.** Calculating wing rib layout, load factors, load planning, weight and balance, powerplant performance, and an introduction to high speed aerodynamics. 3 hours.
- 156. Powerplant Systems, III.** An introduction to fuels and fuel systems as related to aircraft turbine and reciprocating powerplants; study of fuel system functions including carburetion, fuel injection, fuel management, and supercharging. Prerequisite: Aviation 142 and 145. 3 hours.
- 157. Powerplant Conditioning and Testing.** A study of powerplant malfunction, diagnosis and maintenance procedures, materials, and equipment; includes condition monitoring techniques and some of the economic aspects of powerplant maintenance. Prerequisite: Aviation 143, 144, 152, 153, 154, and 156; concurrent registration in Aviation 159 or consent of instructor. 7 hours.
- 159. Powerplant Maintenance and Inspection System.** Studies specialized inspection techniques, equipment, and procedures used in the maintenance of aircraft powerplants; includes federal aviation regulations, advisory circulars, airworthiness directives, and manufacturers' publications, and record-keeping systems as they apply to powerplants. Prerequisite: Aviation 142, 143, 144, 145, 147, 152, 154, and 156; concurrent registration in Aviation 157 or consent of instructor. 2 hours.
- 163. Aircraft Materials and Processes, III.** A survey of nonstructural materials used in the construction of aircraft components; the sources, manufacturing processes, physical properties, and working characteristics of synthetics, fabrics, composites, woods, and their associated surface treatments studied in detail. Prerequisite: Credit or concurrent registration in Aviation 143. 3 hours.
- 164. Aircraft Systems: Survey of Rotary Wing Technology.** Includes airfoil and drive system inspection, powerplant operation, fire detection, extinguishing systems, hydraulics, pneumatics, flight control, and electrical systems. Prerequisite: Consent of instructor. 3 hours.
- 165. Aircraft Fabricating Processes, I.** Procedures and techniques of mechanical, non-fusion attachment; sheet metal forming; and use of adhesives, bonded materials, and plastics in aircraft component fabrication. Laboratory experiences include the use of mechanical fasteners, similar and dissimilar metal assembly, and plastic and bonded structure fabrication. Prerequisite: Aviation 143, 153, and 155. 4 hours.
- 167. Aircraft Fabricating Processes, II.** Fusion and adhesion procedures and techniques including gas, AC and DC arc, and inert gas processes. Laboratory experiences include fusion and adhesion processes with representative metals used in the aircraft industry. Prerequisite: Aviation 143 and 153; General Engineering 105. 3 hours.
- 169. Aircraft Systems, I.** A study of basic principles and design concepts of the environmental and life-support systems used in modern aircraft; study of representative systems for pressurization, oxygen, heating, cooling, and ice and fire protection with detailed emphasis on individual components and their relationship to the complete system. Prerequisite: Aviation 145. 4 hours.
- 170. Aircraft Systems, II.** Electrical distribution circuits and associated lighting, power, communication, navigation, and instrumentation systems common to modern aircraft;

emphasis on circuit analysis and performance testing. Prerequisite: Aviation 145, 152, and 155. 5 hours.

- 172. Aircraft Systems, III.** Includes hydraulic and pneumatic power systems as utilized in modern aircraft; emphasis on theory of operation, design concepts, component relationships, and malfunction diagnosis. Prerequisite: Aviation 145. 3 hours.
- 174. Aircraft Assembly and Inspection.** Aircraft assembly, configuration, and alignment consistent with associated aerodynamics; includes structure and systems inspection, and FAA regulations. Prerequisite: Aviation 163, 165, 167, 169, 170, and 172; or concurrent registration in Aviation 169, 170, or 172, and consent of instructor. 5 hours.
- 179. Airframe Maintenance and Inspection Systems.** Studies specialized inspection techniques equipment, and procedures used in the maintenance of aircraft/rotorcraft airframes; includes Federal Aviation regulations, advisory circulars, airworthiness directives, manufacturers' publications, record-keeping systems as they apply to airframes. Prerequisite: Aviation 163, 165, 167, 170, 172, and 174; or concurrent registration in Aviation 172 and 174. 2 hours.
- 181. Aircraft Communication Systems.** Comprehensive study of the characteristics and operating principles of modern very-high frequency (VHF) and ultra-high frequency (UHF) airborne communications equipment. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 182 and 183. 5 hours.
- 182. Aircraft Navigation Systems.** Study of the characteristics and operating principles of airborne navigation equipment; includes VHF omnidirectional range (VOR), instrument landing system (ILS), automatic direction finding (ADF), and area navigation (RNAV). Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 183. 5 hours.
- 183. Aircraft Pulse Systems.** Operating principles, applications, diagnosis, and maintenance of airborne pulse equipment, including distance-measuring equipment (DME), transponders, and radar. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 182. 5 hours.
- 185. Aircraft Flight Control Systems.** Operating principles, diagnosis, and maintenance of flight directors, autopilots, and area navigation (RNAV) airborne computers (analog and digital). Prerequisite: Aviation 181, 182, and 183. 5 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Commercial-Instrument, III.** The third in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; reviews cross country flight, emphasizing instrument flying procedures. Includes 40½ hours of lecture discussion on cross country procedures, aircraft powerplants and systems, and aircraft maintenance inspections as well as 28½ hours of flight (7 dual, 11½ solo, and 10 pilot in command to include one flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 140; consent of director. 5 hours.
- 210. Commercial-Instrument, IV.** The fourth and final in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate with an instrument rating: IFR, VFR cross-country, and VFR commercial maneuvers; includes 40½ hours of lecture-discussion on applied meteorology, aircraft operation, and federal aviation regulations and 31½ hours of flight (13½ dual, 10 solo, and 8 pilot-in-command to include 2 flight exams for qualified individuals), plus 4 hours in a flight simulator. Prerequisite: Aviation 200, consent of director. 5 hours. Students may not receive credit for both Aviation 210 and 211.
- 211. Commercial-Instrument, V.** The fourth and final in a series of advanced flight courses in preparation for the FAA Commercial Certificate with both instrument and multi-engine ratings: IFR local and cross-country; VFR commercial maneuvers in multi-engine aircraft. Includes 40½ hours of lecture discussion in applied meteorology, multiengine aircraft operations, and Federal Aviation regulations and 31 hours of flight (23½ dual, 7½ solo) plus 4 hours in a flight simulator and 4 hours of flight tests. Prerequisite: Aviation 200, consent of director. 5 hours. Students may not receive credit for both Aviation 210 and 211.
- 220. Flight Instructor.** Prepares the commercial pilot for an FAA Flight Instructor certificate. Forty-eight classroom hours of ground school instruction on techniques of flight

- instruction and theory of flight, and a minimum of twenty-three hours of flight training in four-place aircraft, two hours in a flight simulator, three hours practice teaching in a flight simulator, and one hour flight check. Prerequisite: Commercial pilot certificate; instrument rating; junior standing; consent of director. 3 hours.
- 222. Instrument Flight Instructor.** Leads to an instrument instructor's rating on the student's flight instructor certificate; five hours of simulator, ten hours of flight and one hour of flight check time. Includes refresher on chart symbol interpretation, federal aviation regulations, communications, instrument construction and operation, and electronic aids to navigation; designed to include obtaining a flight instructor instrument rating. Prerequisite: Commercial pilot certificate; instrument rating; flight instructor certificate; airplane rating; consent of director. 1 hour.
- 224. All Attitude Orientation.** Safe handling of an aircraft in all attitudes through various aerobatic maneuvers which include loops, snap rolls, slow rolls, Immelmann, Cuban 8's and similar type maneuvers; thorough check of takeoff and landing procedures. Prerequisite: Aviation 101 and 120 or the private pilot certificate; consent of director. 1 hour.
- 250. Practice Teaching, Airplane.** Practice teaching using classroom, audiovisual material, simulator, and airplane; prepares the certified flight instructor to teach in all modes of aviation education. A minimum of 2 hours of classroom lecture, 5 hours of simulator instruction, and 19 hours of airplane instruction is given by the student; an additional 20 hours of classroom lecture clarifies and explains the proper method of successful instruction. Prerequisite: Aviation 220 or flight instructor certificate; junior standing; consent of director. 3 hours.
- 280. Special Rating (Multiengine Land).** Prepares the commercial pilot for an FAA multiengine land airplane rating; 16 hours of discussion and 9 hours of flight (7 $\frac{1}{2}$ dual, $\frac{1}{2}$ solo, and 1 flight exam for qualified individuals in a multiengine land airplane). Prerequisite: Commercial Pilot Certificate, consent of director. 1 hour.
- 284. Jet Aircraft Systems and Operations, I.** An operator-oriented study of modern jet systems and procedures, including related federal aviation regulations, aerodynamics, weight, and balance; preparation for the airline flight engineer. Prerequisite: Commercial Pilot Certificate with Instrument Rating; or Private Pilot Certificate and credit or concurrent registration in Aviation 169, 170, and 172; or consent of instructor. 3 hours.
- 290. Advanced Topics in Avionics.** Independent study of advanced topics in the applications of aviation electronics. Prerequisite: Second year standing in aviation or consent of instructor. 1 to 4 hours.
- 291. Special Ratings and/or Specialized Flight.** Prepares the commercial pilot for special FAA pilot certificates and/or ratings such as seaplane, airline transport pilot, and helicopter, and specialized flight such as advanced multiengine operation; sixteen hours of preflight (ground school) instruction and variable flight instruction as selected by the student. Options are advanced multiengine, helicopter, and airline transport pilot. Registration is limited to professional students with approval of director through head of pilot training. Prerequisite: Commercial pilot certificate; consent of director. 1 hour.
- 294. Airport Management.** Management problems in planning, design, operation, maintenance, and administration of airports; legislation and federal regulations affecting air commerce and airports; and current problems in certification, security, safety, land acquisition, zoning, and state and federal participation in airport development. Prerequisite: Aviation 101 and Business Administration 210 or 247, or consent of instructor. 3 hours.
- 295. Aviation Management.** Studies management functions, responsibilities, techniques, and problems specific to aviation enterprises. Includes case study analysis of typical problems/ situations found in aviation organizations. Prerequisite: Aviation 120 or Business Administration 210 or 247, or consent of instructor. 3 hours.
- 355. Aviation Accident Investigation and Analysis.** Fundamental concepts of aviation safety augmentation with emphasis on accident prevention through accident investigation, casualty reduction through crashworthy design, and safety enhancement re-

sulting from litigation; accident investigation techniques and crash survival design factors. Prerequisite: Aviation 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

BIOCHEMISTRY

Head of Department: L. P. Hager

Department Office: 415 Roger Adams Laboratory, 1209 West California, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 292. Senior Thesis.** Limited in general to seniors in biochemistry and chemistry. Each student who desires to do thesis research must receive written permission from a member of the biochemistry faculty. Accordingly, prospective students are encouraged to contact the biochemistry staff in the semester prior to registration in this course. Students must present a thesis to receive credit in this course. Registration of 10 hours over two semesters is expected. Prerequisite: Biochemistry 350 and 355. 4 to 6 hours. (Counts for advanced hours in LAS.)
- 320. Molecular Biophysics.** Same as Biophysics 320. See Biophysics 320.
- 338. Plant Molecular Biology.** Same as Plant Biology 338. See Plant Biology 338.
- 350. Introductory Biochemistry.** The chemistry and metabolism of carbohydrates, lipids, proteins, nucleic acids, vitamins, and coenzymes and their relation to the regulation and processes of organisms, cells, and subcellular components. Not intended for students in biochemistry curriculum. Prerequisite: Chemistry 131 or 136, or equivalent. 3 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Biochemistry 350 and the Biochemistry 352-353 sequence.
- 352. General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Students should not enroll in Biochemistry 352 without intent to take Biochemistry 353. Prerequisite: Chemistry 110 or 123, and Chemistry 336; or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
- 353. General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Prerequisite: Biochemistry 352 or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
- 355. Biochemistry Laboratory.** Introduction to experimentation with biochemical systems, processes, and compounds; identification and quantitative measurement of constituents and transformations in biological systems. Prerequisite: Chemistry 131 or 136, or equivalent; credit or concurrent registration in Biochemistry 350, 352, or 353, or equivalent. Quantitative analytical chemistry and credit or concurrent registration in a course that includes nucleic acid biochemistry (i.e., Biochemistry 350 or 353) are recommended. 4 hours or 1 unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biophysics and Chemistry 440. See Chemistry 440.
- 450. Biomolecular Physics.** Same as Biophysics 450 and Physics 450. See Physics 450.
- 452. Experimental Techniques in Biochemistry.** Experiments concerning the detection, isolation, and characterization of macromolecules, including enzymes, antibodies, and nucleic acids; methods of studying the size, shape, and hydrodynamic properties of macromolecules and other compounds. Prerequisite: Biochemistry 355. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units credit.
- 455. Biochemistry Seminar.** Discussions of current research and literature. Required of all graduate students whose major is biochemistry. Prerequisite: Biochemistry 352, 353, and 355; or equivalent. $\frac{1}{2}$ unit. May be repeated once.
- 490. Individual Study.** Designed for students majoring or minoring in biochemistry who wish to undertake individual studies of a non-Ph.D. thesis nature under the direction

of a faculty member of the department. Prerequisite: Consent of head of department. $\frac{1}{4}$ to 4 units (summer session, $\frac{1}{4}$ to 2 units).

- 494. Chemical Basis of Biological Specificity.** Same as Chemistry 494. Biological formation and interaction of large molecules; analysis of the structural features concerned with functional specificity in heteropolymers, viruses, and subcellular particles; nucleic acids and their role as genetic molecules; proteins in their role as genetic products with highly specific functions; and metabolic interrelations of these molecules. Prerequisite: Chemistry 344 and 346, Biochemistry 352 and 353, or consent of instructor. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 2 units credit.
- 499. Thesis Research.** 0 to 4 units.

BIOENGINEERING

Chairperson, Executive Committee: C. Cain

Program Office: 164 Mechanical Engineering Building, 1206 West Green, Urbana

- 120. Introduction to Bioengineering.** Readings and discussions on historical development, recent trends, and specific topics such as radiation, modeling, instrumentation, biomaterials, biomechanics, heat and mass transfer, ergonomics, and operations research. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 270. Individual Study.** Individual projects. Prerequisite: Consent of instructor. 0 to 4 hours.
- 306. Veterinary Orthopedic Biomechanics.** Same as Veterinary Biosciences 306. See Veterinary Biosciences 306.
- 308. Implant Materials for Medical Applications.** Review of the biological and engineering aspects of implant materials; characterization of major classes of promising implant materials; and problems of tissue-implant interaction and surgical problems involved in implant work. Laboratories and independent projects illustrate the use of implant materials. Prerequisite: Chemistry 102; Physics 102 or 108, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Biomedical Instrumentation.** Same as Electrical Engineering 314. See Electrical Engineering 314.
- 315. Biomedical Instrumentation Laboratory.** Same as Electrical Engineering 315. See Electrical Engineering 315.
- 370. Special Topics in Bioengineering.** Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 375. Modeling of Bio-Systems.** Same as Electrical Engineering 375. See Electrical Engineering 375.
- 424. Ultrasonic Biophysics.** Same as Biophysics 424. See Biophysics 424.
- 498. Individual Study.** Individual projects. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.

BIOLOGY

Director of School of Life Sciences: S. Kaplan

School Office: 393 Morrill Hall, 505 South Goodwin, Urbana

- 100. Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. Low credit option; no laboratory. 3 hours. Credit is not given for both Biology 100 and 101.
- 101. Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. High credit option; weekly laboratory. 4 hours. Credit is not given for both Biology 100 and 101.

- 102. Biological Sciences.** Continuation of Biology 100 or 101. Low credit option; lecture and discussion, no laboratory. Prerequisite: Credit in one first-level course in biology. 3 hours.
- 103. Biological Sciences.** Continuation of Biology 100 or 101. High credit option; lecture, discussion and laboratory. Prerequisite: Credit in one first-level course in biology. 4 hours.
- 104. Animal Biology.** Introductory zoological concepts with emphasis on the diversity and comparative anatomy of animals and the fundamentals of physiology, genetics, evolution, and behavior. Enrollment priority is given to students in curricula which require this course. 4 hours.
- 106. Heredity and Society.** Provides nonscience students with an understanding of genetics so they can appreciate how recent discoveries and environmental changes may affect their future and the future of society. 3 hours. Students may not receive credit for both Biology 106 and 210.
- 107. Evolution.** Analysis of the theories of evolution, the mechanism of evolutionary changes, and the evolution of man. Prerequisite: Sophomore standing. 3 hours. Students may not receive credit for both Biology 107 and Ecology, Ethology, and Evolution 301.
- 108. Biology of Human Aging.** Comprehensive and critical analysis of what happens as humans age; includes information gained from model systems ranging from cells to such diverse organisms as bamboo and chimpanzees; considers the role of evolution in shaping special features of our life cycle. 3 hours.
- 110. Principles of Biology, I.** Heredity, evolution, diversity, reproduction, development, structure and function of cells, organisms, and populations. Prerequisite: One year of college chemistry, or concurrent registration in Chemistry 102 with laboratory. 5 hours.
- 111. Principles of Biology, II.** Continuation of Biology 110. Prerequisite: Biology 110. 5 hours.
- 123. Adventures in Life Sciences.** General introduction to the School of Life Sciences emphasizing selected areas of research in SOLS and career opportunities in life sciences. 1 hour.
- 144. Introduction to the Biological Literature.** Using professional literature as examples of introductory-level biological concepts, class discussions analyze biological research papers as they appear in a weekly scientific journal. Prerequisite: Concurrent registration in Biology 111 or consent of instructor. 1 hour.
- 151. The Cell.** Study of the biology of cells from the molecular to the microscopic level of organization. Prerequisite: Credit or concurrent registration in organic chemistry; consent of honors biology committee. 5 hours. Students may not receive credit for both Biology 151 and Biology 213.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 206. Working With the Disabled, I.** Same as Rehabilitation 206. See Rehabilitation 206.
- 207. Working With the Disabled, II.** Same as Rehabilitation 207. See Rehabilitation 207.
- 210. Genetics.** Principles of heredity and the nature of genetic material. Prerequisite: Biology 111 or equivalent, or consent of instructor. 4 hours. Students may not receive credit for both Biology 210 and 106. (Counts for advanced hours in LAS.)
- 213. Cells and Tissues.** Lecture and laboratory introduction to the structure of animal cells and tissues and plant cells, including basic ultrastructure. Prerequisite: Biology 111 or equivalent and consent of instructor. 4 hours. Students may not receive credit for both Biology 151 and 213. (Counts for advanced hours in LAS.)
- 251. The Organism.** Study of the way different classes of organisms respond to challenges of their environment; emphasis on the general features of organismic behavior. Prerequisite: Biology 151; good standing in the honors biology program; and consent of the honors biology committee. 5 hours.
- 303. Introduction to Neurobiology.** An introduction to the physiology of nerve cells, mechanisms of neural integration, and the organization of sensory and motor systems; also introduces neurochemistry, neuroendocrinology, neural development, neural plasticity, and the physiological basis of behavior. Prerequisite: Biology 111 or 251, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 304. Biological Clocks.** Study of the nature, mechanisms, functions, development, and evolution of the biological rhythms associated with geophysical cycles; emphasizes circadian rhythms and their role as biological clocks for the timing of photoperiodism, celestial orientation, and human physiology and behavior. Prerequisite: Biology 111 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 305. Fundamentals of Microscopy.** Lectures on applications of transmission and scanning electron microscopy; review of light microscopy, phase contrast, interference, and Nomarski optics. Prerequisite: Physics 102 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 307. Immunology.** Introduction to fundamentals of immunology with emphasis on biological application; basic background for understanding immunological responses and techniques applicable to biological research. Prerequisite: Four semesters of college biology; a course in organic chemistry, or consent of instructor. 4 hours or $\frac{3}{4}$ unit.
- 309. Ecological Genetics.** Study of the genetics of natural populations, stressing empirical observations and experiments. Emphasis on recent theories of genotype/environmental interactions and their relationship to evolutionary processes. Prerequisite: Biology 210. 3 hours or $\frac{3}{4}$ unit.
- 310. Immunogenetics and Immunophysiology.** Same as Animal Sciences 310. See Animal Sciences 310.
- 313. Experimental Genetics.** Laboratory course to expose students to several types of organisms, experimental approaches, and methods of analysis utilized in genetic research. Prerequisite: Biology 151 or 210; consent of instructor. 4 hours or 1 unit.
- 316. Population Genetics.** Same as Animal Science 316. See Animal Science 316.
- 317. Quantitative Genetics.** Same as Animal Science 317. See Animal Science 317.
- 324. Chemical Ecology.** The chemical bases of ecological interactions among organisms; topics include the chemical structures and functions of messenger compounds important in inter- and intraspecific interactions among plants, insects, higher animals, fungi, microbes, and their environments. Offered in alternate years. Prerequisite: Courses in organic chemistry and ecology, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 332. Genetic Toxicology.** Same as Agronomy 332 and Environmental Studies 332. See Environmental Studies 332.
- 338. History of Biology.** Same as History 338. See History 338.
- 339. Tropical Ecology.** Interactions of climate, soils, plants, and animals (including humans) in the tropics; examines principles of ecology as they relate to diversity of tropical habitats and to problems of agricultural and technological development in the tropics. Prerequisite: Ecology, Ethology, and Evolution 212 or Plant Biology 381; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 351. Population Biology.** Study of problems associated with behavior of plant and animal populations based on genetic, evolutionary, and ecological principles. Prerequisite: Biology 251; statistics; good standing in the honors biology program; consent of Honors Biology Committee. 4 hours or 1 unit.
- 371. Quantitative Biology, I.** Theory and practical application in biology of probability and statistics; lectures and assigned problems. Prerequisite: College algebra; consent of instructor. 4 hours or 1 unit.
- 372. Quantitative Biology, II.** Additional topics in biostatistics, emphasizing nonparametric comparative, correlational, and sequential analyses; multi-dimensional contingency analyses, circular statistics, binomial sequential sampling. Lecture, field trips, and discussion. Prerequisite: Biology 371 or consent of instructor. 4 hours or 1 unit.
- 373. Advanced Biometry.** Bivariate and multivariate statistical treatment of biological experiments and surveys; emphasizes analysis of large, unbalanced data matrices; and follows the general linear model approach. Techniques appropriate to electronic digital computation are considered in detail. Prerequisite: A course in calculus, a course in statistics, and a course or experience in electronic digital computation; or consent of instructor. 5 hours or 1 unit.
- 380. Social Issues in Biology.** Ethical and sociopolitical implications of the biological sciences; an issue-oriented lecture-discussion format centering on problems such as bioethics, genetics and development, health care and allocation of scarce resources,

death and dying, behavior manipulation, biological experimentation, population control, and environmental ethics. Prerequisite: Upper-division standing and 6 hours of life science. 3 hours or $\frac{3}{4}$ unit.

- 390. Special Courses.** Experimental and temporary courses. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topic varies.
- 417. Advanced Quantitative Genetics.** Same as Animal Science 417. See Animal Science 417.
- 418. Concepts and Topics in Immunology.** Same as Veterinary Pathobiology 418. See Veterinary Pathobiology 418.
- 420. Advanced Topics in Neural and Behavioral Biology.** Survey of current research in modern neural and behavioral biology. Each weekly seminar is presented by a faculty member or distinguished visiting neuroscientist. Abstracts and suggested readings are presented prior to each seminar. Prerequisite: Graduate standing or consent of instructor. $\frac{1}{4}$ unit.
- 425. Experimental Parasitology.** Same as Veterinary Pathobiology 425. See Veterinary Pathobiology 425.
- 431. Plant Cell Metabolism.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 431. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the biochemistry of mature seeds and metabolic processes occurring during seed germination and heterotrophic growth. Meets during the first half of the fall semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
- 432. Plant Cell Energetics.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 432. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the energy coupling processes in plant cells (respiration, photosynthesis, photorespiration); and discusses current literature relating to mechanisms of electron transport, phosphorylation, and carbon fixation. Meets during the second half of the fall semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 433. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns mechanisms of plant response to the environment, including ion uptake and transport, water relationships, gas exchange, and photosynthesis of whole plants. Meets during the first half of the spring semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 434. One of four courses giving a comprehensive summary of present knowledge in plant physiology; concerns the hormonal regulation of growth, development, and reproduction and the metabolism of seed and fruit formation. Meets during the second half of the spring semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
- 444. Morphometry.** Examines the theoretical basis and practical applications of stereological principles to sectioned materials (useful for both light and electron microscopic studies); compares manual and computer-assisted data collection and analysis; three-dimensional reconstructions from serial sections. Prerequisite: Statistics 100 or equivalent; consent of instructor. $\frac{1}{2}$ or $\frac{3}{4}$ unit.
- 450. Scanning Electron Microscopy.** Introduction to theoretical aspects of the scanning electron microscope structure and function, beam-specimen interactions, image characteristics, and qualitative energy-dispersive x-ray microanalysis. Prerequisite: Concurrent registration in Biology 451; a course in modern physics or physical chemistry giving an introduction to wave mechanics; consent of instructor. $\frac{1}{2}$ unit.
- 451. Scanning Electron Microscopy Laboratory.** Operation of the scanning electron microscope and ancillary equipment; studies of specimen preparation technique development and x-ray microanalysis. Prerequisite: Concurrent registration in Biology 450; consent of instructor. $\frac{1}{2}$ unit.

- 452. Transmission Electron Microscopy.** Fundamental principles of transmission electron microscopy; topics include instrumentation, electron optics, image formation and interpretation, photographic techniques, and routine specimen preparation. Prerequisite: Concurrent registration in Biology 453 or equivalent; consent of instructor. $\frac{1}{2}$ unit.
- 453. Transmission Electron Microscopy Laboratory.** Examines alignment, operation and performance evaluation of transmission electron microscopes; electron micrography of a variety of biological specimens including electron diffraction, photographic dark-room techniques, ultramicrotomy, perfection of routine and specialized biological specimen preparation. Prerequisite: Concurrent registration in Biology 452; consent of instructor. 1 unit.
- 454. Advanced Methods in Electron Microscopy.** Same as Ceramic Engineering 454. Supplementary training in advanced techniques such as electron microprobe analysis, freeze-etch/freeze-fracture techniques, quantitative energy dispersive x-ray analysis, or instruction on specific microscopes. Prerequisite: Biology 450-451, 452-453, or Ceramic Engineering 469; consent of instructor. $\frac{1}{4}$ unit. May be repeated.
- 457. Ultrastructural Pathology.** Same as Veterinary Pathobiology 457. See Veterinary Pathobiology 457.
- 490. Special Topics in Biology.** Individual topics in research and/or reading conducted under the supervision of faculty members in the School of Life Sciences. Designed for students enrolled in the biology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their doctorate degree. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

BIOPHYSICS

(See Physiology and Biophysics)

BUSINESS

Dean of College: J. D. Hogan

College Office: 260 Commerce Building (West), 1206 South Sixth, Champaign

- 299. International Business Study in Absentia.** Upon prior written approval of the adviser, the major department, and the College of Commerce and Business Administration office, a student may earn up to 18 credit hours per semester undertaking a study and/or research project in international business away from the Urbana-Champaign campus. The student's major department verifies the satisfactory progress of the work by means of interim and final written reports, written or oral examinations, or other means established by the department. While absent from the Urbana-Champaign campus, the student must continue to pay all fees required by the University of Illinois to retain continuity of enrollment and to allow the time spent away from this campus to count toward residency. Prerequisite: The student must be a commerce major in good standing who has completed at least 45 semester hours toward a bachelor's degree with at least one semester in residence at the University of Illinois. 0 to 18 hours. This course may be repeated for a maximum of 36 credit hours, all of which must be earned within twelve consecutive months.

BUSINESS ADMINISTRATION

Head of Department: F. W. Winter

Department Office: 350 Commerce Building (West), 1206 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. The Legal Environment of Business.** Examination of the nature of law and the formation and application of legal principles; the role of law in society; the legal environment in which business operates, particularly government taxation; the regulation of commerce, competition, and labor-management relations; and the concept of property: its creation, transfer, and importance to our business society. Prerequisite: Junior standing. 3 hours.
- 202. Principles of Marketing.** Emphasizes the concepts of planning, organization, control, and decision making as they are applied in the management of the marketing function. Prerequisite: Economics 172 or equivalent. 3 hours.
- 203. Principles of Business Law.** Contracts, the uniform commercial code, creditors' rights, agency and employment, business organizations, and property. Prerequisite: Business Administration 200. 4 hours. Credit is not given for both Business Administration 203 and 261.
- 205. Business Location Decision-Making: Theory and Practice.** Same as Geography 205. See Geography 205.
- 210. Management and Organizational Behavior.** A general analysis of management and organizational behavior from a systems point of view, including classical organizational theory and management, organizational behavior, and management science; environmental forces; planning, organizing, and control processes; motivation, incentives, leadership, communication, and interpersonal relations; and discussion of production and decision-making and mathematical models. Prerequisite: Junior standing. Students are encouraged to take Business Administration 202, 210, and Finance 254 concurrently. 3 hours. Credit is not given for both Business Administration 210 and 247.
- 212. Principles of Retailing.** Gives a general analysis of the structure of retailing emphasizing the retailing environment and operating efficiencies; includes patronage behavior, merchandise control, pricing, promotion, location, and vendor relations; and gives special attention to emerging trends in retailing. Prerequisite: Business Administration 202. 3 hours.
- 247. Introduction to Management.** Summary of management in a modern industrial enterprise; emphasis on motivation, small group behavior, and the problems of designing and operating a formal organization structure. For noncommerce students only. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Business Administration 247 and 210.
- 261. Summary of Business Law.** Basic principles of the private law of business including the law of contracts, agency, and business organizations; a brief introduction to the law of sales, commercial paper, security devices, and property. Prerequisite: Junior standing. 3 hours. Credit is not given for both Business Administration 261 and 203.
- 274. Operations Research.** Introduction to methods of operations research from an executive or managerial viewpoint, emphasizing formulation of business problems in quantitative terms; industrial applications of linear programming, dynamic programming, game theory, probability theory, queueing theory, and inventory theory. Prerequisite: Economics 173, or consent of instructor. 3 hours.
- 294. Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
- 295. Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.

- 300. Socio-Economic Management as Public Policy.** Same as Accountancy, Political Science, and Social Science 300. See Political Science 300.
- 314. Production.** Introduction to production management, consideration of major problems of the production area, and the use of quantitative methods for solving them. Prerequisite: Business Administration 274 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 315. Management in Manufacturing.** The application of production concepts and quantitative techniques to actual industrial problems; the mathematical structure of the particular production problems; the general structure of the production system and its interaction with marketing and budgeting; and areas including inventory control, production processes, programming, production control, forecasting of production levels, simulation of the production system, and physical planning of industrial plants. Prerequisite: Business Administration 314. 3 hours or $\frac{1}{2}$ unit.
- 320. Marketing Research.** Focuses on the techniques and methods of marketing research; emphasizes primarily survey research and experimental design; and offers students the opportunity to apply techniques to real-world situations. Prerequisite: Business Administration 202 and Economics 172. 3 hours or $\frac{1}{2}$ unit.
- 321. Individual Behavior in Organizations.** Understanding the behavior of employees in work organizations; particular attention to the motivation of individuals to join and perform in organizations and to employee satisfaction with elements of the work environment; and emphasis on various management strategies to modify employee motivation and satisfaction. Prerequisite: Business Administration 210, graduate standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 322. Group Processes in the Organization.** Analyzes several aspects of group techniques within the organization, including norm establishment, communication and comparison processes, collective bargaining, group decision making, problem solving, and coalition formation and conflict. Prerequisite: Business Administration 210 and Psychology 201. 3 hours or $\frac{3}{4}$ unit.
- 323. Organizational Design and Environment.** Understanding of complex organizations; particular attention to ways of dividing work, achieving coordination, and issues connected with change and adaptation. Prerequisite: Business Administration 210. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 337. Promotion Management.** Studies the effects of promotion upon sales and society from managerial and behavioral points of view; examines management of the advertising, sales promotion, and sales force functions within the context of an overall marketing program; includes consumer response to advertising, promotional planning and budgeting, advertising and sales research, media selection, legal environment of promotion, and sales force management and control; takes an analytical focus throughout; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 344. Buyer Behavior.** Studies the factors affecting customer behavior in household and organizational markets and their relevance for marketing management planning and analysis; provides an overview of explanations of consumption differences anchored in socioeconomic, demographic, cultural, and psychological processes; and surveys buyer decision-making processes and their implications for marketing strategy. Prerequisite: Business Administration 320. 3 hours or $\frac{1}{2}$ unit.
- 345. Small Business Consulting.** Through guided experience, students identify and offer advice to local small business firms; exposes students, serving as consultants, to the wide variety of problems facing the smaller firm as well as enables them to apply current business methods to real problems. Students work in teams. Prerequisite: Junior standing in the College of Commerce and Business Administration or admission to the Master of Business Administration program; or consent of instructor. 4 hours or 1 unit.
- 346. Entrepreneurship: Small Business Formation.** Studies entrepreneurship for those with a serious interest in owning their own business within five years of graduation; students prepare a comprehensive business plan for starting or acquiring such a business; also studies the problems of an existing small business. Prerequisite: Consent of instructor. 4 hours or 1 unit.
- 351. Personnel Administration.** Studies concepts and methods used by the staff personnel

unit in building and maintaining an effective work force in an industrial organization; development of ability to design the personnel subsystem within the firm and to deal effectively with problems encountered in such areas as recruitment, selection, training, and wage and salary administration; and considerable emphasis on case analysis, role playing, and research. Prerequisite: Business Administration 323; Economics 173 and 240, 3 hours, or $\frac{1}{2}$ to 1 unit. Credit is not given for Business Administration 351 and Psychology 245.

- 352. Pricing Policies.** The role of pricing in contemporary marketing and major pricing decisions facing the firm; theoretical, economic, and practical methods and models for setting prices; pricing new products, initiating price changes, and responding to competitive pricing; the relationship of pricing objectives and strategies to the goals of the firm; and sealed bidding for contracts. Prerequisite: Business Administration 202, 3 hours or $\frac{1}{2}$ unit.
- 360. Marketing to Business and Government.** Introduces the general area of industrial marketing; examines the nature of industrial markets especially as they compare to consumer markets and emphasizes such factors as the demand for industrial goods, marketing intelligence systems for industrial firms, marketing strategy in industrial markets, and analyses and control of industrial marketing programs; integrates important concepts from sales management and business logistics throughout the course; uses case studies. Prerequisite: Business Administration 202, 3 hours or $\frac{1}{2}$ unit.
- 370. International Marketing.** Examines social, political, cultural, and economic environmental differences among countries in terms of their impact on the strategy of extension versus adjustment of marketing practice by multinational corporations; examines each marketing function in detail with respect to the specific areas the international marketer must examine. A special section concentrates on international market research. Prerequisite: Business Administration 344 or consent of instructor, 3 hours or $\frac{1}{2}$ unit.
- 373. Business Information Systems.** Fundamentals of business data processing; consideration of the use of modern electronic computers in the areas of accountancy, economics, management, marketing, and general business. The facilities of the Digital Computer Laboratory are utilized. Prerequisite: Accountancy 221, 3 hours, or $\frac{1}{2}$ or 1 unit.
- 380. Advanced Marketing Management.** An integrative study of methods and models for marketing decision-making; emphasizes the application of analytical tools and behavioral and quantitative models to marketing decision-making. Uses lectures, case studies and simulation exercises. Prerequisite: Business Administration 274 and 344, 3 hours or $\frac{1}{2}$ unit.
- 382. Introduction to International Business.** Analyzes the major business management functions of international business operations of multinational firms; topics include international business environment, organizational policies and strategies of multinational companies, industrial relations and control policies. Prerequisite: Business Administration 202 or 210, or equivalent; Economics 101 or 102, 3 hours or $\frac{1}{2}$ unit.
- 384. International Management.** Analyzes the impact of socio-cultural variables on organization structure processes, decision-making, leadership role, employee motivation and productivity in the international business area. Prerequisite: Business Administration 202 or 210, or equivalent; senior standing, 3 hours or 1 unit.
- 389. Business Policy.** Analysis of policy formulation and implementation from a company-wide standpoint; emphasis on integration of knowledge and approaches across functional areas; both endogeneous and exogeneous factors which affect company policies; and the role of the firm in society. Prerequisite: Senior standing in the College of Commerce and Business Administration, 3 hours or $\frac{1}{2}$ unit.
- 391. Introduction to Management Information Systems.** Same as Accountancy 332. See Accountancy 332.
- 392. Information Organization for Management Information Systems.** Same as Accountancy 333. Data collection, classification, verification, and transmission; file organization, including sequential and random processing techniques, record locating, overflow procedures, and file security; analysis of alternative methods of data orga-

nization; commercial file management systems; design of data processing systems; and instruction in COBOL and use of case studies. Prerequisite: Accountancy 332 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.

- 393. Management Information System Development.** Same as Accountancy 334. Essential steps in developing a management information system, including preliminary planning, design, feasibility analysis, implementation schedule, and postimplementation review of the system; includes a semester-long project which familiarizes students with methodology and techniques. Prerequisite: Accountancy 332 or Business Administration 392, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 394. Management Information and Control Systems.** Same as Accountancy 335. See Accountancy 335.
- 400. Managerial Economics.** Introduction to decision making for the private or public enterprise; principles of economic maximization under uncertainty; and marketing, financial, and production strategies in a dynamic multiperiod context. 1 unit. Graduate credit is not given for both Business Administration 400 and either Economics 300 or 400.
- 401. The Economic Environment.** Analysis of the functioning of the economy from an aggregative point of view; role of government policy in affecting the economic environment. 1 unit. Graduate credit is not given for Business Administration 401 and either Economics 301 or 401.
- 408. Foundations of Behavioral Science for Administration.** Develops and integrates fundamental behavioral concepts and theory having administrative applications; initially focuses on the individual decision maker and ultimately includes interpersonal, organizational, and social structures and influences; and develops strategies and methods of research on behavioral applications in business. 1 unit.
- 409. Organizational Behavior.** Same as Labor and Industrial Relations 409. Examines and analyzes the organization as a social system and the impact of its various components on work attitudes and behavior; topics include the development of organizational structures, organizational effectiveness, decision making and policy formulation, leadership, and change. Prerequisite: Business Administration 408. 1 unit.
- 410. Organizational Sciences, I.** Same as Political Science 460, Psychology 453, and Sociology 456. Introduction to the principal theories and important empirical research in various disciplines that study organizations; in addition to examination of the subject matter content of various disciplines, students critically examine the capacities and limitations of the various fields to make contributions to the study of organizations. Prerequisite: Enrollment as a major in organizational sciences in a cooperating program or consent of instructor. 1 unit.
- 411. Problems of Personnel Management.** Same as Labor and Industrial Relations 448. Examines the organization and administration of the personnel function in management; the relations of personnel administration to operating departments and the scope of business and industrial personnel services; analytical appraisal of policies and practices in selected areas of personnel administration, such as selection and training, carried out through case studies and direct industrial contracts; and specific consideration given to problems up to and including placing the person on a job. Prerequisite: Consent of instructor. 1 unit.
- 412. Organization and Its Environment.** Analysis of business organizations adapting to shifts in internal and external elements; major emphasis on (1) the business firm as a part of a complex socioeconomic system; (2) the effects of government, labor unions, and political, religious, and business organizations on the executive's decision problems; (3) environmental factors conducive to organizational change; and (4) organizational growth. Prerequisite: Business Administration 409. 1 unit.
- 413. Behavioral and Organizational Decision Making.** Examines the major types of organization theory; use of organization theory to guide research and to make business decisions; and examination of major research methods used to study business organizations. Prerequisite: Business Administration 412. 1 unit.
- 415. Foundations of Buyer Behavior.** Studies alternative models of buyer behavior; fo-

- cuses attention on psychological, sociological, and economic factors including motivation, learning, attitudes, personality, reference groups, social stratification, demographics, life-styles, and cross-cultural differences and their impact on purchasing, consumption, and choice decisions. Prerequisite: Business Administration 420. 1 unit.
- 416. Metatheory in Consumer Behavior.** An advanced doctoral level seminar which critically examines the relevance of behavioral and social constructs for generating consumer behavior theories with the use of philosophy of science and metatheory criteria; specifically discusses the need for, and procedures with which to modify behavioral/social constructs and processes such as motivation, concept formation, information processing, choice axioms, attitude consistency, and group norms. Prerequisite: Business Administration 415. 1 unit.
- 420. Marketing Management.** Introduces concepts useful in understanding marketing systems and buyer behavior in addition to developing skills in making marketing decisions; the orientation is primarily managerial and uses examples from both business and non-business contexts. 1 unit.
- 421. Marketing Strategy: Theoretical Foundations.** A formal analysis of strategy drawing on concepts from the theory of games, decision theory, value theory, and information theory; topics cover elements of game models, classes of decision problems, games against nature, modern utility theory, information theory, group decision making, statistical decision theory, and linear and nonlinear optimization. 1 unit.
- 422. Marketing Strategy: Decision Models.** The role of models in the design, implementation, and adjustment of seller strategy; application of simulation, programming, and other methods to the specification and solution of product, price, promotion, and other marketing problems; and topics including the nature of models and model building, forecasting models, optimization models, and other decision models. Prerequisite: Business Administration 421. 1 unit.
- 424. Market Segmentation.** Deals with unique subsets of potential customers in the market who differ with regard to applications of the marketing tactic to be employed; applies cost benefit criteria to possible aggregations of these subsets. Discusses the topic from a historical perspective, a research perspective, and finally a strategic perspective; involves actual segmentation research by students. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
- 425. Product Management.** The decisions on the firm's total market offer, including such topics as use of market analysis in making decisions on assortment, product development, pricing, packaging, branding, and sales forecasting; coordination of these decisions and actions with market communications, physical movement, production, finance, and the overall goals and policies of the firm; and emphasizes the use of analytic and research methods in making assortment and product decisions. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
- 426. Marketing Theory and Systems.** A detailed study of macro- and micro-marketing systems and the various approaches to marketing theory; attention given to general systems theory, the nature of marketing systems, system adaptation to the environment, concepts of theory, and major approaches to macro- and micro-theory in marketing. 1 unit.
- 427. Sales Force Management.** Examines primary elements and problems in the area of sales force management; studies such topics as the dyadic interaction between the buyer and seller, the sales presentation, important salesperson characteristics, the selection, training, assignment, motivation, and compensation of salespeople, supervision and evaluation of the sales force, and coordination of the sales force with other elements in a firm's marketing program. Uses case studies. Prerequisite: Business Administration 420. 1 unit.
- 428. Promotional Strategy.** Management orientation to promotional strategy for the medium and large size organization: includes analyses of the primary elements of the promotional function from both qualitative and quantitative perspectives emphasizing such factors as (1) selection among alternative promotional tools, (2) the promotional budgeting and allocation process, and (3) determination of appropriate messages and

media schedules for given product/market situations. Explores widely used models in depth for strategic usefulness; emphasizes case analysis and contemporary situations. Prerequisite: Business Administration 420. 1 unit.

- 429. Marketing Research.** Examines the collection and analysis of information applied to marketing decisions; stresses quantitative methods including samplings, scalings, experimental design, forecasting, and multivariate procedures through the use of class projects on actual market research problems. Prerequisite: Business Administration 472, and credit or concurrent registration in Business Administration 420. 1 unit.
- 430. Research Methods in Business Administration.** Theory and practice of research methodology for the study of administrative, industrial, and consumer behavior and organizations; alternative methods of data collection and their strengths and weaknesses; observational, questionnaire, field, and laboratory experimentation and statistical analysis of pregathered time-series and cross-sectional data; and examples of good and bad research in business disciplines. A completed individual research project of potentially publishable nature is formally presented in class. Prerequisite: Basic inferential statistics course; credit or concurrent registration in Business Administration 408. 1 unit.
- 431. Survey Methods in Marketing Research.** Same as Sociology 474. Analysis of survey methods in marketing with emphasis on sample design, data collection, and data processing; an advanced course in the methods required to design, implement, and evaluate a research project. Prerequisite: Economics 171 or equivalent. 1 unit.
- 432. Applied Multivariate Analysis in Business.** An advanced doctoral level seminar on the applications of multivariate statistical techniques to marketing and business problems; critically examines the relevance of optimization rules and inferential properties of various multivariate techniques including regression, AID, MANOVA, discriminant, canonical, factor, clustering and multidimensional scaling for marketing and business problems; particularly emphasizes pitfalls of data and computational problems. Prerequisite: Psychology 494. 1 unit.
- 433. Experimental Design.** Training in the design, execution, and interpretation of field and laboratory experimental research; emphasis on the evaluation of alternative designs, execution of problems, and interpretation of data; and a review of illustrative research studies made, an actual study designed, and data collected and interpreted. Prerequisite: Business Administration 472 or consent of instructor. 1 unit.
- 435. The Sampling of Human Populations and Social Organizations.** Same as Sociology 485 and Psychology 485. Procedures for selecting samples from and estimating population parameters for human populations and social organizations; types of sample designs treated include simple random samples, stratified, and cluster samples together with random number and systematic selection techniques; and emphasis given to the study of various kinds of advanced sample designs for both area and institutional settings together with the problems involved in the application of analytical statistics to complicated sampling procedures. Each student is required to participate in a field project which involves the actual selection of a cluster sample from the local area. Prerequisite: Sociology 387 or consent of instructor. 1 unit.
- 442. Social Performance of Business and Government.** The position of the business enterprise as an institution in American society; the role of the businessman in that society. Prerequisite: Completion of the first year of the M.B.A. program or equivalent. 1 unit.
- 443. Legal Aspects of Management Decisions.** The legal environment in which business decisions are made, including the legal system and the role of courts, government taxation and regulation of business, administrative law, antitrust law, labor law, and trends in the law affecting business policy. 1 unit.
- 444. Policy and Planning.** Policy construction and planning of policy implementation at the executive level; case studies of company-wide situations from the management point of view; and integration and application of material from previous courses. Credit is not given for both Business Administration 444 and 389. Prerequisite: Business Administration 408, 420, 451, and 467, or equivalent. 1 unit.

- 451. Financial Management.** An introduction to financial decision making in the firm; development of a decision-making framework for determining the most efficient allocation of resources within the firm; and emphasis placed on the analysis of capital investment projects, long-term sources of funds, and short-term financing problems. 1 unit.
- 452. Long-Term Financial Decision Making.** Same as Finance 452. See Finance 452.
- 453. Working Capital Management.** Same as Finance 453. See Finance 453.
- 455. Risk Management and Control.** Same as Finance 470. See Finance 470.
- 456. Investment.** Same as Finance 456. See Finance 456.
- 457. Security Analysis.** Same as Finance 457. See Finance 457.
- 458. Portfolio Management.** Same as Finance 458. See Finance 458.
- 460. Managerial Accounting and Control.** Analysis of managerial controls, the information needed for their operation, and the manner in which accounting provides that information; emphasis on accounting as a tool of management; and problems and cases stressing the type of figure information relevant to managerial decisions and the methods of using such data. 1 unit.
- 467. Production Management.** An introductory course in decision-making problems in production; includes the theoretical foundations for production management as well as the applications of decision-making techniques to production problems in the firm; and considers production processes, plant layout, maintenance, scheduling, quality control, and production control in particular. Prerequisite: Business Administration 472 and 473. 1 unit.
- 468. Production Planning and Control.** In-depth treatment of decision-making topics in production at the factory manager level and above; topics include the development of generalized decision rules and systems analysis in production; and particular emphasis on the design of production control, quality control, and inventory control systems, and how each of these systems is integrated into the firm as a whole. Prerequisite: First year of the M.B.A. program. 1 unit.
- 469. Quantitative Techniques in Production.** An advanced course in the application of quantitative techniques to decision-making problems dealing with production in the firm; topics include structural estimation of production systems, application of operations research techniques to production problems, and computer simulation of decision systems. Prerequisite: Business Administration 468 or equivalent. 1 unit.
- 470. Mathematical Analysis for Management Decisions.** An elementary course in calculus with applications to business and economics; topics include differentiations, integration, Lagrange multipliers, multivariate functions, and matrices. 1 unit.
- 472. Modern and Classical Statistics for Management Decisions.** The application of classical and modern statistics for business decision making. The level of the course assumes some prior knowledge of basic statistics as well as facility with elementary calculus. Prerequisite: Business Administration 470. 1 unit.
- 473. The Quantitative Analysis of Decisions.** Introduction to operations research techniques; topics include the construction and solution of linear models under certainty, and the construction of probabilistic models, specifically queueing theory, Markov chains, and sequential decisions. Prerequisite: Business Administration 470. 1 unit.
- 474. Applications of Operations Research Techniques.** The application of the operations research techniques developed in Business Administration 473 to practical business problems. Most of the semester is devoted to a series of field research studies. A review of previous work in the field is made prior to the field studies, and the role of the computer in solving operations research problems and its application to the field research is also a major consideration. Prerequisite: Business Administration 473. 1 unit.
- 475. Systems Modeling and Simulation.** Same as Computer Science 445. Theory and techniques of simulation and gaming; simulation languages such as GPSS, DYNAMO, and SIMSCRIPT. Applications: investigation, control, and design of various systems (inventory, production scheduling, computer, marketing, and others). Prerequisite: Computer Science 105 or Statistics 310 or Business Administration 274, or equivalent, or consent of instructor. 1 unit.

- 476. Business Forecasting and Econometrics.** Introduction to maximum likelihood estimating techniques; topics including the use and limitations of least squares, two-stage least squares, limited-information and full-information estimates; and consideration of problems with observational errors, multicollinearity, and autocorrelation in time-series and cross-section structural estimation. A major portion of the course is devoted to the application of the econometric techniques in business forecasting and analysis. Prerequisite: Business Administration 472. 1 unit.
- 477. Economics of Decision Making.** The operational analysis of the problems of individual decisions under uncertainty that arise in the practice of management. Prerequisite: Business Administration 472. 1 unit.
- 478. Stochastic Models in Management Science.** Application of Markov processes to describe, analyze, and design systems of interest in management science, including queues, inventory, production, brand loyalty, stock market, and other applications. Prerequisite: Mathematics 361 or Statistics 310, or equivalent. 1 unit.
- 479. Mathematical Programming for Management Science.** Mathematical programming models (linear, integer, quadratic, nonlinear, dynamic, and combinatorial) used to describe, analyze, and design systems such as production, transportation, scheduling, and planning. Prerequisite: Mathematics 315 or equivalent. 1 unit.
- 482. International Business Operations, I.** An integration of economics and the functional areas of business focused on the problems of managing international business operations: studies economic, legal, functional, and administrative problems through cases and literature emphasizing financial and marketing problems. Students select one area from the following for special study and reporting: Europe, Latin America, Africa, Middle and Near East, or South Asia and Far East. Prerequisite: Completion of first year of the M.B.A. program. 1 unit.
- 483. International Business Operations, II.** Continuation of Business Administration 482. Prerequisite: Business Administration 482. 1 unit.
- 486. Japanese Business and Management Systems.** Analyzes the business and management systems of Japan and compares them with the American business and management systems: topics include quality circles and quality of work life; the human side of Japanese productivity; business-government relations in Japan; organizational strategies and policies of Japanese business organizations; economic, political, legal, and ecological factors affecting Japanese management systems. Prerequisite: Graduate standing; Business Administration 409 or equivalent. 1 unit.
- 490. Seminar in Business Administration.** Special topics in the general area of business. Topics are selected by the instructor at the beginning of each semester. 0 to 1 unit.
- 491. Seminar in Special Topics.** Lectures in topics of current interest not covered by regular course offerings. Subjects are announced in the Timetable. Prerequisite: Consent of instructor or head of department. $\frac{1}{4}$ to 1 unit.
- 493. Research in Special Fields.** $\frac{1}{4}$ to 2 units.
- 494. Independent Study and Research.** Directed reading and research. $\frac{1}{2}$ or 1 unit.
- 499. Dissertation Research.** Required of all students writing doctoral dissertations in business administration: guidance in writing theses and seminar discussions of interim progress reports. 0 to 4 units.

BUSINESS AND TECHNICAL WRITING

(See English)

CERAMIC ENGINEERING

Head of Department: D. A. Payne

Department Office: 204 Ceramics Building, 105 South Goodwin, Urbana

- 190. Topics in Ceramic Engineering.** A course for freshmen providing an opportunity to become acquainted with ceramic engineering, and to participate in an engineering course in the freshman year; discussions and demonstrations on ceramic materials, processes, and properties; ceramic articles, glasses, ceramic magnets, and coatings are made in laboratory demonstrations. Discusses environmental concerns of the ceramic industries. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Ceramic Crystal Chemistry.** Crystal structure and crystal chemistry of ceramic materials, including the structure of silicates; geometrical crystallography and discussions of crystal character and crystal growth of ceramic materials. 3 hours.
- 202. Ceramic Materials and Processes.** Characterization of ceramic raw materials and their preparation, fabrication, and processing. Prerequisite: Sophomore standing. 3 hours.
- 205. Phase Equilibria in Ceramic Systems.** The concepts, interpretations, and utilization of phase equilibrium diagrams in multicomponent ceramic systems at high temperatures; methods of determining equilibrium relationships; and interpretation of binary, ternary, and quaternary systems emphasizing quantitative calculations, metastability, and the origin of microstructure. Lecture and discussion. Prerequisite: Concurrent registration in Ceramic Engineering 245 or consent of instructor. 3 hours. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
- 208. Thermal Processing.** The application of the principles involved in drying and high-temperature operations utilized in processing ceramic materials. Prerequisite: Junior standing in ceramic engineering. 3 hours.
- 216. Rate Processes in Ceramic Engineering.** Reaction kinetics of ceramic processes; high-temperature phase transformations, sintering and grain growth, nucleation and crystal growth from melts; and mechanisms of material transport in solid and liquid systems. Prerequisite: Ceramic Engineering 245; junior standing in ceramic engineering. 3 hours.
- 245. Physical Chemistry for Engineers.** Same as Chemistry 245. Primarily for ceramists, metallurgists, and other engineering students; not offered to chemistry or chemical engineering majors. Provides the elements of chemical thermodynamics and chemical kinetics, and provides an introduction to the statistical concepts of entropy. Prerequisite: Chemistry 102; Physics 107 or 108; Mathematics 242 or equivalent. 3 hours.
- 271. Design of High-Temperature Systems.** Design for dryers, kilns, and furnaces for ceramic facilities. Prerequisite: Ceramic Engineering 208; Theoretical and Applied Mechanics 221. 3 hours.
- 297. Senior Seminar.** Lectures and discussions dealing with professional practice, job selection, employment practice, continuing education, professional growth, and economics of the ceramic industries. Prerequisite: Senior standing in ceramic engineering. 1 hour.
- 298. Special Problems.** Special topics in ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. Prerequisite: Senior standing. 1 to 2 hours. May be repeated to a maximum of 2 hours.

- 299. Senior Thesis.** Research in ceramics and ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. To receive credit, a thesis must be presented. Prerequisite: Senior standing; grade-point average of 4.0 or better. 1 to 5 hours. May be repeated to a maximum of 5 hours. A minimum total credit of 3 hours is required.
- 307. Thermal and Mechanical Properties of Ceramics.** Interprets the thermal and mechanical behavior of crystalline and amorphous ceramics in terms of atomistic concepts of materials; examines influences of microstructure, composition, temperature, pressure, time and other controllable parameters. Prerequisite: Ceramic Engineering 216 and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
- 309. Ceramic Processing.** Examines principles and details of ceramic processing operations; case histories and unit operations for a wide variety of ceramic products; and interrelationships that exist between materials, composition, fabrication, properties, and characterization. Prerequisite: Junior standing in engineering or physical sciences. 3 hours or $\frac{3}{4}$ unit.
- 310. Refractory Technology.** Engineering properties and thermochemistry of polycrystalline materials for use at elevated temperatures including processing of raw materials and the manufacture, heat treatment, quality control, and specification of refractory products; particular emphasis on oxides, silicates, carbides, borides, cermets, and refractory metals with a correlation of the properties of those materials to certain design criteria. Includes laboratory if taken for 1 unit of graduate credit. Prerequisite: Senior standing in engineering. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 311. Ceramic X-Ray Analysis.** X-ray diffraction for phase identification, for the determination of crystalline lattice parameters, and for the determination of the thermal expansion of crystalline solids; analytical methods of indexing powder diffraction patterns; the determination of precise lattice parameters by means of computer programming and high-temperature x-ray techniques. Prerequisite: Computer Science 101 and senior standing in engineering, chemistry, or geology, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 312. Ceramic Coatings.** Examines principles and technology of a wide range of ceramic coatings; emphasizes chemistry and physics that underlie coating properties, and application processes; and studies types of coatings treated including porcelain enamels, glazes, melt-sprayed coatings, vapor deposited coatings, electrolytically deposited coatings, weld-rod coatings, and sputtered coatings. Prerequisite: Ceramic Engineering 245; or Metallurgical Engineering 314 and 370; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Chemistry and Technology of Glass.** Glass structure and constitution and their relationship to chemical, physical, and electrical properties; melting, forming, and annealing operations; preparation of glasses and measurement of important glass properties; lectures and laboratory. Prerequisite: Junior standing in engineering, chemistry, physics, or geology. 3 hours or $\frac{3}{4}$ unit.
- 320. Surfaces and Colloids.** An introduction to the chemistry and physics of surfaces and interfaces, with emphasis on behavior in liquid media; major areas include surface composition, surface and interfacial forces, colloidal stability and flocculation, and amphiphilic molecules. Prerequisite: Metallurgical Engineering 314, or Ceramic Engineering 245, or Chemistry 342, or Physics 361, or equivalent undergraduate course in thermodynamics or physical chemistry, or consent of instructor. 3 hours or $\frac{1}{4}$ or 1 unit.
- 331. Ceramic Microscopy.** Studies the optical activity in isotropic and anisotropic media with particular emphasis on the materials and products of ceramics; the application of these principles and related topics of optical microscopy to the study of the morphology, aggregation, size, and microstructure of the products of high-temperature thermochemical reactions and equilibria. Includes studies in thermal microscopy if taken for 1 unit of graduate credit. Prerequisite: Ceramic Engineering 205 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 340. Electrical Ceramics.** Presents the subject of dielectric crystals and their electrical

properties; discussion and correlation of ferroelectric and piezoelectric properties of several crystal classes; coverage in detail of the perovskite class of ferroelectric compounds; and discussion of spinel, garnet, and hexagonal type ferrimagnetic crystals and their properties. Prerequisite: Ceramic Engineering 309 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 346. Hybrid Circuit Fabrication Laboratory.** Same as Electrical Engineering 346. See Electrical Engineering 346.
- 347. Portland Cement Technology.** An introduction to the production, composition, and properties of portland cement, emphasizing the technology and chemistry of cement manufacture, composition and characterization of cements, quality control and specifications, and reactions of cement with water in concrete. Prerequisite: Senior standing in engineering or chemistry, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 398. Special Topics.** Studies advanced topics related to ceramic engineering. Prerequisite: Junior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 401. Ceramic Chemistry.** Silica, silicates, fusions, and phase relations. Prerequisite: Courses in chemistry and physics. 1 unit.
- 405. Glass Technology.** Following a brief review of unit processes and operations in glass manufacture, the course treats selected major topics relating to the glass preparation process and the chemical, mechanical, optical, and electrical properties of glass from a dominantly theoretical and research point of view. Prerequisite: Ceramic Engineering 314 or equivalent, or consent of instructor. $\frac{3}{4}$ or 1 unit.
- 410. Dielectric Properties of Ceramic Materials.** Review of fundamental properties of vector fields; consideration of the reaction of insulating solids to external electric fields in terms of dielectric theory; the properties of ceramic dielectrics including treatment of ferroelectrics in terms of present theory; and correlation of the piezoelectric properties of ferroelectric crystals and ceramics with the crystal structure, microstructure, and the ferroelectric properties. Prerequisite: Mathematics 345 and 343, or consent of instructor. $\frac{3}{4}$ or 1 unit.
- 412. Structural Physical Ceramics.** Structural chemistry and crystallization behavior of ceramic systems at elevated temperatures; nucleation, and crystal growth; mineral synthesis; and high-temperature reaction kinetics including phase transformations and diffusion. $\frac{3}{4}$ or 1 unit.
- 414. Physical Chemistry of Clays and Soils.** Same as Soils 414 and Mining Engineering 414. See Soils 414.
- 418. Physics of Strong Solids.** Characterization and interpretation of physical properties of single-phase and composite materials of high strength: covalently bonded semiconductors; transition-metal carbides; borides and nitrides; graphite; glass; fibers; and precipitation-hardened metals. Prerequisite: Any one of the following: Ceramic Engineering 307 or 421, Metallurgical Engineering 384, Chemistry 342 or Physics 490, or consent of instructor. 1 unit.
- 454. Advanced Methods in Electron Microscopy.** Same as Biology 454. See Biology 454.
- 461. Mineralogy of Clays.** Same as Geology 461. See Geology 461.
- 462. Petrology of Clay Minerals.** Same as Geology 462. See Geology 462.
- 469. Introductory Electron Microscopy in Physical Sciences.** Introduction to the theory, practice, design, operation, and routine maintenance of scanning and transmission electron microscopes and ancillary equipment; examines techniques for research-oriented studies in electron microscopy, electron diffraction, x-ray energy microanalysis, and practical interpretation of data. Introduces related photographic techniques, safety procedures, and established laboratory protocol. Prerequisite: Graduate standing or equivalent; consent of instructor or endorsement of advisor or supervisor. $\frac{1}{2}$ or 1 unit. Students may receive $\frac{1}{2}$ unit for either the first or latter section and 1 unit for both sections.
- 495. Materials and Special Problems.** Conference and laboratory. Prerequisite: Graduate standing in ceramic engineering. 0 to 2 units.
- 497. Research Seminars.** Discussion and lectures on current research topics. 0 or $\frac{1}{4}$ unit. May be repeated each semester.

- 498. Seminar in Ceramics.** Lectures on current ceramic research and development; presentations by visiting lecturers as well as graduate students and staff in the department. Registration required of all graduate students in ceramic engineering. Graduate students nearing completion of their theses are required to make a seminar presentation. Prerequisite: Graduate standing in ceramic engineering. 0 credit.
- 499. Thesis Research.** Research in any of the branches of ceramics. Prerequisite: Graduate standing in ceramic engineering; Ceramic Engineering 311. 0 to 4 units.

CHEMICAL ENGINEERING

Head of Department: R. C. Alkire

Department Office: 114 Roger Adams Laboratory, 1209 West California, Urbana

- 161. The Chemical Engineering Profession.** Lectures and problems on the history and scope of chemical engineering endeavors; decisions and criteria for process development and plant design. Prerequisite: Chemistry 101 or 107. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Cooperative Education: Planning.** Same as Chemistry 201. See Chemistry 201.
- 202. Cooperative Education: Industrial Practice.** Same as Chemistry 202. See Chemistry 202.
- 261. Introduction to Chemical Engineering.** Lectures and problems on material and energy balances. Prerequisite: Chemistry 102 or 108. 3 hours.
- 292. Senior Thesis.** Limited in general to seniors in the curriculum in chemical engineering. Any others must have the consent of the head of the department. Each student taking the course must register in a minimum of 5 hours either in one semester or divided over two semesters. A maximum registration of 10 hours in two semesters is permitted. However, Chemical Engineering 390 (2 hours) may be substituted for 2 of the 5 hours required in Chemical Engineering 292. In order to receive credit, a thesis must be presented by each student registered in Chemical Engineering 292. 1 to 6 hours.
- 370. Chemical Engineering Thermodynamics.** Fundamental concepts and laws of thermodynamics with emphasis on application to chemical engineering problems; introduction to phase equilibria. Prerequisite: Chemical Engineering 261. 3 hours or $1\frac{1}{2}$ unit.
- 371. Fluid Mechanics and Heat Transfer.** Introduction to fluid statics and dynamics; dimensional analysis; design of flow systems; and introduction to heat transfer conduction, convection, and radiation. Prerequisite: Chemical Engineering 261 or consent of instructor. 4 hours or 1 unit.
- 373. Mass Transfer Operations.** Introduction to mass transfer processes and design methods for separation equipment. Prerequisite: Chemical Engineering 371 or consent of instructor. 4 hours or 1 unit.
- 374. Chemical Engineering Laboratory.** Experiments and computation in fluid mechanics, heat transfer, reaction kinetics, and separation processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; senior standing in chemical engineering. 3 hours or $1\frac{1}{2}$ unit.
- 377. Synthesis and Design of Chemical Systems.** Techniques used in the synthesis and analysis of designs for chemical processing systems; emphasizes the strategy of process engineering, including economic analysis, process simulation, and optimization. This is a capstone course designed to bring together principles from previous courses for the design of complete processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; Mathematics 345; Computer Science 101. 3 hours or $\frac{3}{4}$ unit.
- 380. Heat, Mass, and Momentum Transport.** A unifying treatment of physical rate processes with particular emphasis on the formulation and solution of typical boundary value problems associated with heat, mass, and momentum transport. Prerequisite: Chemical Engineering 371; Mathematics 345. 3 hours or $\frac{3}{4}$ unit.

- 381. Chemical Rate Processes and Reactor Design.** Chemical kinetics, chemical reactor design, and the interrelationship of transport and chemical reaction in open and closed systems. Prerequisite: Credit or registration in Chemical Engineering 373. 2 hours or $1/2$ unit.
- 382. The Prediction of Physical Properties.** Prediction of equilibrium and transport properties in gases, liquids, and solids. Prerequisite: One year of physical chemistry. 2 hours or $1/2$ unit.
- 384. Process Design Project.** A comprehensive design project; complements material covered in Chemical Engineering 377. Prerequisite: Credit or registration in Chemical Engineering 377. 1 to 3 hours, or $1/4$ to $3/4$ unit.
- 387. Applied Chemical Kinetics and Catalysis.** Problems in chemical kinetics; techniques for the prediction and measurement of rates of reactions; and homogeneous and heterogeneous catalysis chain reactions. Prerequisite: Chemistry 342 or Chemical Engineering 370. 2 or 3 hours, or $1/2$ or $3/4$ unit.
- 388. Electrochemical Engineering.** Fundamentals of analysis, design, and optimization of electrochemical systems. Prerequisite: Senior standing in physical science or engineering. 2 or 3 hours, or $1/2$ or $3/4$ unit.
- 389. Chemical Process Control and Dynamics.** Techniques used in the analysis of process dynamics and in the design of process control systems; includes Laplace transforms, stability analysis, and frequency response methods. Laboratory emphasizes on-line data acquisition and control. Prerequisite: Chemical Engineering 371 and senior standing in Chemical Engineering; Mathematics 345; Computer Science 101. 2 or 3 hours, or $1/2$ or $3/4$ unit.
- 390. Individual Chemical Engineering Projects.** Laboratory; development of an individual project. Prerequisite: Senior standing in chemical engineering. 2 hours or $1/2$ unit.
- 392. Polymer Science and Engineering.** Fundamentals of polymer science and engineering; polymerization mechanisms, kinetics, and processes; physical chemistry and characterization of polymers; polymer rheology, mechanical properties, and processing. Prerequisite: Chemical Engineering 370; credit or concurrent registration in Chemical Engineering 371; Chemistry 344. 3 hours or $3/4$ unit. Credit is not given for both Chemical Engineering 392 and either Metallurgical Engineering 375 or Chemistry 346.
- 396. Special Topics in Chemical Engineering.** Study of topics in chemical engineering; content varies from semester to semester. Typical topics include optimization, chemical kinetics, phase equilibrium, biochemical engineering, kinetic theory, and transport properties. Prerequisite: Senior standing in chemical engineering, or consent of instructor. 1 to 3 hours, or $1/4$ to $3/4$ unit. May be repeated.
- 465. Chemical Engineering Seminar.** Required of all graduate students whose major is chemical engineering. Prerequisite: Chemical Engineering 373. $1/4$ unit.
- 466. Applied Mathematics in Chemical Engineering.** The development of mathematical models and a survey of modern mathematical methods currently used in the solution of chemical engineering problems; topics include the application of vectors and matrices, partial differential equations, numerical analysis, and methods of optimization in chemical engineering. Prerequisite: Consent of instructor. $3/4$ or 1 unit.
- 468. Properties of Fluids.** The kinetic theory of gases and the prediction of transport coefficients; statistical mechanics applied to dense gases and liquids; and theories of solutions. Prerequisite: A background in modern physical chemistry and physics; consent of instructor. $3/4$ or 1 unit.
- 469. Special Topics in Chemical Engineering.** Various advanced topics; generally taken during the second year of graduate study. Typical topics include turbulence, hydrodynamic instability, process dynamics, interfacial phenomena, reactor design, properties of matter at high pressure, and phase transitions. Prerequisite: Consent of instructor. $1/4$ to 1 unit. May be repeated.
- 487. Fluid Dynamics.** Basic concepts in fluid dynamics with special emphasis on topics of interest to chemical engineers; derivation of the Navier-Stokes equations; solutions for creeping flow, for perfect fluids, and for boundary layers; non-Newtonian fluids; and turbulence. Prerequisite: Consent of instructor. 1 unit.

- 488. Advanced Topics in Heat and Mass Transfer.** Principles of transfer operations developed in terms of physical rate processes; boundary layer heat and mass transfer, eddy diffusion, phase changes, and separation processes. Prerequisite: Consent of instructor. $\frac{3}{4}$ or 1 unit.
- 496. Individual Study.** Study under the supervision of a staff member in areas not covered in course offerings. Prerequisite: Consent of the staff member under whom the study is to be made. 0 to 1 unit.
- 497. Special Problems.** Individual work on problem-oriented projects not included in theses. This could be research, engineering design, or professional work in chemical engineering which has educational values. The work must be done under the supervision of a staff member with the approval of the department head. $\frac{1}{2}$ to 4 units.
- 498. Research Seminar.** Discussion of recent developments of importance to different areas of chemical engineering research. The course is divided into a number of sections, and subject matter differs from section to section and from time to time. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
- 499. Thesis Research.** Candidates for the master's degree who elect research are required to write a thesis. A thesis is always required for the Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in another department must receive permission from the head of the Department of Chemical Engineering to register in this course. 0 to 4 units.

CHEMICAL SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Biochemistry, Chemical Engineering, and Chemistry.)

Director of School: J. Jonas

School Office: 106 Noyes Laboratory, 505 South Mathews, Urbana

CHEMISTRY

Head of Department: L. R. Faulkner

Department Office: 106 Noyes Laboratory, 505 South Mathews, Urbana

- 100. Introductory Chemistry.** Introduction to the basic concepts and language of chemistry; lectures, recitations, and audiotutorial laboratory. Prerequisite: Two and one-half units in high school mathematics, or credit or concurrent registration in Mathematics 112. Only students without high school chemistry or with chemistry placement scores inadequate for enrollment in Chemistry 101 receive graduation credit; students with designated borderline placement into Chemistry 101 may take Chemistry 100 but will not receive credit toward graduation. 2 hours.

NOTE: Chemistry 101 - 102 constitutes the standard college chemistry sequence. Chemistry 107, 108, 109, and 110 is the intensive, more rigorous sequence for chemistry majors and well-prepared students of science. The regular and intensive sequences are not designed to be mixed. A student who registers for parts of both sequences without special permission from the director of general chemistry risks loss of credit. Chemistry 101 and 103 constitutes a terminal sequence for agriculture students which does not satisfy prerequisites for advanced chemistry courses.

- 101. General Chemistry.** Lecture and laboratory. For students who have some prior knowledge of chemistry. Principles governing atomic structure, bonding, states of matter, stoichiometry, and chemical equilibrium; descriptive chemistry of the elements and

- coordination compounds. Prerequisite: Credit in or exemption from Mathematics 112; one year of high school chemistry or equivalent. Placement into 101 by the Chemistry Placement Test recommended. 4 hours. Students may not receive credit for both Chemistry 101 and Chemistry 107 and 109. Three semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
- 102. General Chemistry (Biological or Physical Version).** Lectures, recitations, and laboratory. Section B (Biological Version): Chemistry of organic and biochemical systems, chemical energetics and equilibrium, chemical kinetics, and reaction mechanisms. Section P (Physical Version): Chemistry of materials, including organic and biological substances, chemical energetics and equilibrium, chemical kinetics, and solids and crystals. Prerequisite: Chemistry 101, or Chemistry 107 and 109, or advanced placement credit for one semester of college-level chemistry. 4 hours. Students may not receive credit for both Chemistry 102 and Chemistry 108 and 110. Three semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
- 103. General Chemistry: Organic Chemical Studies.** Lectures, recitations, and laboratory-discussion. Descriptive facts and theory of organic chemistry and applications to living processes. For students in the College of Agriculture. A terminal course in chemistry; it does not meet the Chemistry 102 prerequisite for more advanced courses in chemistry. Prerequisite: Chemistry 101. 4 hours. No two of the courses Chemistry 102, 103, and 108 may be taken for credit.
- 107. Accelerated Chemistry, I.** Lectures and recitations. The beginning chemistry course for students in the chemical sciences and others with strong high school chemistry and mathematics preparation. Chemical calculations, structure, bonding and equilibrium. Credit toward graduation is received for Chemistry 107 only if Chemistry 109 is also completed. Prerequisite: Admission by U. of I. placement test or consent of adviser; credit or concurrent registration in Mathematics 120 or 135; concurrent registration in Chemistry 109. 3 hours.
- 108. Accelerated Chemistry, II.** Continuation of Chemistry 107. Lectures and recitations. Emphasizes chemical thermodynamics, equilibrium, chemical kinetics, and coordination chemistry. Prerequisite: Chemistry 107 and/or 109 and concurrent registration in Chemistry 110, or consent of instructor. 3 hours.
- 109. Accelerated Chemistry Laboratory, I.** Laboratory and discussion. Includes quantitative analysis. Prerequisite: Concurrent registration in Chemistry 107, or receipt of credit by examination for Chemistry 107, or consent of department. 2 hours. Credit is not given for both Chemistry 109 and either 122 or 123.
- 110. Accelerated Chemistry Laboratory, II.** Laboratory and discussion. Includes experiments in qualitative analysis, inorganic synthesis, and kinetics as well as an individual project. Prerequisite: Concurrent registration in Chemistry 108 or consent of department. 2 hours.
- 115. Chemistry and Technology.** Introduces students majoring in non-technical fields to the chemical model of the material universe describing the structure and dynamics of changing matter with special emphasis on the materials and processes of everyday living. Prerequisite: Two years of high school algebra. 3 hours.
- 122. Elementary Quantitative Analysis.** Theory and practice of equilibria pertinent to chemical analyses; practical applications of classical and instrumental methods of analysis. Intended primarily for students outside the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 122 and either 109 or 123.
- 123. Quantitative Analysis.** Theory and application of chemical equilibria and instrumentation in analysis. Intended primarily for students majoring in departments within the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 123 and either 109 or 122.
- 131. Elementary Organic Chemistry.** Basic structural and synthetic organic chemistry is presented with emphasis on applications of this material to closely related areas. For

- students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Chemistry 102 or 108. 3 hours. Students may not receive credit for both Chemistry 131 and Chemistry 136.
- 134. Elementary Organic Chemistry Laboratory.** Basic laboratory technique in organic chemistry is presented with emphasis on experiments of interest to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Credit or concurrent registration in Chemistry 131. 2 hours. Students may not receive credit for both Chemistry 134 and 181.
- 136. Basic Organic Chemistry.** Fundamental structural, synthetic, and mechanistic organic chemistry is presented. For students whose major is chemistry or for those registering in the curriculum in chemistry or chemical engineering. Prerequisite: Chemistry 108, 122, or 123; concurrent registration in Chemistry 181; Mathematics 132 or 135. 3 hours. Students may not receive credit for both Chemistry 136 and 131.
- 181. Structures and Synthesis.** A laboratory course emphasizing molecular structure and synthetic chemistry. Prerequisite: Chemistry 108, 122, or 123; Mathematics 132 or 135; credit or concurrent registration in Chemistry 136. 2 hours. Students may not receive credit for both Chemistry 181 and 134.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Cooperative Education: Planning.** Same as Chemical Engineering 201. On-campus planning and discussion of cooperative work-study education programs in industry and government. Each chemistry or chemical engineering student participating in the cooperative education program must register for Chemistry/Chemical Engineering 201 or 202 each term (201 if on-campus, 202 if off-campus). Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
- 202. Cooperative Education: Industrial Practice.** Same as Chemical Engineering 202. Off-campus cooperative practice of chemistry or chemical engineering in industrial or governmental facilities. Each chemistry or chemical engineering student participating in cooperative education must register for Chemistry 202 for each off-campus term. Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
- 245. Physical Chemistry for Engineers.** Same as Ceramic Engineering 245. See Ceramic Engineering 245.
- 292. Senior Thesis.** Research, with thesis, under the direction of a senior staff member in chemistry. Normally the student takes two semesters of Chemistry 292 in the senior year. Chemistry 292 is recommended for all those who plan to do research and graduate study, and it or Biochemistry 292 is a prerequisite for graduation with distinction in chemistry. In the semester preceding their initial enrollment, those interested in taking the course should consult with their advisers and with the graduate adviser for the area of interest in which they plan to work. A maximum of 10 hours may be counted toward graduation and a thesis must be presented for credit to be received. 2 to 6 hours. (Counts for advanced hours in LAS.)
- 315. Inorganic Chemistry.** Electronic structure of atoms and molecules and their relation to the properties of the elements and compounds; types of bonding; and a survey of symmetry, group theory, ligand field theory, organo-metallic chemistry, acids and bases, nonaqueous solvents, homogeneous catalysts, and bioinorganic chemistry. Prerequisite: Credit or concurrent registration in Chemistry 342. 3 hours or $\frac{3}{4}$ unit.
- 316. Inorganic Chemistry Laboratory.** Preparation of typical inorganic compounds illustrating special and advanced techniques, including characterization by modern physical methods. Prerequisite: Chemistry 383, or credit or concurrent registration in Chemistry 315, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 322. Separation Methods.** Examines theory, practice, and instrumentation in gas and liquid chromatography, extraction techniques, mass spectrometry as coupled to chromatography, electrophoresis, and separations based on phase equilibria. Prerequisite: Credit or concurrent registration in Chemistry 340 or 342. 4 hours or 1 unit.
- 323. Applied Electronics for Scientists.** A lecture and laboratory course designed expressly for chemists and other scientists or engineers who have little or no background

in electronics, but who need a working knowledge of electronic devices, circuits, and instruments; begins with electronic principles and leads systematically into digital, analog, and servo systems used in scientific instrumentation. Prerequisite: Senior or graduate standing in any of the physical sciences or engineering, or consent of instructor. 4 hours or 1 unit.

- 329. Instrumental Methods of Analysis.** Studies instrumental methods for characterization of chemical systems: potentiometry, voltammetry, atomic spectroscopy, molecular absorption and fluorescence, mass spectrometry, activation analysis, electron and x-ray spectroscopies, gas and liquid chromatography, and current topics such as laser spectroscopy. Prerequisite: Chemistry 340; or credit or concurrent registration in Chemistry 342; or consent of instructor. 4 hours or 1 unit.
- 336. Organic Chemistry.** Second course; lectures. Prerequisite: Chemistry 131 and 134, or Chemistry 136 and 181. 3 hours or $\frac{3}{4}$ unit.
- 337. Organic Chemistry.** Laboratory experiments in organic chemistry with emphasis on synthesis. Prerequisite: Credit or concurrent registration in Chemistry 336. 3 hours or $\frac{3}{4}$ unit.
- 338. Separation, Purification, and Identification of Organic Compounds.** Separation, purification, and identification of organic compounds using modern research methods; the identification of organic compounds by the use of spectroscopic methods and chemical conversion; the separation of mixtures and the purification of the components by crystallizations, sublimation, distillation, extraction, and chromatography; and the qualitative and quantitative identification of the components of a mixture. Prerequisite: Chemistry 336 and 337. 4 hours or 1 unit.
- 339. Advanced Organic Chemistry.** Interpretation of reactivity, reaction mechanisms, and intermediates; applications in organic synthesis, photochemistry, biosynthesis of natural products, and other areas. Prerequisite: Chemistry 338. 3 hours or $\frac{3}{4}$ unit.
- 340. Principles of Physical Chemistry.** A one-semester course in physical chemistry emphasizing topics most important to students in the biological and agricultural sciences. Not open to students in the specialized curricula in chemistry and chemical engineering. Laboratory experience in this area provided by Chemistry 383 to be taken preferably after Chemistry 340. Prerequisite: Chemistry 122 or 123 and Chemistry 131, or equivalent; Physics 102; Mathematics 242 or equivalent (calculus including partial derivatives). 4 hours or 1 unit.
- 342. Physical Chemistry, I.** Lectures and problems focusing on microscopic properties. Chemistry 342 and 344 constitute a year-long study of chemical principles covering topics such as quantum chemistry, atomic and molecular structure and spectra, statistical thermodynamics, properties and thermodynamics of materials in gases, solids, and liquids, and chemical kinetics and equilibria. Prerequisite: Chemistry 108, 122, or 123; Mathematics 225 or 315, and a minimal knowledge of differential equations, or equivalent; Physics 106, 107, and 108 or equivalent. 4 hours or 1 unit.
- 344. Physical Chemistry, II.** Continuation of Chemistry 342, focusing on bulk properties. Prerequisite: Chemistry 342. 4 hours or 1 unit.
- 346. Physical Chemistry of Macromolecules.** The physical properties of systems containing large molecules, with special emphasis on proteins, nucleic acids, and high polymers; the use of physical methods for the characterization of such substances. Prerequisite: Chemistry 340 or 344. 3 hours or $\frac{3}{4}$ unit. Credit may not be received for both Chemistry 346 and Physics 350.
- 348. Advanced Physical Chemistry.** The sequence, Chemistry 348 and 349, is designed to give seniors and graduate students a unified treatment of physical chemistry on an advanced level; topics include the electronic structure and spectra of atoms, principles of wave mechanics, experimental and theoretical aspects of the chemical bond in diatomic and polyatomic molecules, statistical thermodynamics, and chemical kinetics. Prerequisite: Chemistry 344 or equivalent. 4 hours or 1 unit.
- 349. Advanced Physical Chemistry.** Continuation of Chemistry 348. Prerequisite: Chemistry 348. 4 hours or 1 unit.
- 383. Dynamics, Structure, and Physical Methods.** Laboratory presenting the relationship

of dynamics and structure with emphasis on the use of physical methods to follow the course of reactions. Prerequisite: Chemistry 181 or 134; credit or concurrent registration in Chemistry 342, or credit in Chemistry 340. 2 hours or $\frac{1}{2}$ unit.

- 385. Chemical Fundamentals.** Laboratory with experiments on the fundamental physical nature of chemical phenomena. Prerequisite: Chemistry 342 and 383; credit or concurrent registration in Chemistry 344. 4 hours or 1 unit.
- 390. History of Chemistry.** Selected topics in the intellectual and social history of chemistry from antiquity to the present, viewed within the context of broader scientific and cultural developments. Prerequisite: Technical background commensurate with that of juniors in chemistry or allied sciences; or, with consent of instructor, junior standing in history and philosophy of science or other disciplines. 2 hours or $\frac{1}{2}$ unit.
- 391. Special Topics in Chemical Science and Technology.** Open to advanced undergraduates and graduate students. Deals with subjects not ordinarily covered by regularly scheduled courses. Prerequisite: Credit or concurrent registration in any 300-level course in chemistry. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. May be repeated as topics vary.
- 392. Solid State Structural Analysis.** Lectures and laboratory on various aspects of x-ray diffraction studies of solids; topics include the properties of crystals, symmetry, diffraction techniques, data collection methods, and the determination and refinement of crystal structures. Prerequisite: Chemistry 342 or consent of instructor. 4 hours or 1 unit.
- 397. Radiochemistry.** Same as Nuclear Engineering 397. Properties of radioactive nuclei, nature of radioactivity, nuclear structure, nuclear reactions, interactions of radiations with matter, chemical aspects of radioactivity work, and applications of nucleonics to chemistry. Prerequisite: One semester of physical chemistry or one semester of atomic physics, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 404. Advanced Inorganic Chemistry Laboratory.** Specialized laboratory techniques; more difficult inorganic syntheses. Prerequisite: Credit or concurrent registration in one of the lecture courses in inorganic chemistry in the 400 series. $\frac{1}{4}$ to $\frac{3}{4}$ unit.
- 405. Inorganic Chemistry Seminar.** Required of all graduate students whose major is inorganic chemistry. $\frac{1}{4}$ unit.
- 406. Physical Inorganic Chemistry.** Includes group theory and use of physical methods to provide information about the geometry, electronic structures, and reactivity of inorganic compounds in solution; emphasizes NMR and ESR. Prerequisite: Chemistry 344. 1 unit.
- 407. Special Topics in Inorganic Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as organometallic chemistry, advanced ligand field theory and molecular orbital theory of inorganic compounds, kinetics and mechanisms of inorganic reactions, etc. Prerequisite: Chemistry 406 or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for credit.
- 421. Spectrochemical Methods of Analysis.** Principles and applications of spectroscopic measurements and instrumentation; atomic emission, absorption, and fluorescence; ultraviolet, visible, and infrared absorption spectroscopy; molecular fluorescence and phosphorescence; Raman spectroscopy; and other spectrometric methods. Prerequisite: General physics and chemistry equivalent to a major in physical sciences for a bachelor's degree. $\frac{1}{2}$ or 1 unit. (Lecture, $\frac{1}{2}$ unit; lecture and laboratory, 1 unit.)
- 422. Electrical Methods of Chemical Analysis.** Polarography, potentiometric, amperometric, and conductometric titrations, and other selected topics. Lectures and laboratory. Prerequisite: Chemistry 344 or equivalent. 1 unit.
- 424. Special Topics in Analytical Chemistry.** Recent advances in measurement science and the application of analytical chemistry to other sciences; designed to acquaint students with techniques and applications not covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May be repeated.
- 425. Analytical Chemistry Seminar.** Required of all graduate students whose major is analytical chemistry. $\frac{1}{4}$ unit.
- 430. Advanced Organic Chemistry: Structure and Spectroscopy.** Advanced survey of

organic chemistry with emphasis on structure and spectroscopy. Prerequisite: Chemistry 336. 1 unit.

- 431. Advanced Organic Chemistry: Reaction Mechanisms.** Advanced survey of organic chemistry with emphasis on reaction mechanisms and concepts of physical organic chemistry. Prerequisite: Chemistry 336 and one year of physical chemistry. 1 unit.
- 432. Advanced Organic Chemistry: Synthesis.** Advanced survey of organic chemistry with emphasis on synthesis. Prerequisite: Chemistry 336. 1 unit.
- 433. Organic Chemistry.** Special topics in organic chemistry. An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as natural product synthesis and biosynthesis, organic photochemistry, chemistry of special families of organic compounds, etc. Prerequisite: Chemistry 431 and 432, one of which may be taken concurrently. $\frac{1}{2}$ or $\frac{3}{4}$ unit. Two lectures per week are required for $\frac{3}{4}$ unit credit. May be repeated for credit.
- 435. Organic Chemistry Seminar.** Current literature in organic chemistry. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 436. Experimental Organic Chemistry.** A lecture course on research techniques in organic chemistry. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biochemistry and Biophysics 440. Topics of importance in research in biophysical chemistry are discussed with emphasis on physical background and current applications; topics may be chosen from among the following: NMR and ESR spectra of biological macromolecules; x-ray diffraction studies of macromolecules; kinetics and statistical mechanics of helix coil transitions; physical approaches to the refolding and assembly of multi-subunit proteins; fluorescence spectroscopic studies on macromolecules; and light scattering from macromolecules in solution. Prerequisite: Chemistry 344 or equivalent, or Chemistry 346. 1 unit.
- 441. Thermodynamics and Statistical Thermodynamics.** Fundamentals of classical thermodynamics with emphasis on equilibrium and stability criteria; an introduction to equilibrium statistical mechanics with discussion of several ensembles and applications to ideal systems of interest to chemists; and introduction to nonequilibrium thermodynamics. Prerequisite: Chemistry 342 and 344, or equivalent. 1 unit.
- 442. Statistical Mechanics.** Fundamentals of equilibrium statistical mechanics with selected applications to interacting classical fluids: dense gases, solutions, liquids, plasmas, and ionic solutions; introduction to nonequilibrium statistical mechanics and linear response theory. Prerequisite: Chemistry 348 and 441, or equivalent, or consent of instructor. 1 unit.
- 443. Quantum Dynamics.** The quantum mechanical description of time-dependent processes, including discussions of the time-dependent Schrodinger equation, approximations, interaction of matter with radiation, wave packets, elastic and inelastic scattering, and relaxation phenomena. Prerequisite: Concurrent registration in Chemistry 348 or consent of instructor. 1 unit.
- 445. Physical Chemistry Seminar.** Required of all graduate students whose major is physical chemistry. Prerequisite: Consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 446. Molecular Electronic Structure.** The theoretical basis of the electronic structure of atoms and molecules; molecular orbital concepts and self-consistent field theory; angular momentum and the full rotation group; electron correlation effects; and applications to electronic spectroscopy of organic molecules, detailed descriptions of chemical reactions, and molecular properties. Prerequisite: Chemistry 348. 1 unit.
- 448. Chemical Kinetics.** Theoretical and experimental topics in chemical kinetics and chemical dynamics; topics include relation between rates and mechanisms of chemical reactions, collision theory of reaction rates, activated complex theory, theory of unimolecular processes, classical dynamics of reactive scattering, elastic scattering, quantum theory of inelastic scattering or equivalent curve crossing processes, and experimental methods. Prerequisite: Chemistry 344. 1 unit.
- 449. Special Topics in Physical Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as molecular spectroscopy,

statistical mechanics, radiation and hot-atom chemistry, molecular quantum mechanics, radio-frequency spectroscopy, advanced experimental methods, kinetics of irreversible processes and cooperative phenomena, etc. Prerequisite: Consent of instructor. $1/2$ or 1 unit. May be repeated.

- 490. Special Topics in Chemistry.** Designed for students majoring or minoring in chemistry who wish to undertake individual studies of a non-research nature under the direction of a faculty member of the department. Prerequisite: Consent of instructor and written approval of department head. Staff for the course is the same as for Chemistry 499. $1/4$ to 1 unit.
- 494. Chemical Basis of Biological Specificity.** Same as Biochemistry 494. See Biochemistry 494.
- 496. Carbon and Hydrogen Tracer Methodology.** Comprehensive study of the tracer methodology concerned with the use of carbon-13, carbon-14, hydrogen-2, and hydrogen-3 in chemical research. Prerequisite: Chemistry 337 or consent of instructor. $3/4$ unit.
- 499. Thesis Research.** A candidate for the master's degree who elects research is required to present a thesis. A thesis is always required of students working toward the degree of Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in a department other than chemistry or chemical engineering must receive permission from the head of the Department of Chemistry to register in this course. 0 to 4 units.

CINEMATOGRAPHY

(See Art and Design)

CIVIL ENGINEERING

Head of Department: W. J. Hall

Department Office: 1114 Civil Engineering Building, 208 North Romine, Urbana

- 195. Introduction to Civil Engineering.** A civil engineering orientation course including historical developments, educational requirements, relation to science, professional practice, and specialties within the profession. Prerequisite: Sophomore standing in civil engineering. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Engineering Surveying.** Introduction to surveying and photogrammetry. Prerequisite: Civil Engineering 293; credit or concurrent registration in Computer Science 101. 4 hours.
- 205. Route Surveying and Design.** Principles for the design and layout of routes; coverage includes horizontal and vertical alignment, route location, earthwork, computation, ground and photogrammetric survey methods, and special survey methods for highways, railroads, pipelines, tunnels and urban construction. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours.
- 210. Behavior of Materials.** Same as Theoretical and Applied Mechanics 224. See Theoretical and Applied Mechanics 224.
- 216. Construction Engineering.** Introduction to the construction processes: contracting and bonding, planning and scheduling, estimating and project control, scientific productivity models, and construction econometrics. Prerequisite: Civil Engineering 292; credit or concurrent registration in Computer Science 101 and Civil Engineering 293. 3 hours.
- 220. Materials for Transportation Facilities.** Materials for the construction of transportation roadways including soils, aggregates, soil-aggregates, bituminous materials, as-

phaltic mixtures, and stabilized soils; emphasizes properties, behavior, mixture analysis, and quality control. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours.

- 230. Introduction to Transportation Engineering and Planning.** Same as Urban and Regional Planning 230. Introduction to engineering and planning principles applicable to all types of transportation systems; technological characteristics of transportation modes; economic and environmental concepts applied to transportation; and design, planning, and management of transportation facilities, operations, and maintenance. Prerequisite: Civil Engineering 292, Computer Science 101, Economics 101, or equivalent. 3 hours.
- 241. Air and Water Quality.** Sources and types of air and water pollution; measurement of air and water quality; effects of pollutants on the environment; transport and ultimate fate of pollutants; environmental quality standards; and methods of pollution control and abatement. Prerequisite: Chemistry 102. 3 hours.
- 255. Introduction to Hydrosystems Engineering.** Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water; presents a quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: Civil Engineering 293 or a course in probability or statistics; credit or concurrent registration in Theoretical and Applied Mechanics 235 and Civil Engineering 292, or equivalent. 3 hours.
- 261. Introduction to Structural Engineering.** Basic topics in the analysis, behavior and design of trusses and framed structures under static loads; analysis topics include member forces in trusses, shear and moment diagrams, deflections, simple applications of the force method and slope-deflection; and an introduction to computer applications by means of a general purpose structural analysis program. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
- 262. Intermediate Structural Analysis.** Energy principles as applied to structural analysis; a comprehensive study of the flexibility and stiffness methods of analysis of structures; influence functions; curves of maxima; and use and interpretation of computer structural analysis programs. Prerequisite: Civil Engineering 261. 3 hours.
- 263. Behavior and Design of Metal Structures, I.** Introduction to the design of metal structures; behavior of members and their connections; and theoretical, experimental, and practical bases for proportioning members and their connections. Prerequisite: Civil Engineering 261. 3 hours.
- 264. Reinforced Concrete Design, I.** Study of the strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces; extensive discussion of the influence of the material properties on behavior. Prerequisite: Civil Engineering 261. 3 hours.
- 280. Introduction to Soil Mechanics and Foundation Engineering.** Classification of soils, compaction in the laboratory and in the field, soil exploration, boring and sampling, one-dimensional settlement analyses, strength, bearing capacity of foundations, and stability of retaining walls and slopes. Prerequisites: Theoretical and Applied Mechanics 221. 3 hours.
- 284. Geotechnical Engineering.** Applied problems in geotechnical engineering; introduction to the analysis and design of foundations, excavation walls, slopes, and underground structures in soil and rock; bearing capacity and settlement of foundations, stability of excavations and slopes, and ground movements due to construction. Prerequisite: Civil Engineering 280. 3 hours.
- 290. Legal Aspects of Engineering Contracts and Specifications.** Same as General Engineering 290. See General Engineering 290.
- 292. Planning, Design, and Management of Civil Engineering Systems.** Introduction to the formulation and solution of civil engineering problems. Major topics are: engineering economy, mathematical modeling, and optimization. Classical optimization, linear and nonlinear programming, network theory, critical path methods, simulation, decision theory, and dynamic programming techniques are applied with the aid of

personal computers to a variety of civil engineering problems. Prerequisite: Mathematics 132, and credit or concurrent registration in Mathematics 225. 3 hours.

- 293. Engineering Modeling Under Uncertainty.** Identification and modeling of non-deterministic problems in civil engineering, and the treatment thereof relative to engineering design and decision making; development of stochastic concepts and simulation models, and their relevance to real design and decision problems in various areas of civil engineering. Prerequisite: Mathematics 132; credit or concurrent registration in Mathematics 242 recommended. 3 hours.
- 295. Professional Practice.** A series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. Lectures are given approximately once a week. Prerequisite: Junior standing. 0 hours.
- 307. Photogrammetric Engineering.** Studies in metric photography in civil engineering practice: examination of topographic, industrial, and engineering applications of photogrammetry; analog methods, instrumentation and systems; flight planning; introduction to analytical photogrammetry. Includes laboratory exercises on stereoscopic plotters. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours or 1 unit.
- 314. Properties and Behavior of Concrete.** Examines the influence of constituent materials (cements, aggregates and admixtures) on the properties of fresh and hardened concrete; mix design handling and placement of concrete; and behavior of concrete under various types of loading and environment; test methods. Laboratory practice is an integral part of the course. Prerequisite: Civil Engineering 210. 3 hours or $\frac{3}{4}$ unit.
- 315. Construction Productivity.** Introduction to the application of scientific principles to the measurement and forecasting of productivity in construction engineering; conceptual and mathematical formulations of the labor, equipment, and material factors affecting productivity. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 316. Construction Planning and Control.** Project definition; scheduling and control models; material, labor, and equipment allocation; optimal schedules; project organization; documentation and reporting systems; and management and control. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 318. Construction Cost Analyses and Estimates.** Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups and profits; and the fundamentals of cost recording for construction cost accounts and cost controls. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Pavement Analysis and Design, I.** Analysis, behavior, performance, and structural design of pavements for highways and airfields; topics include climate factors, rehabilitation, life cycle design economics, and traffic loadings. Prerequisite: Civil Engineering 220 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 321. Bituminous Materials and Mix Design.** Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; and recycling of mixtures. Prerequisite: Civil Engineering 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 322. Development of Highway Facilities.** Analysis of factors in developing a highway transportation facility; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming improvements; drainage design; structural design of surface; concepts of highway management and finance; and highway maintenance planning. Prerequisite: Civil Engineering 220 or consent of instructor. 4 hours or 1 unit.
- 330. Urban Transportation Planning.** Same as Urban Planning 330. See Urban Planning 330.
- 331. Regional Transportation Planning.** Same as Urban Planning 331. Examination of

the transportation systems for regions larger than urban areas through theoretical models linking the economic and political realities of present freight and passenger services at state, interstate, and national levels; considers competition among agencies and travel modes in light of federal regulations and technological developments. Prerequisite: Civil Engineering 230 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 334. Airport Design.** Basic principles of site selection for airports and fundamental considerations of design, construction, and maintenance of airport pavements and structures. Prerequisite: Civil Engineering 220 and senior standing in civil engineering, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Managing Wastewaters in Aquatic Ecosystems.** Examines the characteristics of rivers and lakes which affect the management of domestic and industrial wastewaters; includes assessment of chemical hazards, and introduction to surveillance and biomonitoring, and a review of regulations governing effluents. Prerequisite: Civil Engineering 241 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 338. Biomonitoring: Design, Analysis, and Interpretation.** Discusses the theory and application of biomonitoring as a component of environmental management; reviews a range of techniques to analyze effluents and assess condition and trend in the environment, using biological and ecological systems; and emphasizes biomonitoring program design, selection and analysis of data, and interpretation of biomonitoring results. Prerequisite: Civil Engineering 337 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 339. Environmental Systems Analysis, I.** Examination of principles of environmental engineering design: applications to mathematical methods, including single and multi-objective programming, to environmental systems; economic analysis, including benefit-cost; and management strategies. Prerequisite: Civil Engineering 292; and Civil Engineering 342 or 349. 3 hours or $\frac{3}{4}$ unit.
- 340. Physical Principles of Environmental Engineering Processes.** Analysis of the physical principles which form the basis of many water and air quality-control operations; sedimentation, filtration, inertial separations, flocculation, and mixing and principles of reactor design. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 341. Regional Environment Management Simulation.** Same as Agricultural Economics 319, Environmental Studies 341, Geography 341, and Urban and Regional Planning 375. Simulation of environmental, political, and economic problems facing a mid-western community. Students assume the responsibilities of planners, environmental quality managers, lawyers, business managers, land developers, and other roles and interact to resolve these problems. Course introduces practical procedures and decisions that public servants, lawyers, engineers, business persons, and citizens in general confront with regard to the environment. Prerequisite: Senior or graduate standing, or consent of instructor and credit in an introductory course in pollution control. 2 hours or $\frac{1}{2}$ unit.
- 342. Water Quality Control Processes.** Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
- 343. Chemical Principles of Environmental Engineering Processes.** Application of principles of chemical equilibrium, surface chemistry, chemical kinetics, and photochemistry to air and water quality considerations; carbonate and phosphate systems in natural waters; dissolved gases; hardness; hydrolysis of coagulants; corrosion; chemistry of disinfectants; removal of impurities by adsorption; and reactions of various pollutants in the atmosphere. Prerequisite: Civil Engineering 342 or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Solid Waste Management.** Analyzes the sources, quantities, and characteristics of solid waste; effect of refuse on the environment; establishment and operation of collection and transportation systems, material recovery systems, energy recovery systems, and ultimate disposal systems. A term project is required of all graduate students. Prerequisite: Civil Engineering 241 or consent of instructor. 3 hours or 1 unit.

- 345. Atmospheric Dispersion Modeling.** Application of the fundamentals of meteorology to air pollution problems including the transport and diffusion of particulate matter, aerosols and gases; precipitation processes and rain-out; behavior of stack effluents; effects of pollutants in the atmosphere. Prerequisite: Theoretical and Applied Mechanics 235 and Mechanical Engineering 205, or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 346. Biological Principles of Environmental Engineering Processes.** Application of principles of organic chemistry, biochemistry, and biology to air and water quality, wastes, and their engineering management; biologically mediated changes in water and in domestic and industrial wastewater; biological contaminants of air; and solid waste disposal. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 347. Aquatic Ecology.** Same as Ecology, Ethology, and Evolution 359. Integrated study of the environmental factors affecting the composition and distribution of biota in lakes, rivers, and estuaries; emphasis on the nature of the response of aquatic ecosystems to stress and practical means of aquatic resource management. Prerequisite: Civil Engineering 346 or Ecology, Ethology, and Evolution 343, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 348. Atmospheric Chemistry.** Same as Environmental Studies 348. Examination of the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; atmospheric chemistry of carbon, nitrogen, and sulfur; atmospheric aerosol and heterogeneous reactions; material transport; stratospheric ozone and its depletion; airborne radioactivity and atmospheric ion chemistry. Prerequisite: Mechanical Engineering 207, Chemistry 340, or Atmospheric Sciences 301, or equivalent; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 349. Air Resources Engineering.** Introduction to air pollution; includes the basis for air quality criteria, classification of sources, and the design of systems to control air pollution from stationary sources. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
- 350. Surface Water Hydrology.** A study of descriptive and quantitative hydrology dealing with the distribution, circulation, and storage of water on the earth's surface; discusses principles of hydrologic processes and presents methods of analysis and their applications to engineering and environmental problems. Prerequisite: Civil Engineering 255 or equivalent with consent of instructor. 3 hours, or $\frac{3}{4}$ unit.
- 351. Hydromechanics.** Incompressible fluid mechanics with particular emphasis on topics in analysis and applications in civil engineering areas; primary topics include principles of continuity, momentum and energy, kinematics of flow and stream functions, potential flow, laminar motion, turbulence, and boundary-layer theory. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 353. Analysis and Design of Hydraulic Systems.** Methodologies for hydraulic analysis and design of engineering systems, including closed conduits and hydraulic structures. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Additional $\frac{1}{4}$ unit of credit available to graduate students through registration in Civil Engineering 497 for special course project.
- 356. Hydraulics of Surface Drainage.** Hydraulic analysis and design of urban, highway, airport, and small rural watershed drainage problems; discussion of overload and drainage channel flows; hydraulics of storm-drain systems and culverts; determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 357. Groundwater.** Physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass transport, well hydraulics and pumping test analysis, role of groundwater in the hydrologic cycle, groundwater quality and contamination. Prerequisite: Civil Engineering 255 and Theoretical and Applied Mechanics 235, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 358. Air Pollution and Combustion.** Same as Mechanical Engineering 333 and Aero-

autical and Astronautical Engineering 335. See Aeronautical and Astronautical Engineering 335.

- 361. Matrix Analysis of Framed Structures.** A unified formulation of displacement and force methods of analysis including the topological view of the structure as an assemblage of members; matrix techniques of formulation; considerations for automatic computation; and evaluation of truss, grid, and frame models for the response of real structures. Prerequisite: Civil Engineering 262. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 363. Behavior and Design of Metal Structures, II.** Metal members under combined loads; connections, welded and bolted; moment-resistant connections; plate girders, conventional behavior, and tension field action. Prerequisite: Civil Engineering 263. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 364. Reinforced Concrete Design, II.** Study of the strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 365. Design of Structural Systems.** The whole structural design process including definition of functional requirements, selection of structural scheme, formulation of design criteria, preliminary and computer-aided proportioning, and analysis of response, cost, and value. Prerequisite: Civil Engineering 262, and credit in either Civil Engineering 263 or 264 with concurrent registration in the other. 3 hours or 1 unit.
- 368. Prestressed Concrete.** Study of strength, behavior, and design of prestressed reinforced concrete members and structures, with primary emphasis on pretensioned, precast construction; emphasis on the necessary coordination between design and construction techniques in prestressing. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 369. Behavior and Design of Wood Structures.** Mechanical properties of wood, stress grades and working stresses; effects of strength-reducing characteristics, moisture content, and duration of loading and causes of wood deterioration; glued-laminated timber and plywood; behavior and design of connections, beams, and beam-columns; design of buildings and bridges; other structural applications: trusses, rigid frames, arches, and pole-type buildings; and prismatic plates and hyperbolic paraboloids. Prerequisite: Civil Engineering 261 and one of: Civil Engineering 262, 263, or 264. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Structural Reliability and Probabilistic Bases of Design.** Modern probabilistic bases for the design and evaluation of structures and systems, including analysis of structural safety and reliability, and development of probability-based design criteria; quantitative risk evaluation, systematic assessment and analysis of uncertainties, safety and load factor determinations, and risk analysis and design for wind storms and earthquakes. Prerequisite: Civil Engineering 261 and 293, or equivalent, or graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 374. Introduction to Structural Dynamics.** Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multidegree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; and introduction to systems with distributed mass and flexibility. Prerequisite: Theoretical and Applied Mechanics 212; Mathematics 345; Civil Engineering 261, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for both Civil Engineering 374 and Theoretical and Applied Mechanics 311.
- 375. Welding and Joining Processes.** Same as Metallurgical Engineering 301. See Metallurgical Engineering 301.
- 378. Introduction to the Design of Ocean Structures.** Introduction to design and construction of civil engineering structures in the ocean and to associated engineering operations; principal topics include water wave mechanics, engineering oceanography, wave and current forces, and design considerations for fixed and floating structures.

Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 261; Civil Engineering 293. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 379. Applied Structural Mechanics.** Study of beams under lateral load; beams with combined lateral load and thrust; beams on elastic foundations; applications of Fourier series and virtual work principles to beam-type structures; stress and strain in three dimensions; applications to flexure of beams and plates; elements of the engineering theory of plates; and torsion of thin-walled open sections. Prerequisite: Mathematics 345 and Civil Engineering 262. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Soil Mechanics and Soil Properties.** Index properties and engineering classification; water flow and hydraulic properties; stress in soil; stress-strain properties of soils; consolidation; shear strength; properties of natural soil deposits; unsaturated soils; and experimental measurements. Prerequisite: Civil Engineering 280 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 384. Applied Soil Mechanics.** Application of soil mechanics to foundations of buildings; stability of earth slopes; earth pressures and retaining walls; braced cuts; and damage due to construction operations. Prerequisite: Civil Engineering 383 or equivalent. 4 hours or 1 unit.
- 391. Computer Methods in Civil Engineering.** Review of programming concepts; formulation and programming of numerical, data processing, and logical problems with applications from various branches of civil engineering; organization of programs and data; and development and use of problem-oriented programming languages in civil engineering. Prerequisite: Computer Science 101 or equivalent; senior or graduate standing in civil engineering; or consent of instructor. 3 hours or 1 unit.
- 393. Engineering Decision and Risk Analysis.** Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multiobjective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk-based design criteria, risk benefit trade-offs, and optimal decisions. Prerequisite: Civil Engineering 293 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 397. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. Prerequisite: Senior or graduate standing. 1 to 4 hours, or 0 to 4 units.
- 398. Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering offered by the faculty to augment the formal courses available. Prerequisite: Individually identified for each offering under this course number; see Timetable. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 414. Advanced Concrete Technology.** Discusses the physical and engineering properties of concrete at an advanced level, with emphasis on the materials aspects of repair and rehabilitation of concrete structures. Prerequisite: Civil Engineering 314. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Industrial Engineering 416. See Industrial Engineering 416.
- 417. Systems Analysis, II: Digital Simulation.** Same as Industrial Engineering 417. See Industrial Engineering 417.
- 420. Pavement Analysis and Design, II.** Development of models for and analysis of pavement systems; use of transfer functions relating pavement response to pavement performance; evaluation and application of current pavement design practices and procedures; analysis of the effects of maintenance activities on pavement performance; and economic evaluation of highway and airport pavements. Prerequisite: Civil Engineering 320. 1 unit.
- 421. Pavement Evaluation, Maintenance, and Rehabilitation.** Concepts and procedures for condition survey rating; evaluation by nondestructive testing (roughness, skid resistance, structural capacity); and destructive testing, maintenance strategies, and rehabilitation of pavement systems for highways and airfields. Prerequisite: Civil Engineering 320. 1 unit.
- 423. Highway Materials Stabilization.** Stabilization of aggregates and soils with cement, lime, bituminous materials, and other stabilizing agents; emphasis on basic stabilization

- reactions, properties of stabilized materials, and composition design. Prerequisite: Civil Engineering 220 or consent of instructor. 1 unit.
- 424. Transportation Soils Engineering.** Occurrence and properties of surficial soils, soil classification systems, soil variability; subgrade evaluation procedures, repeated loading behavior of soils; soil compaction and field control; soil moisture, soil temperature, and frost action; soil trafficability and subgrade stability for transportation facility engineering. Prerequisite: Civil Engineering 383 or equivalent. 1 unit.
- 430. Urban Transportation Modeling.** Urban transportation network and travel demand models; methods and data requirements for estimating model parameters; and implications for planning practice. Prerequisite: Civil Engineering 330 and Industrial Engineering 401. 1 unit.
- 439. Environmental Systems Analysis, II.** Examination of advanced topics in environmental systems analysis with emphasis on the mathematical modeling of water quality systems and multi-objective programming methods of analysis. Large scale optimization models and inter-relationships between water quality and water quantity analyses, e.g., reservoir operation. Prerequisite: Civil Engineering 339. 1 unit.
- 440. Processes for Water Quality Control, I.** Theory and basic design of processes used in water and wastewater treatment, including adsorption, ion exchange, chemical oxidation and reduction, disinfection, sedimentation, filtration, coagulation, flocculation, and chemical precipitation. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
- 441. Modeling of Water Quality in Natural Systems.** Studies mathematical modeling of the movement and fate of pollutants and other substances in streams, lakes, and other natural water bodies; the emphasis is on the development of practical models of aquatic systems. Prerequisite: Civil Engineering 340 or 351. 1 unit.
- 442. Processes for Water Quality Control, II.** Theory and basic design of processes used in water and wastewater treatment, including gas transfer, slurry dewatering, incineration and residue disposal, and aerobic and anaerobic biological treatment processes. Prerequisite: Civil Engineering 340 and 343, and credit or concurrent registration in Civil Engineering 346, or consent of instructor. 1 unit.
- 443. Unit Operations in Environmental Engineering.** Experimental and pilot plant studies of unit operations and unit processes in environmental engineering, emphasizing water treatment and wastewater treatment; evaluation of parameters for the design of biological waste treatment units; determination of chemical requirements for water treatment processes; and studies of anaerobic digestion. Prerequisite: Civil Engineering 440 or credit or concurrent registration in Civil Engineering 442, or consent of instructor. 1 unit.
- 448. Control of Air Pollution from Stationary Sources.** Same as Mechanical Engineering 411. Study of the basic theory of pollution control devices and their application to air pollution control problems. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
- 449. Techniques and Instrumentation in Air Sampling.** Same as Environmental Studies 449 and Mechanical Engineering 412. Study of principles of sampling for particles and gases in the field of air pollution; examination of instrumental techniques relevant to the design of sampling systems used in process control, ambient air monitoring and laboratory experiments; methods of sample analysis and their limitations. Prerequisite: Mathematics 345 and Civil Engineering 349; or consent of instructor. 1 unit.
- 450. Hydrologic Systems.** Application of systems concepts to simulate and analyze hydrologic cycle and its components in terms of various deterministic, probabilistic, stochastic, lumped, distributed, linear, and nonlinear mathematical models for the purpose of planning and designing water resources projects. Prerequisite: Civil Engineering 350 or consent of instructor. 1 unit.
- 455. Transport Processes in Water.** Physical processes involved in transport of pollutants by water: turbulent diffusion and longitudinal dispersion in rivers, pipes, lakes, and the ocean; diffusion in turbulent jets, buoyant jets, and plumes. Prerequisite: Mathematics 343 and 345, and Theoretical and Applied Mechanics 235, or consent of instructor. 1 unit.

- 457. Modeling of Groundwater Flow and Solute Transport.** Examines theory and application of numerical methods, finite differences and finite element, for solving the equations of groundwater flow and solute transport; transport of chemically reacting solutes; model calibration and verification. Prerequisite: Civil Engineering 357 or consent of instructor; Mathematics 345 or equivalent. 1 unit.
- 458. Hydraulics of River Engineering.** Hydraulics of flow in rivers, including varied open-channel flow, unsteady flow, sediment transport, and stable-channel design. Prerequisite: Civil Engineering 351 or equivalent. 1 unit.
- 462. Design of Tall Building Structures.** Examination of the methods of analysis and design criteria for tall buildings: dead, live, wind, and earthquake loads; reinforced concrete and steel moment-resisting frames, shear walls, braced frames; plastic design of multistory steel braced frames; P-Delta effects and instability; unreinforced and reinforced masonry buildings; very tall buildings including framed tube, tube in tube, trussed tube and hat trusses. Prerequisite: Graduate standing in structural engineering with courses equivalent to Civil Engineering 363 and 466, or consent of instructor. 1 unit.
- 463. Optimization of Structures.** Structural design processes; formulation of problems in the optimization of structures; optimization of structural elements; minimum volume principles; and use of mathematical programming in optimization of structural systems. Prerequisite: Bachelor of Science degree in engineering with courses in structural analysis and design, or consent of instructor. 1 unit.
- 465. Behavior of Structural Metal Frameworks.** Theories of ultimate behavior of metal structural members with emphasis on buckling and stability of members and frames; theory of torsion applied to beam torsion, lateral-torsional buckling, curved beams with emphasis on design criteria; post-buckling strength of plates and post-buckling versus column behavior. Prerequisite: Civil Engineering 363. 1 unit.
- 466. Behavior of Reinforced Concrete Members.** In-depth study of the behavior of reinforced concrete members, including the relationships between behavior and building code requirements. Prerequisite: Civil Engineering 262 and 264. 1 unit.
- 467. Behavior of Reinforced Concrete Structures.** Study of the strength and behavior of assemblages of reinforced concrete members, including a study of the applicability of traditional elastic design procedures to structures which exhibit inelastic behavior under the influence of both short and long term loadings. Prerequisite: Civil Engineering 466. 1 unit.
- 469. Thin Shell Structures.** Fundamental membrane and bending theories of shells; application of theories to analysis and design of folded plates and cylindrical, rotational, and translational shells; membrane stresses and deflections; and approximate bending solutions by variational, finite-difference, and finite-element methods. Prerequisite: Civil Engineering 473 or consent of instructor. 1 unit.
- 473. Theory of Plates.** Classical plate bending theory; emphasis on methods of solution including series expansions, variational procedures, and finite element techniques applicable to plate-type structures commonly encountered in practice; consideration of inplane loads, large deflections, buckling, and anisotropy. Prerequisite: Civil Engineering 262 and Mathematics 345. 1 unit.
- 474. Dynamics of Framed Structures.** Advanced treatment of the dynamics of multidegree-of-freedom framed structural systems; fundamental concepts of eigenvalue theory of real matrices and energy principles of dynamics as bases for a unified approach to dynamical problems of structural assemblages; structural idealizations, principles of dynamics, Lagrange's equations, response calculations, normal mode method and its limitations; transfer matrix approach, and computer utilization. Prerequisite: Civil Engineering 361 and 374, or equivalent. 1 unit.
- 475. Steel Structures: Fatigue and Fracture.** Examination of fatigue and fracture behavior of steel structures and connections; discussion of relevant fatigue and fracture mechanics theory and experimental data and their application to an assessment of behavior and current design specification practice. Prerequisite: Civil Engineering 353. 1 unit.
- 478. Finite Element Methods in Solid and Structural Mechanics.** Theory and application of the finite element method; stiffness matrices for triangular, quadrilateral, and

isoparametric elements; two- and three-dimensional elements; algorithms necessary for the assembly and solution; direct stress and plate bending problems for static, nonlinear buckling and dynamic load conditions; displacement, hybrid, and mixed models together with their origin in variational methods. Prerequisite: Theoretical and Applied Mechanics 451, or Civil Engineering 379, or consent of instructor. 1 unit.

- 479. Earthquake Engineering.** Study of the effects of earthquakes on constructed works and of the design of structures to resist earthquake motions; earthquake ground motions and mechanisms; response of structures to earthquake motion; behavior of materials, elements, assemblages and structures subjected to earthquake motion; principles of earthquake resistant design; and special topics. Prerequisite: Civil Engineering 374. 1 unit.
- 480. Earth Pressures and Retaining Structures.** Classical and modern earth pressure theories and their experimental justification; pressures and bases for design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
- 481. Earth Dams and Related Problems.** Fundamentals of problems of slope stability; seepage in composite sections and anisotropic materials; methods of stability analysis; mechanism of failure of natural and artificial slopes; compaction; and field observations. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
- 482. Advanced Analysis of Consolidation of Clays.** Elastic solutions relevant to soil mechanics; permeability; general application of Terzaghi's theory of one-dimensional consolidation; advances in consolidation theories; mechanism of volume change; delayed and secondary compressibility and creep; theory of three-dimensional consolidation and solutions; radial flow and design of sand drains; and analysis and control of settlement. Prerequisite: Civil Engineering 383. 1 unit.
- 483. Advanced Analysis of Shear Strength of Soils.** Physico-chemical properties of soils; fabric and structure of soil; mechanism of shearing resistance; residual shear strength of overconsolidated clays and clay shales; long-term shear strength of overconsolidated clays; Hvorslev shear strength parameters; and undrained shear strength of clays. Prerequisite: Civil Engineering 383. 1 unit.
- 484. Foundation Engineering.** Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments, and waterfront structures. Prerequisite: Civil Engineering 384. 1 unit.
- 485. Behavior and Design of Deep Foundations.** Ultimate capacities and load-deflection of piles and drilled shafts subjected to compressive loads, tensile loads, and lateral loads; effects of duration of load, soil-structure interaction; two and three dimensional analysis of pile groups with closely spaced piles; effects of installation; inspection of deep foundations and full-scale field tests. Prerequisite: Civil Engineering 383, 384, or consent of instructor. 1 unit.
- 486. Rock Mechanics, I.** Physical properties and classification of intact rock, theories of rock failure, state of stress in the earth's crust, stresses and deformations around underground openings assuming elastic, plastic, and time-dependent behavior; effect of geologic discontinuities on rock strength; and introduction to stability analyses in rock. Prerequisite: Civil Engineering 383; Geology 450 or equivalent; Theoretical and Applied Mechanics 321 or equivalent; or consent of instructor. 1 unit.
- 487. Rock Mechanics, II.** Application of rock mechanics to engineering problems; shear strength of rock masses; dynamic and static stability of rock slopes; deformability of rock masses; design of pressure tunnel linings and dam foundations; controlled blasting and blasting vibrations; tunnel support; machine tunneling; design and construction of large underground openings; and field instrumentation. Prerequisite: Civil Engineering 486 or consent of instructor. 1 unit.
- 495. Civil and Environmental Engineering Seminar.** Discussion of current topics in civil and environmental engineering and related fields by staff, students, and visiting lecturers. 0 to 1/4 unit. May be repeated.
- 497. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the adviser and the

staff member who will supervise the investigation. Prerequisite: Consent of instructor. 0 to 4 units.

498. Civil Engineering Special Topics. Structured presentations of new and developing areas of knowledge in civil engineering at an advanced graduate level. Prerequisite: Individually identified for each offering under this course number; see Timetable. 1/4 to 1 unit.

499. Thesis Research. 0 to 4 units.

CLASSICAL CIVILIZATION

(See Classics)

CLASSICS

(Including Classical Civilization, Coptic, Greek, and Latin)

Chairperson of Department: D. F. Bright

Department Office: 4072 Foreign Languages Building, 707 South Mathews, Urbana

Classical Civilization

The following courses presuppose no knowledge of the Greek and Latin languages and are open to all students. For other courses in the area of classical civilization, see Architecture 210; History of Art 215, 216, and 323; History 181, 182, 381, 382, 383, and 384; Philosophy 203 and 310; Political Science 393; and Religious Studies 201, 202, 210, and 340.

- 100. Vocabulary Building from Greek and Latin Roots.** Vocabulary building assistance for students through an analysis of Greek and Latin roots, prefixes, and suffixes found in English. 2 hours.
- 101. PLATO Laboratory in English Vocabulary Building.** Intensive drill and practice in English words derived from key Latin and Greek roots. Prerequisite: Concurrent registration in Classical Civilization 100. 1 hour.
- 110. Introduction to Greek Culture.** Study of social and cultural life in Greece during the classical period. 2 hours. Credit is not given for both Classical Civilization 110 and 114.
- 111. Mythology of Greece and Rome.** A study of the major myths of Greece and Rome and their impact upon later art, music, and literature. 2 hours. Credit is not given for both Classical Civilization 111 and 115.
- 112. The Roman Achievement.** Introduction to Roman civilization through the study of the social and cultural life of ancient Rome. 2 hours. Credit is not given for both Classical Civilization 112 and 116.
- 114. Introduction to Greek Culture.** Studies the social and cultural life in Greece during the classical period. Shares two hours of lecture with Classical Civilization 110; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 110 and 114.
- 115. Mythology of Greece and Rome.** Studies the major myths of Greece and Rome and their impact upon later art, music, and literature. Shares two hours of lecture with Classical Civilization 111; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 111 and 115.
- 116. The Roman Achievement.** Introduces Roman civilization through the study of the social and cultural life of ancient Rome. Shares two hours of lecture with Classical

- Civilization 112; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 112 and 116.
- 120. Origins of Western Literature.** Same as Comparative Literature 120. The origins and development of selected major genres in Western literature, emphasizing the relationship between classical representatives and their modern successors. 3 hours.
- 131. Introduction to Classical Archaeology: Greece.** Introduction to the archaeology of ancient Greece and the Aegean world. 3 hours.
- 132. Introduction to Classical Archaeology: Rome and Italy.** Introduction to the archaeology of Italy and Rome to the fall of the Roman Empire. 3 hours.
- 150. Sports in Greece and Rome.** Same as Kinesiology 141. Athletics and sports in ancient Greece and Rome from 776 B.C. to 393 A.D. 2 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 217. Greek Art.** Same as History of Art 215. See History of Art 215.
- 218. Roman Art.** Same as History of Art 216. See History of Art 216.
- 221. The Heroic Tradition.** Same as Comparative Literature 263. Study of ancient epics and their relation to the social consciousness of their period; introductory and background lectures; and readings in the epic tradition of antiquity and its successors. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 222. The Tragic Spirit.** Same as Comparative Literature 264. Readings in the tragic drama of Greece and Rome; a systematic study of the contents and development of this classical literary/dramatic genre. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 231. The Development of the Ancient City.** Same as History of Art 217. Monuments and archaeological remains illustrating the development of the Greek and Roman city (polis). Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 232. Ancient Greek Sanctuaries.** Same as History of Art 218 and Religious Studies 232. A survey of the archaeological remains of ancient Greek sanctuaries and their importance to ancient society and religion. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 250. Byzantine Civilization.** Surveys Byzantine civilization, literature, and art from A. D. 330 to 1453. Prerequisite: Classical Civilization 110, 111, 112, 131, or 132; or consent of instructor. 3 hours.
- 292. Senior Thesis.** Thesis and honors; for candidates for departmental distinction in classical civilization and for other seniors. Prerequisite: Senior standing and consent of chairperson of classics honors program. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Survey.** For candidates for departmental distinction in the classics field of concentration. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 315. Greek, Roman, and Medieval Rhetorical Theory.** Same as Speech Communication 315. See Speech Communication 315.
- 332. The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Comparative Literature 306. Study of the aesthetic standards and theories of the Graeco-Roman world and the ways in which these ideals are expressed in the literature, art, and architecture of antiquity. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 343. The Archaeology of Greece.** Same as History of Art 315. Monuments, material remains, and sculpture and other arts illustrating the development of Greek civilization to 323 B.C. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 344. The Archaeology of Italy.** Same as History of Art 316. Monuments, material remains, and sculpture and other arts illustrating the development of Graeco-Roman and other ancient Italian civilizations to 330 A.D. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 382. Computer-Based Foreign Language Teaching.** Same as English as a Second Language, French, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 390. Topics in Classical Literature.** Same as Comparative Literature 307. Study of selected topics in Greek and Latin literature in translation; content is variable. Prerequisite: Classical Civilization 201 or 202, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
- 391. Topics in Classical Archaeology and Civilization: Seminar and Tutorial.** Study of selected topics; variable content. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.

Coptic

- 301. Introductory Coptic, I.** Same as Linguistics 314 and Religious Studies 301. Introduction to the principles of Coptic grammar and to the reading of biblical and gnostic texts. A knowledge of classical or koine Greek, though useful, is not required. 3 hours or $\frac{3}{4}$ unit.
- 302. Introductory Coptic, II.** Same as Linguistics 315 and Religious Studies 302. Continuation of Coptic/Religious Studies 301 and Linguistics 314; reading of gnostic and postbiblical texts. Prerequisite: Coptic 301 or Linguistics 314. 3 hours or $\frac{3}{4}$ unit.

Greek

- 101. Elementary Greek, I.** Same as Religious Studies 111. Introduces ancient Greek (both classical and koine), including the reading of simple prose. 4 hours.
- 102. Elementary Greek, II.** Same as Religious Studies 112. Continuation of Greek 101. Grammar and reading in classical and koine Greek. Prerequisite: Greek 101. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Classical and Koine Greek Prose.** Same as Religious Studies 200. Readings in classical Greek prose, and narrative and epistolary New Testament texts. Prerequisite: Greek 102. 4 hours.
- 202. Second-Year Greek.** Continuation of Greek 201. Introduction to epic Greek; reading of Homer. Prerequisite: Greek 201 or equivalent. 4 hours.
- 204. The Gospels.** Same as Religious Studies 204. Reading and analysis of the Greek Gospels following literary-critical, form-critical, and redaction-critical approaches. Prerequisite: Greek 200 or consent of instructor. 3 hours.
- 292. Senior Thesis.** Open to candidates for distinction in Greek. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Survey.** Thesis and honors. For candidates for honors in Greek and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 301. Third-Year Greek.** Readings in Attic prose. Prerequisite: Greek 202. 3 hours or $\frac{1}{2}$ unit.
- 310. Introduction to Indo-European Linguistics.** Same as Latin 310 and Linguistics 309. See Linguistics 309.
- 311. Greek Prose Composition.** Practice in the writing of Greek prose. Prerequisite: Greek 201 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 391. Readings in Greek Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Greek. Prerequisite: Greek 301 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
- 411. Advanced Composition.** Practice in writing continuous Greek prose, with special attention to stylistic problems. Prerequisite: Greek 311 or equivalent. $\frac{1}{2}$ unit.
- 419. Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric, dramatic, or Hellenistic poetry. Areas normally follow this sequence in

successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.

- 420. Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or Hellenistic prose. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
- 431. Special Disciplines.** Same as Latin 431. Variable content course concentrating on an area such as comparative grammar, epigraphy, metrics, palaeography, or papyrology. Prerequisite: Greek 391 and Latin 391, or equivalent. 1 unit. May be repeated as topic varies.
- 480. Greek Seminar.** Research on special problems of Greek literature; required of all majors in classical philology. Prerequisite: A Greek proseminar. 1 unit.
- 493. Independent Reading.** Prerequisite: Consent of the student's advisor and of the instructor. $\frac{1}{4}$ to 2 units. May be repeated but no more than 1 unit of credit may be applied toward the minimum requirement for the M.A. degree, and no more than 2 units of credit may be applied toward the minimum requirement for the Ph.D. degree.
- 495. Introduction to Classical Studies.** Same as Latin 495. An introductory survey for graduate students in classics; prepares students for work at the graduate level and surveys basic bibliography and methodology. Prerequisite: Graduate standing in classics. 1 unit.
- 499. Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

Latin

- 101. Elementary Latin.** Grammar and reading for students who have had no work in Latin. 4 hours.
- 102. Elementary Latin.** Grammar and reading of easy prose. Prerequisite: Latin 101 or one year of high school Latin. 4 hours.
- 103. Intermediate Latin.** Review of grammar; reading of easy narrative prose. Prerequisite: Latin 102 or two years of high school Latin. 4 hours.
- 104. Introduction to Latin Literature.** Continuation of Latin 103, with readings chiefly in Latin poetic literature. 4 hours.
- 105. Intensive Elementary Latin.** Equivalent to Latin 101 and 102. Introduction to basic grammar and syntax for students who have had no previous Latin and want to learn at a rapid rate; use of computer-assisted individual mastery lessons. 8 hours.
- 106. Intensive Intermediate Latin.** Equivalent to Latin 103 and 104. Review of grammar and syntax and reading of easy prose and poetry for students who have attained 102 proficiency and wish to advance more rapidly; use of computer-assisted program materials. Prerequisite: Latin 102 or 105, or a placement score showing high school achievement equivalent to Latin 102. 8 hours.
- 113. Latin Composition.** Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Credit or concurrent registration in Latin 103 or three years of high school Latin. 2 hours.
- 114. Latin Composition.** Continuation of Latin 113. Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Latin 113. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Survey of Latin Literature.** The republican period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
- 202. Survey of Latin Literature.** The imperial period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
- 270. Parateaching.** Same as French, German, Russian, and Spanish 270. See French 270.
- 279. Introduction to Foreign Language Education.** Same as French, German, Humanities, Russian, and Spanish 279. See Humanities 279.

- 280. Teachers' Course.** Introduction to the problems of the teaching of Latin and a study of textbooks. Required of teacher-training majors in Latin. This course will not meet during the six-week student teaching period. Prerequisite: Latin 202; senior standing. 4 hours.
- 292. Senior Thesis.** Thesis and honors. For candidates for honors in Latin and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Survey.** Thesis and honors. For candidates for honors in Latin and for other seniors. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 310. Introduction to Indo-European Linguistics.** Same as Greek 310 and Linguistics 309. See Linguistics 309.
- 311. Intermediate Prose Composition.** Practice in the writing of Latin prose. Prerequisite: Latin 114 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 391. Readings in Latin Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Latin. Prerequisite: Three years of college Latin or equivalent; consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit.
- 400. Beginning Latin for Graduate Students.** Basic grammar, syntax, and vocabulary; reading practice. Designed for graduate students who need to use Latin in their research. 4 hours. No graduate credit.
- 401. Readings in Latin for Graduate Students.** Directed readings, largely in medieval and modern Latin. Designed for graduate students who need to use Latin in their research. Prerequisite: Latin 400 or two years of high school Latin, or equivalent. 4 hours. No graduate credit.
- 411. Advanced Composition.** Practice in writing Latin prose, with special attention to stylistic questions. Prerequisite: Latin 311 or equivalent. $\frac{1}{2}$ unit.
- 419. Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric and elegiac, dramatic, or satirical poetry. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
- 420. Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or epistolography. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
- 431. Special Disciplines.** Same as Greek 431. See Greek 431.
- 480. Latin Seminar.** Research on special problems of Latin literature; required of all concentrators in classical philology. Prerequisite: A Latin proseminar. 1 unit.
- 493. Independent Reading.** Prerequisite: Consent of the student's adviser and of the instructor. $\frac{1}{4}$ to 2 units. May be repeated but no more than 1 unit of credit may be applied toward the minimum requirement for the M.A. degree, and no more than 2 units of credit may be applied toward the minimum requirement for the Ph.D. degree.
- 495. Introduction to Classical Studies.** Same as Greek 495. See Greek 495.
- 499. Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

COMMUNICATIONS

Chairperson of Committee on Graduate Study: C. Christians
Office: 222b Armory, 505 East Armory, Champaign

- 101. The Social and Cultural Foundations of the Mass Media.** Analysis of the evolution and structure of the mass media in the United States with special emphasis on the effects of the mass media on public life. Prerequisite: Freshman or Sophomore standing. 3 hours. Does not count toward major requirements in the College of Communications.
- 217. History of Communications.** Same as Journalism 217. See Journalism 217.
- 218. Communications and Public Opinion.** Same as Journalism 218. See Journalism 218.

- 220. Communications and Popular Culture.** Same as Journalism 220. Examines the critical literature on mass media entertainment; reviews significant contemporary issues and develops perspectives for understanding popular culture. Prerequisite: Registration in the College of Communications or consent of the College. 3 hours.
- 231. Mass Communications in a Democratic Society.** Same as Journalism 231. See Journalism 231.
- 241. Law and Communications.** Same as Journalism 241. See Journalism 241.
- 251. Social Aspects of Mass Communications.** Same as Journalism 251 and Sociology 251. See Journalism 251.
- 261. American Broadcasting and Telecommunications.** Examines the history and principal issues of American broadcasting and the electronic media; the context of prior forms of mass communication and ideas about purposes and terms of control; the important social, economic, political, and cultural questions bearing on AM and FM radio, commercial television, public broadcasting, cable and new forms of electronic communication; issues in programming and service content; and basic legal and regulatory matters. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours.
- 264. Economic Structure of Communication.** Describes and analyzes the economic structures, policies, and current problems of fields such as telecommunications, publishing, broadcasting and cable, film, recorded music, and postal service; examines how copyrights, patents, antitrust laws, and government regulation bear on the communications industry. Prerequisite: Consent of College. 3 hours.
- 291. Special Problems.** Special projects, research, and independent reading in communications for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of the College. 1 to 3 hours.
- 307. The Art of the Screen: Narration.** Same as Speech Communication 307. See Speech Communication 307.
- 308. The Art of the Screen: Exposition and Persuasion.** Same as Speech Communication 308. See Speech Communication 308.
- 310. Media Ethics.** Surveys the major ethical problems in news, advertising, and entertainment media; includes case studies and moral reasoning on confidentiality, privacy, conflict of interests, deception, violence, and pornography. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
- 319. Russian and East European Cinema.** Same as Slavic and Speech Communication 319. See Slavic 319.
- 322. Politics and the Media.** Same as Political Science 322. Examines the interaction between the media and politics in the United States and elsewhere, with special emphasis on the constitutional protection of the media, politics of media control, impact of the media on such political processes as elections and policymaking, international news agencies and communications satellites, and quest for a new international information order. Prerequisite: Political Science 150 or 6 hours of social science; or consent of instructor. 3 hours, or 1/2 to 1 unit.
- 323. Language Acquisition.** Same as Linguistics 323 and Psychology 323. See Psychology 323.
- 325. Introduction to Psycholinguistics.** Same as Linguistics 325. See Linguistics 325.
- 335. Interpersonal Communication Processes.** Same as Speech Communication 335. See Speech Communication 335.
- 352. Attitude Theory and Change.** Same as Psychology 352 and Sociology 352. See Psychology 352.
- 361. Telecommunications Programming.** History and interpretation of American radio and television programs: types, formats, and contents in relationship to trends in American social and cultural history; themes, and myths; and relevant aspects of telecommunications technology, economics, and cultural production. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
- 362. Telecommunications Management.** Examines problems and issues in telecommunications management; the role of management in operation of broadcasting, cable, and telecommunications industries; forces shaping products and services in commercial and

non-profit media, i.e., technology, markets, revenues, programming, and regulation; planning, accountability, and social responsibility. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.

- 366. Film as Business.** Studies the filmed entertainment industry: the economic structures and policies of the production, distribution, and exhibition sectors; the nature of ownership patterns, investment, competition, and trade practices; filmed entertainment as a commodity in an international market system. Prerequisite: Consent of college or consent of instructor. 3 hours or 1 unit.
- 368. Legal and Policy Issues in Telecommunications.** Same as Radio and Television 368. Studies the histories, assumptions, and consequences of major legislative, regulatory, and judicial decisions in American broadcasting and telecommunications; social, cultural and economic background of federal communications law and regulation; administrative agency (FCC) practice and constraints; various regulatory and policy issues including fiduciary licensing, fairness doctrine, cable, public broadcasting, telematics, deregulation, and statutory revision process. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
- 370. Language, Culture, and Society.** Same as Anthropology 370 and Linguistics 370. See Anthropology 370.
- 377. International Communications.** Same as Political Science 377. See Political Science 377.
- 414. Seminar on Social Interaction.** Same as Sociology 414. See Sociology 414.
- 417. Contemporary Viewpoints in Speech Communication Theory.** Same as Speech Communication 417. See Speech Communication 417.
- 420. Seminar in Semantics.** Same as Philosophy 420. See Philosophy 420.
- 424. Developmental Psycholinguistics.** Same as Linguistics 424 and Psychology 424. See Psychology 424.
- 425. Psycholinguistics.** Same as Linguistics 425 and Psychology 425. See Psychology 425.
- 432. History of Libraries.** Same as Library and Information Science 432. See Library and Information Science 432.
- 437. The Analysis of Interpersonal Interaction.** Same as Speech Communication 437. See Speech Communication 437.
- 444. Seminar in Public Opinion.** Same as Sociology 444. See Sociology 444.
- 456. Attitude Measurement and Behavioral Prediction.** Same as Psychology 456. See Psychology 456.
- 462. Seminar in Radio and Television.** Same as Radio and Television 462. See Radio and Television 462.
- 463. World Broadcasting.** Same as Radio and Television 463. See Radio and Television 463.
- 468. The Political Economy of Communications.** Same as Journalism 468. See Journalism 468.
- 470. Communications and Popular Culture.** Same as Journalism 470. See Journalism 470.
- 471. Proseminar in Communications, I.** Same as Journalism 471. See Journalism 471.
- 472. Proseminar in Communications, II.** Same as Journalism 472. See Journalism 472.
- 473. History and Theory of Freedom of the Press.** Same as Journalism 473. See Journalism 473.
- 474. Communications Systems.** Same as Journalism 474. See Journalism 474.
- 481. Economic and Social Aspects of Advertising.** Same as Advertising 481. See Advertising 481.
- 482. Research Methods in Advertising and Communications.** Same as Advertising 482. See Advertising 482.
- 485. Advertising Planning and Decision Making.** Same as Advertising 485. See Advertising 485.
- 486. Analytical Methods in Advertising and Communications.** Same as Advertising 486. See Advertising 486.
- 490. Special Topics in Communications.** Prerequisite: Consent of chairperson of committee on graduate study in communications. 1/2 to 2 units.

- 492. Research Methods in Communications.** Same as Journalism 492. Introduction to the methods of empirical research in the behavioral sciences applicable to research problems in human communication, with emphasis on studies of mass communication. Lectures, readings, and laboratory practice. Prerequisite: Consent of College of Communications. 1 unit.
- 493. Qualitative Research Methods in Communications.** Introduces qualitative concepts and strategies in the social sciences and humanities which apply to research problems in mass communications. Prerequisite: Consent of College of Communications. 1 unit.
- 499. Thesis Research.** Prerequisite: Consent of chairperson of committee on graduate study in communications, and of thesis supervisor. 0 to 4 units. Students may reregister for a total of 8 units.

COMPARATIVE LITERATURE

Acting Director of Program: D. F. Bright

Office: 2070 Foreign Languages Building, 707 South Mathews, Urbana

- 119. The Literature of Fantasy.** Same as English 119. See English 119.
- 120. Origins of Western Literature.** Same as Classical Civilization 120. See Classical Civilization 120.
- 130. Italian Medieval Literature and Civilization.** Same as Italian 130. See Italian 130.
- 141. Masterpieces of Western Culture, I.** Comparative study of selected works reflecting main currents of western literature and thought, such as biblical stories, Homer, Greek drama, Vergil, medieval romance and love lyrics, Dante, Boccaccio, Chaucer, Petrarch, Rabelais, Cervantes, and Shakespeare. 3 hours.
- 142. Masterpieces of Western Culture, II.** Comparative study of selected works reflecting main currents of western literature and thought, such as Moliere, Voltaire, Swift, Goethe, romantic lyrics, Melville, Flaubert, Dostoevsky, Ibsen, Joyce, Kafka, and Camus. 3 hours.
- 175. Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175, and Japanese 175. See Asian Studies 175.
- 189. Classic Masterpieces of Non-Western Cultures.** Analysis of representative works from the Middle East and Asia through the seventeenth century, portraying literary, philosophical and religious achievements of the Islamic, Hindu, Buddhist and Confucian traditions, and emphasizing comparative perspectives both within the range of non-western traditions and in juxtaposition to western thinking. All readings in English. 3 hours.
- 190. Modern Masterpieces of Non-Western Cultures.** Analysis of representative works from the Middle East and Asia of the eighteenth to twentieth centuries, portraying literary, philosophical and religious achievements of the Islamic, Hindu, Buddhist and Confucian traditions and emphasizing comparative perspectives both within the range of non-western traditions and in juxtaposition to western thinking. All readings in English. 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Comparative Literary Studies, I.** An introduction to various methods in comparative literary study, including genres, thematic, literary relations, literary movements, and interdisciplinary approaches. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
- 202. Comparative Literary Studies, II.** An analysis of several important world-views in western civilization (such as classical, Romantic, modern, and so forth), studied comparatively and in relation to selected figures in western literature. Prerequisite: Com-

- parative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
- 203. Introduction to Persian Culture and Literature, I.** Same as Persian 205. See Persian 205.
- 204. Introduction to Persian Culture and Literature, II.** Same as Persian 206. See Persian 206.
- 210. Introduction to Modern African Literature.** Same as African Studies 210 and English 211. See African Studies 210.
- 211. Japanese Literature in Translation, I.** Same as Asian Studies and Japanese 205. See Japanese 205.
- 212. Japanese Literature in Translation, II.** Same as Asian Studies and Japanese 206. See Japanese 206.
- 215. The Scandinavian Novel: Masterpieces in English Translation.** Same as Scandinavian 215. See Scandinavian 215.
- 218. Japanese Hero Types.** Same as Asian Studies and Japanese 218. See Japanese 218.
- 219. Women in Japanese Literature.** Same as Asian Studies, Japanese, and Women's Studies 219. See Japanese 219.
- 224. German Literature in Translation.** Same as German 200. See German 200.
- 228. Special Topics in German Literature.** Same as German 296. See German 296.
- 238. Hiroshima/Nagasaki and the Literature of Survival.** Same as Asian Studies and Japanese 238. See Japanese 238.
- 244. Spanish American Culture Through Its Literature.** Same as Spanish 250. See Spanish 250.
- 248. Dostoevsky and Tolstoy.** Same as Russian 222. See Russian 222.
- 249. Soviet Russian Literature.** Same as Russian 225. See Russian 225.
- 252. Icelandic Sagas in Translation.** Same as Scandinavian 252. See Scandinavian 252.
- 253. Medieval Literature and Culture.** Same as English 202. See English 202.
- 255. Renaissance Literature and Culture.** Same as English 204. See English 204.
- 257. Literature and Culture of the Enlightenment.** Same as English 206. See English 206.
- 260. Science and Technology in Contemporary Literature.** Same as Science, Technology, and Society 260. See Science, Technology, and Society 260.
- 263. The Heroic Tradition.** Same as Classical Civilization 221. See Classical Civilization 221.
- 264. The Tragic Spirit.** Same as Classical Civilization 222. See Classical Civilization 222.
- 265. Development of the Modern Drama.** Same as English 243. See English 243.
- 266. Development of the Modern Drama.** Same as English 244. See English 244.
- 267. The Short Story.** Same as English 245. See English 245.
- 268. The Short Story.** Same as English 246. See English 246.
- 269. Modern British and American Fiction in Relation to Continental Fiction.** Same as English 248. See English 248.
- 283. Jewish Sacred Literature.** Same as English and Religious Studies 283. See Religious Studies 283.
- 284. Jewish Experience in Literature.** Same as English and Religious Studies 284. See English 284.
- 288. French and Comparative Cinema, I.** Same as French 288. See French 288.
- 289. French and Comparative Cinema, II.** Same as French 289. See French 289.
- 293. Senior Thesis and Honors.** Independent research guided by tutor(s), leading to the writing of a comparative thesis. Intended primarily for candidates for honors in comparative literature, but open to other seniors. 3 to 6 hours. May be repeated to a maximum of 12 hours. (Counts for advanced hours in LAS.)
- 295. Special Topics: Colloquium on Interdisciplinary Subjects.** Presentation and discussion of subjects relating literature to other disciplines; topics vary. 3 hours. May be repeated to a maximum of 6 hours.
- 305. Literary Criticism from 1800 to the Present.** Same as English 383. See English 383.
- 306. The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Classical Civilization 332. See Classical Civilization 332.

- 307. Topics in Classical Literature.** Same as Classical Civilization 390. See Classical Civilization 390.
- 310. Modern African Fiction.** Same as African Studies and French 310 and English 370. See African Studies 310.
- 311. The Chinese Novel.** Same as Asian Studies and Chinese 311. See Chinese 311.
- 312. Modern Chinese Literature in Translation.** Same as Asian Studies and Chinese 312. See Chinese 312.
- 313. The Divine Comedy.** Same as Italian 313. See Italian 313.
- 315. Modern Japanese Fiction in Translation.** Same as Asian Studies and Japanese 315. See Japanese 315.
- 323. Modern German Poetry.** Same as German 330. See German 330.
- 326. Ibsen in Translation.** Same as Scandinavian 361. See Scandinavian 361.
- 327. Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Scandinavian 362. See Scandinavian 362.
- 334. Studies in Francophonie.** Same as French 379. See French 379.
- 335. Polish Literature in Translation, I.** Same as Polish 345. See Polish 345.
- 336. Polish Literature in Translation, II.** Same as Polish 346. See Polish 346.
- 337. Nineteenth-Century Literature in Translation.** Same as Russian 315. See Russian 315.
- 338. Twentieth-Century Literature in Translation.** Same as Russian 317. See Russian 317.
- 340. Studies in Russian Literature and Society.** Same as Russian 360. See Russian 360.
- 341. Themes and Types in Western and non-Western Narratives.** Analysis of literary themes and types in narratives of Western and non-Western literatures (e.g., the hero, east and west; dream visions), emphasizing comparative perspectives. Prerequisite: One year of college literature, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 351. International Literary Movements.** Study of the development and mutation of literary movements and stylistic trends; emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 353. Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Italian 309. See Italian 309.
- 354. Masterpieces of Italian Renaissance Literature.** Same as Italian 333. See Italian 333.
- 357. Russian Modernism.** Same as Russian 324. See Russian 324.
- 359. The International Folk Tale.** Same as English 367. See English 367.
- 361. International Literary Genres and Forms.** Structure and development of literary genres and forms in historical perspective (for instance, drama, parody and the grotesque, poetry, fables and fabulists, and modern fiction); essential international components and significant national variations of such genres and forms. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 365. Comedy.** Same as English 365. See English 365.
- 368. Russian Drama.** Same as Russian 335. See Russian 335.
- 370. Nabokov and the Emigre Literature.** Same as Russian 370. See Russian 370.
- 371. International Literary Relations.** Study of specific relations between authors of different countries; influences of certain works, concepts, or tastes on another work, author, or country; and literary interaction between Eastern and Western cultures. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 387. Introduction to Myth and Folklore.** Same as English, German, Slavic and Speech Communication 387. See English 387.
- 396. Special Topics in Comparative Literature.** Selected literary topics of international significance in relation to other cultural expressions. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 401. Theory of Literature.** Methods and objectives of the discipline of comparative literature. Prerequisite: Reading knowledge of two foreign languages; consent of instructor. 1 unit.

- 404. Seminar in Renaissance and Baroque Literature.** Same as Spanish 418. See Spanish 418.
- 405. Seminar in Stylistics.** Same as Linguistics 405. See Linguistics 405.
- 415. Dostoevsky.** Same as Russian 415. See Russian 415.
- 419. Tolstoy.** Same as Russian 419. See Russian 419.
- 420. Chekhov.** Same as Russian 420. See Russian 420.
- 425. Studies in Contemporary Critical Problems.** Same as French 425. See French 425.
- 441. Naturalism, Symbolism, and Expressionism.** Same as German 451. See German 451.
- 451. Seminar in Literary Movements and Periods.** Investigation of the development and mutation of literary movements (classicism, romanticism, symbolism, etc.) through a study of critical texts and their reception in various countries. The subject of the seminar varies each semester. 1 unit. May be repeated to a total of 3 units.
- 452. Seminar in Romantic Literature.** Same as English 433. See English 433.
- 461. Seminar in Literary Genres and Forms.** Study of a form (the lyric, the novel, the drama, etc.) to discover its essential components in all the literatures studied and the significance of national variations. 1 unit. May be repeated to a maximum of 3 units as topic varies.
- 462. Seminar in Spanish-American Novel.** Same as Spanish 436. See Spanish 436.
- 471. Seminar in Literary Relations.** Investigation of the impact of one literature upon another, or of some specific works upon others (the role of English literature in continental Europe, the influence of Russian novelists on French and German writers, etc.). The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
- 472. Studies in French and Comparative Cinema.** Same as French 452. See French 452.
- 478. Seminar in Twentieth-Century French Literature.** Same as French 478. See French 478.
- 481. Seminar in Literary Themes and Types.** Study of a theme or type (the Faust myth, the romantic hero, etc.) to discover its essential components in all the literatures studied and the significance of national variations. The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
- 482. Seminar in Modern German Literature.** Same as German 461. See German 461.
- 490. Seminar in Contemporary Criticism, Methods and Theory.** Same as French 490. See French 490.
- 493. Special Studies.** $\frac{1}{4}$ to 1 unit.
- 499. Thesis Research.** Intended for students engaged in writing a thesis as a partial requirement for the M.A. or Ph.D. degree in comparative literature. Maximum credit for master's candidates is 2 units. 0 to 4 units.

COMPUTER SCIENCE

Head of Department: C. W. Gear

Department Office: 114 Digital Computer Laboratory, 1304 West Springfield, Urbana

NOTE: Credit is not allowed for more than one of Computer Science 101, 102, 103, 105, and 121. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences.

- 101. Introduction to Computers for Application to Engineering and Physical Science.** A beginning course in problem solving by digital computers which covers problem formulation, algorithm development, and coding in a high-level language; use of the computer in solving a series of problems. Prerequisite: Mathematics 120 or consent of instructor. 3 hours.

- 102. Introduction to Computers and Their Application to Architecture.** Introduction to computer programming for students of architecture; higher-level programming languages and application programs of special use in architecture. Prerequisite: Mathematics 111 or high school equivalent. 3 hours.
- 103. Introduction to Computers and Their Application to Social and Behavioral Science.** Introduction to computer programming for students with an interest in behavioral and social science computation; instruction in programming languages with an emphasis on applications from statistical and data manipulative procedures. Prerequisite: Sophomore standing; one year of college mathematics or statistics. 3 hours.
- 105. Introduction to Computers and Their Application to Business and Commerce.** Introduction to computer fundamentals, higher language programming, and the use of the computer for the solution of business problems. Prerequisite: Mathematics 111 or high school equivalent. 3 hours.
- 106. Introduction to Computers for the Nontechnical Major.** A concise treatment of the computer's important and still-growing role in virtually every significant aspect of society, including commerce, quantitative and qualitative planning, science, the criminal justice system, education, and medicine. The student is first taught to program computers interactively using an elementary programming language. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences. 3 hours.
- 121. Introduction to Computer Science.** The first course for computer science majors and other students with a deep interest in the subject; introduces students to a high-level block-structured programming language and presents the fundamental techniques of using such a language for the solution of non-numerical problems. Students write several programs during the course. Prerequisite: Three years of high school mathematics or Mathematics 111. 4 hours. Credit is not given for both Computer Science 121 and 122.
- 122. Introduction to Computer Science.** For students with previous programming experience as an alternative to Computer Science 121; presents the fundamental techniques of using a block-structured programming language for the solution of non-numerical problems. Students write several programs. Prerequisite: Computer Science 101, 102, 103, or 105, or equivalent programming experience. 2 hours. Credit is not given for both Computer Science 121 and 122.
- 196. Honors Course in Computer Science.** This course is offered for honors credit in conjunction with other 100-level computer science courses, in which concurrent registration is required. Enrollment is strictly limited to beginning students with superior talents in computer science. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 100-level computer science course (see Timetable); consent of instructor. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 221. Machine-Level Programming.** A basic course in machine-level programming. Organization of memory, central processor, and input/output devices; instruction and data types and their representation; structure and modularity of programs and data at the machine level; and introduction to system software. Prerequisite: Computer Science 121 or 122. 3 hours.
- 225. Data Structures.** A continuation of Computer Science 121; basic data types, including bits, integers, characters, and reals; data structures, including arrays, strings, lists, stacks, queues, and trees; storage management, including allocation and pointers; and searching and sorting techniques. Prerequisite: Computer Science 121 or 122. 3 hours.
- 257. Numerical Methods.** Same as Mathematics 257. An introduction to numerical methods for students in science and engineering; topics include floating-point computation, systems of linear equations, approximation of functions and integrals, the single non-linear equation, and the numerical solution of ordinary differential equations; discusses various applications in science and engineering; includes some programming as well

as the use of high quality mathematical library routines. Prerequisite: 100-level computer science course or Computer Science 400; Mathematics 225 or 315; Mathematics 242. 3 hours.

- 264. Introduction to the Structure and Logic of Digital Computers.** Introduction to the internal structure of digital computers; design of gates, flipflops, registers, and memories to perform operations on numerical and other data represented in binary form; and presentation in terms of logic devices (black boxes), not electrical circuits. Prerequisite: 100-level computer science course or Computer Science 400. 3 hours. Students may not receive credit for both Computer Science 264 and Electrical Engineering 290.
- 265. Logic Design Laboratory with Integrated Circuits.** A digital design laboratory employing the department's EXCEL integrated circuit modular logic kits; emphasizes designing with logic blocks (not the design of their internal circuits), the theory of which is treated in Computer Science 264. Experiments with combinational and sequential networks and simple digital systems culminate in a term project. Prerequisite: Credit or concurrent registration in Computer Science 264 or credit in Electrical Engineering 290, or consent of instructor. 2 hours. Students may not receive credit for both Computer Science 265 and Electrical Engineering 249.
- 273. Introduction to Theory of Computation.** Introduction to the various aspects of the theory of computation, including the necessary background in graph theory, combinatorics, and probability theory; also includes algorithmic procedures, theoretical limitations of computing machines, analysis of algorithms, and correctness and efficiency of algorithms. Prerequisite: Computer Science 121 or 122, or consent of instructor. 3 hours.
- 281. Introduction to Computer Circuits.** Introduction to the operation and use of integrated and other circuits used in digital computers; for students with a basic knowledge of electricity and magnetism but lacking experience with electronic circuits. Prerequisite: Physics 102 or 107. 3 hours. Students in the Electrical or Computer Engineering curricula may not receive credit for Computer Science 281.
- 282. Digital Circuits Laboratory.** A laboratory course designed to accompany Computer Science 281. Prerequisite: Credit or concurrent registration in Computer Science 281 or equivalent. 1 hour.
- 290. Individual Study.** Prerequisite: 100-level computer science course. 1 to 3 hours.
- 296. Honors Course in Computer Science.** Group projects for honors work in computer science. Sections of this course are offered in conjunction with other 200-level computer science courses, in which concurrent registration is required. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 200-level computer science course (see Timetable); consent of instructor. 1 hour.
- 297. Special Topics in Computer Science.** A lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours.
- 300. Advanced Computer Programming.** Advanced features of programming languages: input/output disks and tapes; plotted output; and use of operating systems and job control languages. This course is intended primarily for students who are not majoring in computer science. Prerequisite: Computer Science 100-level programming course or Computer Science 400, or consent of instructor. 3 hours or 1 unit. Students majoring in computer science may not receive graduate credit for Computer Science 300.
- 310. Information Systems.** Systems design and analysis; includes structured programming and programming in COBOL; file organizations and processing; sorting, validating, updating, and retrieval of information; storage devices; and data base concepts. Prerequisite: Accountancy 331 or 332, or 6 hours of computer science courses; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 311. Database Systems.** Examines the logical organization of databases: the entity-relationship model; the hierarchical, network, and relational data models and their languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control, and dis-

tributed database systems. Prerequisite: Computer Science 225 or 310; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 313. Combinatorial Mathematics.** Same as Mathematics 313. See Mathematics 313.
- 315. Applications of High-Performance Computers.** Detailed study of selected current applications which pace computer development in one or more significant dimensions such as processing speed, memory size and speed, input-output capacity, or programming complexity; draws applications from those of interest in the physical, social, or biological sciences; emphasizes the interplay between solution requirements and computer capabilities. Prerequisite: 100-level computer science course or Computer Science 400, and Math 132, and Math 125, 225, or 315; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 317. Computer-Assisted Instruction.** Same as Secondary Education 317. See Secondary Education 317.
- 318. Computer Graphics.** Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applications of these tools to specific problems. Prerequisite: Computer Science 225 or 300, and analytic geometry. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Operating Systems Design.** Discussion of the organization and structure of operating systems for various modes of computer use from simple batch systems to time-sharing/multiprocessing systems. Prerequisite: Computer Science 225, and Computer Science 221 or Electrical Engineering 291. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Programming Language Principles.** An introduction to the structure of programming languages. Formal specification of syntax and semantics; structure of algorithmic, list processing, string manipulation, data description, and simulation languages; basic data types, operations, statement types, and program structure; macro languages and their implementation; and run-time representation of programs and data. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 326. Compiler Construction.** Compiler structure; lexical analysis, syntax analysis, grammars, description of programming languages, automatically constructed recognizers, and error recovery; and semantic analysis, semantic languages, semantic processes, intermediate language, optimization techniques, and extendible compilers. Prerequisite: Computer Science 221 and 325. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 327. Software Engineering.** Follows the software life cycle from the requirement, specification, and design phases through the construction of actual software. Topics include management of programming teams, programming methodologies, debugging aids, documentation, evaluation and measurement of software, verification and testing techniques, and the problems of maintenance, modification, and portability. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 328. Computer Networks and Distributed Systems.** Same as Electrical Engineering 328. Introduction to concepts of transport connections and sessions; design issues in transport layer and session layer protocols, terminal and file transfer protocols, message handling protocols, etc.; methods to ensure network security and privacy; algorithms for deadlock detection, concurrency control and synchronization in distributed systems; models of distributed computation; networking facilities and resource control and management methods in network and distributed operating systems. Prerequisite: Computer Science 221 or Electrical Engineering 291; Computer Science 225. 3 hours or $\frac{3}{4}$ unit.
- 331. Microprocessor Systems.** Study of microprocessor architectures, hardware modules, and interfaces; programming, software tools, development systems, and applications; and microprocessor system design methodology. Prerequisite: Computer Science 221; Computer Science 264 or Electrical Engineering 290. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 333. Computer System Organization.** Computer system analysis and design; organizational dependence on computations to be performed; and speed and cost of parts and overall machines. Prerequisite: Computer Science 221 or Electrical Engineering 291; Computer Science 264 or Electrical Engineering 290. 3 hours or 1 unit.
- 335. Introduction to the VLSI System Design.** Same as Electrical Engineering 325. See Electrical Engineering 325.

- 337. Control Structure of Computers.** Asynchronous, synchronous, and microprogrammed control structures in the framework of computer architecture; interlocking of autonomous subcontrols; and case studies in typical control features: instruction look-ahead, multiprocessing interrupt, and input/output. Prerequisite: Computer Science 264, Electrical Engineering 290, or Mathematics 391. 3 hours or 1 unit.
- 338. Communication Networks for Computers.** Same as Electrical Engineering 338. Introduction to International Standards Organization Open System Interconnection (ISO-OSI) reference model, design issues and protocols in the physical layer, data link layer and network layer; architectures and control algorithms of local-area networks, point-to-point networks and satellite networks; standards in network access protocols; models of network interconnection; and overview of networking and communication software. Prerequisite: Computer Science 264 or Electrical Engineering 290. 3 hours or $\frac{3}{4}$ unit.
- 339. Computer Aided Design for Digital Systems.** Same as Electrical Engineering 339. Examines fundamental concepts, techniques, and tools for the computer-aided design of digital systems; topics include hardware description languages, hardware compilers, evaluation and simulation of computer architectures, logic and circuit simulation, testing, partitioning, placement and routing algorithms and the integration of CAD tools into complete design automation systems. Prerequisite: Computer Science 264 or Electrical Engineering 290; Computer Science 221 or Electrical Engineering 291; and Computer Science 281 or Electrical Engineering 340 and 342. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Mechanized Mathematical Inference.** Introduces methods of mathematical inference which can be programmed on a computer; topics include propositional calculus decision procedures, forward and backward chaining, semantics, resolution, equational systems, specialized decision procedures, applications to program verification, abstraction, and problem representation. Prerequisite: Computer Science 225 and 273. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 342. Computer Inference and Knowledge Acquisition.** Systematically describes principles and algorithms underlying development of artificial intelligence systems, with special emphasis on methods of computer inference and knowledge acquisition; topics include deductive and inductive inference systems, plausible reasoning techniques, problem solving strategies, knowledge representation schemes, machine learning, conceptual data analysis, prediction and discovery programs, automatic programming, and planning strategies. Prerequisite: Computer Science 273 and Electrical Engineering 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 346. Pattern Recognition and Machine Learning.** Organized review of basic theoretical concepts and methods of machine learning and recognition; decision space and linguistic and relational representation of objects; statistical and deterministic recognition algorithms; various types of learning, including adaptive, procedural, and inductive; selected applications; and medical consulting, determination of cost-optimal classification rules, inferential information systems, and computer vision. Prerequisite: Computer Science 273 and Electrical Engineering 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 347. Knowledge-Based Programming.** Examines use of the computer to process human-made knowledge-bases. Topics include: trade-off of search versus knowledge; complexity of finite problem-domains; machine-aided acquisition of knowledge from experts; acquisition of knowledge by computer induction; validation and measurement methods, production-rule programming; and logic programming. Prerequisite: Computer Science 273 and Electrical Engineering 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 348. Introduction to Artificial Intelligence.** Same as Electrical Engineering 348. See Electrical Engineering 348.
- 355. Numerical Methods for Partial Differential Equations.** Same as Mathematics 355. An introduction to numerical techniques for initial and boundary value problems in partial differential equations; includes finite difference and finite element discretization techniques, direct and iterative solution methods for discrete problems, and programming techniques and usage of FORTRAN packages. Prerequisite: Computer Science 257; Mathematics 341, 343, or 345. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 358. Numerical Linear Algebra.** Same as Mathematics 358. Direct and iterative methods

for systems of linear equations; overdetermined systems of equations; eigenvalue problems; nonlinear systems of equations. Prerequisite: Computer Science 257 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 359. Numerical Approximation and Ordinary Differential Equations.** Same as Mathematics 359. Polynomial and spline interpolation; least squares and uniform approximation; numerical differentiation and integration; initial-value and boundary-value problems in ordinary differential equations. Prerequisite: Computer Science 257 and Mathematics 340, 341, or 345, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 363. Integrated Circuit Logic Design.** IC fabrication techniques; survey of different IC logic families; logic design procedures for each IC logic family; design of masks; logic design of digital networks with IC packages; use of ROMs as substitutes for gates; computer-aided design; and comparison of different implementation approaches based on different IC logic families, from the viewpoints of economy, performance, and design time. Prerequisite: Computer Science 281 or equivalent and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
- 364. Introduction to Computer Arithmetic.** Review of binary number representations, logical design of adders and arithmetic units, and simple multiplication and division methods; multiplier recoding; redundant division methods; design of carry-save adders and signed-digit arithmetic units; and case studies of high-speed arithmetic units. Prerequisite: Computer Science 264 or Electrical Engineering 290. 3 hours or 1 unit.
- 373. Combinatorial Algorithms.** Same as Mathematics 373. Representation and generation of combinatorial objects; searching: exhaustive search and its approximations and fast search techniques; sorting and related problems; graph algorithms; NP-hard and NP-complete combinatorial problems. Prerequisite: Computer Science 225 and 273. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Mathematics 375. Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linear-bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems; recursive functions; and computational complexity. Prerequisite: Mathematics 319 or Computer Science 273. 3 hours or 1 unit.
- 376. Program Verification.** Examines formal methods for demonstrating correctness and other properties of programs; includes an overview of predicate calculus. Topics include: invariant assertions, Hoare axiomatics, well-founded orderings for proving termination, structural induction, computational induction, data structures, and parallel programs. Prerequisite: Computer Science 225, and either Computer Science 273 or Mathematics 314. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 381. Introduction to Computer Memories and I/O.** Introduction to memories, input/output devices, and optical processors; lecture and demonstration. Prerequisite: Computer Science 281, Electrical Engineering 340, or equivalent. 3 hours, or $\frac{1}{4}$ or 1 unit.
- 383. Linear Programming.** Same as Mathematics 383. See Mathematics 383.
- 384. Computer Data Acquisition Systems.** Theory, operation, and design of computer data acquisition systems; analog and digital aspects, conversions between representations, interfacing and systems considerations. Prerequisite: Computer Science 264 or Electrical Engineering 290; Computer Science 281 or Electrical Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 389. Advanced Computer Circuits.** Theory, operation and use of digital integrated circuit technologies that are commonly used in modern digital computers; provides an understanding of the operation of various computer technologies, design knowledge at the integrated circuit package level, and an introduction to computer circuit design aids. Prerequisite: Computer Science 264 or Electrical Engineering 290; Computer Science 281 or Electrical Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit. Students may not receive credit for both Computer Science 389 and Electrical Engineering 380.
- 391. Switching Theory.** Same as Electrical Engineering 391 and Mathematics 391. See Electrical Engineering 391.
- 397. Special Topics in Computer Science.** Lectures in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.

- 400. Introduction to Automatic Digital Computing for Graduate Students.** Beginning course covering the programming of digital computers using a procedure-oriented language. Prerequisite: Mathematics 111 or high school equivalent. 1 hour. No graduate credit.
- 405. Numerical Methods in Fluid Dynamics.** Same as Atmospheric Science 405. See Atmospheric Science 405.
- 426. Topics in Compiler Construction.** Advanced topics in compiler construction, including incremental and interactive compiling, error correction, code optimization, models of code generators, etc. Prerequisite: Computer Science 326. 1 unit.
- 433. Theory of High-Speed Parallel Computation.** Same as Electrical Engineering 433. Theoretical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; and overall computer system ideas. Prerequisite: Consent of instructor. 1 unit.
- 441. Computer Systems Analysis.** Same as Electrical Engineering 441. Development of analytical models of computer systems and application of such models to performance evaluation; topics include scheduling policies, paging algorithms, multiprogrammed resource management, and queuing theory. Prerequisite: Mathematics 361 or 363, Electrical Engineering 313, or equivalent. 1 unit.
- 445. Systems Modeling and Simulation.** Same as Business Administration 475. See Business Administration 475.
- 446. Advanced Artificial Intelligence Programming Methods.** Same as Electrical Engineering 446. See Electrical Engineering 446.
- 456. Coding Theory.** Same as Electrical Engineering 456 and Mathematics 476. See Electrical Engineering 456.
- 457. Numerical Solution of Ordinary Differential Equations.** Same as Mathematics 457. Derivation and rigorous analysis of one-step, multistep, and extrapolation methods, variable stepsize, error estimation, stiff equations, and boundary value problems. Prerequisite: Computer Science 359 or consent of instructor. 1 unit.
- 458. Topics in Numerical Analysis.** Same as Mathematics 458. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 463. Information Theory.** Same as Electrical Engineering 463 and Mathematics 463. See Mathematics 463.
- 464. Topics in Digital Computer Arithmetic.** Topics selected from the advanced theory of digital computer arithmetic, including division methods, use of redundancy, and implications of the use of number representations, such as continued products and continued fractions. Prerequisite: Computer Science 364. 1 unit.
- 465. Topics in Automata Theory.** Same as Electrical Engineering 465 and Mathematics 465. See Mathematics 465.
- 469. Introduction to Coherent Optics and Holography.** Same as Electrical Engineering 469. See Electrical Engineering 469.
- 472. Graph Theory.** Same as Mathematics 418. See Mathematics 418.
- 473. Topics in Analysis of Algorithms.** Theoretical analysis of various algorithms; topics include sorting, searching, selection, polynomial evaluation, matrix multiplication, and multiplication of real numbers. Prerequisite: Computer Science or Mathematics 373 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 474. Topics in Graph and Geometric Algorithms.** Same as Electrical Engineering 474. See Electrical Engineering 474.
- 475. Topics in Combinatorics.** Same as Mathematics 475. Selected topics from graph theory, algebraic coding theory, enumerative analysis, combinatorial design, and discrete optimization; includes other topics of current research interest, such as Ramsey's Theorem, Sperner's Theorem, Dilworth's Theorem, and the theory of matroids. Prerequisite: Computer Science 273, Mathematics 313, or consent of instructor. 1 unit.
- 479. Computational Complexity.** Same as Electrical Engineering 479 and Mathematics 479. See Electrical Engineering 479.
- 485. Topics in Computer Hardware.** Advanced features of computer hardware; topics vary, but typically are chosen from: memories, optical data processing and storage.

device modeling and computer-aided circuit design, and stochastic representation and processing of information. Prerequisite: Consent of instructor. 1 unit.

487. Theory of Approximation. Same as Mathematics 487. See Mathematics 487.

490. Individual Study. Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.

491. Seminar in Computer Science. Seminar on topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.

492. Individual Project Study. Individual study of a computer-related project required of all candidates for the Master of Computer Science degree. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units (summer session $\frac{1}{2}$ to 2 units).

497. Special Topics in Computer Science. Lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.

499. Thesis Research. Prerequisite: Consent of instructor. 0 to 4 units.

CRAFTS

(See Art and Design)

DANCE

Head of Department: P. K. Knowles

Department Office: 4-501 Krannert Center for the Performing Arts, 500 South Goodwin, Urbana

101. Beginning Modern Dance. Introduction to basic dance technique and movement improvisation; the study of motion as an art, group relationships in improvisation, and discussion of choreographic ideas. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.

102. Intermediate Modern Dance. Intermediate dance technique and improvisation. For nondance majors. Prerequisite: Dance 101 or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.

105. Jazz. Introduction to basic dance technique and stylistic work in the jazz idiom. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.

106. Jazz Dance, II. A progressive development of the concepts and skills in Dance 105. For nondance majors. Prerequisite: Dance 105 or equivalent; or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.

107. Ballet Fundamentals, I. Introduction to ballet for nondance majors. 1 hour. May be repeated to a maximum of 4 hours.

108. Ballet Fundamentals, II. A progressive development of the concepts and skills in Dance 107; for the nondance major. Prerequisite: Two semesters of Dance 107 or equivalent; consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.

130. Performance Practicum, I. Performance laboratory involving the rehearsal and performance of student works under faculty supervision and/or works by faculty and visiting artists. Prerequisite: Consent of instructor. 1 to 3 hours (1 or 2 hours credit per dance). A maximum of 16 hours of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.

131. Production Practicum. Practical experience in the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. 1 or 2 hours (1 hour credit per concert up to 2 hours per semester). May be repeated to a maximum of 6 hours.

150. Orientation to Dance. A survey of the field including dance as a theatre art, careers, dance education, production, injury prevention and nutrition; also serves to orient incoming students to the faculty, programs, and policies of the Department of Dance.

and the production and performing resources in the Krannert Center for the Performing Arts. 2 hours.

- 160. Modern Technique, I.** Elementary technique for majors with emphasis on a conceptual understanding of movement principles and the development of technical skill and performance sensitivity. Prerequisite: Departmental audition. 1 to 3 hours. May be repeated to a maximum of 18 hours.
- 162. Improvisation, I.** Experience in selective, basic processes of movement involvement, both individual and group; special attention to organic, economical bodily use, the dynamics and quality of which are necessary to the activity being performed. 1 hour.
- 163. Improvisation, II.** Continuation of Dance 162, with emphasis on expanding bodily activity into various existing or created performing environments; use of sound and music, body coverings, and properties; and special attention to relating these experiences to dance composition. Prerequisite: Dance 162 or consent of instructor. 1 hour.
- 164. Beginning Composition.** Theory and practice in principles of dance composition; emphasis on solo creative work using various approaches to composition. Prerequisite: Dance 163 or consent of instructor. 2 hours.
- 166. Ballet, I.** Elementary ballet for dance majors; emphasizes placement, refinement of adagio, pirouette, jumps, and connecting steps. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 168. Music Theory for Dancers.** An introduction to basic music theory: rhythms (including experience playing existing and created percussion scores), major and minor scales, chords, intervals, phrases, cadences, and rhythmic and harmonic analysis of existing pieces; includes the study of tape recorders and related sound production techniques such as splicing, editing, dubbing, and recording. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated to a maximum of 9 hours.
- 243. Creative Dance for Children.** Introduction to theories and methods of teaching dance to children, grades 1-5; includes twenty-four hours of assistance, observation, and supervised practice teaching in class situations. Prerequisite: Dance 164 and 260, or consent of instructor. 3 hours.
- 250. Dance Forms.** Introduction to movement skills and stylistic elements of theatrical and folk forms to be chosen from tap, character, jazz, preclassical and Renaissance forms, and dances of other cultures. Prerequisite: Dance 160 or 166. 1 hour. May be repeated to a maximum of 4 hours.
- 260. Modern Technique, II.** A progressive development of the concepts in Dance 160, with emphasis on the qualitative and definitive performance of a variety of technical styles. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours. May be repeated to a maximum of 18 hours.
- 264. Intermediate Composition.** Experience in choreographing a minimum of one solo and two small group works utilizing various approaches to choreographic form. Prerequisite: Dance 164 or consent of instructor. 2 hours.
- 266. Ballet, II.** Intermediate ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 166, with emphasis on technical development and extended movement combinations. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 269. Music Literature for Dancers.** Basic analysis of representative pieces from the Renaissance, baroque, classical, romantic, and modern periods, emphasizing music of the twentieth century. Students learn to recognize general stylistic characteristics of each period and to understand dance forms related to the music. Prerequisite: Dance 168, or equivalent and consent of instructor. 3 hours.
- 328. Composer-Choreographer Workshop.** Same as Music 328. For experienced composers and choreographers; explores the many relationships between musical composition and choreography. Prerequisite: For dance majors, Dance 264 or consent of instructor; for music majors, Music 106 or equivalent, other compositional experience, and consent of instructor. 2 hours or 1/2 unit.
- 330. Performance Practicum, II.** Laboratory for the rehearsal and performance of concert works by graduate choreographers, faculty, and guest artists. Prerequisite: Consent of

instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit (1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.

- 331. Production Practicum.** Practical experience in all aspects of the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. Prerequisite: Dance 131 or equivalent, and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit (1 hour or $\frac{1}{4}$ unit credit per concert up to 2 hours or $\frac{1}{2}$ unit per semester). May be repeated to a maximum of 6 hours or $\frac{1}{2}$ unit.
- 335. Dance Repertory Workshop.** Experience in learning, rehearsing, and perfecting concert dance pieces under the direction of experienced choreographers. Prerequisite: Enrollment in advanced technique course; consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
- 340. History of Dance, I.** A survey of dance from its beginnings in primitive societies through the early nineteenth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 341. History of Dance, II.** A survey tracing the development of dance from the rise of Romanticism through the twentieth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 345. Theories and Fundamentals of Movement.** Approaches to increasing ease and efficiency of movement, including theories of Sweigard, Laban, Bartenieff, Alexander, Feldenkrais, and Rolf; emphasizes alignment, connectedness, body awareness, strength, mobility, and the study of human anatomy as applied to pedestrian and dance movement. Prerequisite: Major standing in dance, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 346. Theory and Philosophy of Dance.** Study of the relationship of aesthetic principles and dance theory to a philosophy of dance in education and of dance as a performing art. Prerequisite: Dance 341 or consent of instructor. 3 hours or 1 unit.
- 347. Labanotation, I.** Fundamentals of labanotation, including theory, reading, and writing; introduction to effort/shape analysis. Prerequisite: Dance 260 or consent of instructor. 3 hours or 1 unit.
- 348. Labanotation, II.** Intermediate level theory and vocabulary of movement notation, including reading, writing, and or special projects. Prerequisite: Dance 347. 3 hours or $\frac{3}{4}$ or 1 unit. Graduate students enrolled for one unit credit will be expected to do additional reading and writing projects.
- 349. Movement Notation.** Same as Kinesiology 365 and Psychology 312. See Psychology 312.
- 351. Independent Study and Special Topics.** Special projects in research or creative investigation taught on an individual or class basis. Prerequisite: Junior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated for a maximum of 8 hours or 2 units, which may be counted toward degree requirements.
- 360. Modern Technique, III.** A progressive development of the concepts in Dance 260, with emphasis on virtuosity and versatility. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 18 hours or 2 units.
- 363. Improvisation, III.** Advanced improvisational techniques and forms; theory and practice in advanced concepts of creative improvisational human movement as an overt public art form. Prerequisite: Dance 264 or equivalent. 1 hour or $\frac{1}{4}$ unit.
- 365. Advanced Composition.** Choreography for the experienced student; includes performance of at least one original work. Prerequisite: Dance 264 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 366. Ballet, III.** Advanced ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 266. For dancers of advanced technical level with the ability to execute the ballet vocabulary; includes fundamentals of pointe work. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 8 hours or 1 unit.

- 369. Accompaniment for Dance.** Same as Music 369. For dancers and musicians; theory and practice of musical accompaniment for dance, with emphasis on improvisational techniques. Prerequisite: For dance majors, Dance 168 or equivalent, or consent of instructor; for music majors, audition with and consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 410. Professional Seminar.** Survey of professional organizations, publications, scholarly resources, and trends, culminating in student presentation of projects examining current issues in the field. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit.
- 420. Problems in Teaching and Administration.** Recent developments in the teaching of dance, including standards for major programs, curricula planning, performance experiences, administration, evaluation, and theoretical approaches to the teaching of studio courses. Prerequisite: Dance 410. 1 unit.
- 430. Dance Touring Company.** A repertory ensemble for the performance of lecture-demonstration programs, off-campus concerts, and short-term residencies; rehearsal and performance of works by resident faculty and guest choreographers. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 431. Production Practicum.** Practical experience in the technical, design, and administrative aspects of production in conjunction with department concerts. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit. May be repeated to a maximum of 1 unit.
- 450. Independent Research.** Independent research of a historical, contemporary, philosophical, or educational facet of dance under the guidance of a faculty advisor. Prerequisite: Dance 340, 341, 346, and 410, or equivalent and consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 1 unit.
- 451. Supervised Teaching.** Practical teaching experience under the supervision of a faculty member; weekly conference devoted to evaluation and planning. Teaching areas include major and nonmajor university courses and classes for community adults and children. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units with consent of instructor as topics vary.
- 460. Modern Technique, IV.** Modern technique for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.
- 465. Choreography.** A structured creative utilization of formal choreographic elements in the creation, rehearsal, staging, and performance of original dance works. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit.
- 466. Ballet, IV.** Ballet for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.
- 475. Production for Dance.** Examines theoretical and practical aspects of dance production with emphasis on lighting and costuming; includes scenery and props, make-up, audio, video, stage management, and public relations. The design and execution of costumes for a dance production is a required culminating project. Prerequisite: M.F.A. candidacy in dance; Dance 465; concurrent registration in Dance 498. 1 unit.
- 498. Creative Project in Dance.** The design, implementation, and completion of a culminating creative project in choreography and/or performance. Prerequisite: Seven units of graduate work in dance, including one unit in choreography. 1 unit. May be repeated to a maximum of 2 units.

ECOLOGY, ETHOLOGY, AND EVOLUTION

Head of Department: G. O. Batzli

Department Office: 515 Morrill Hall, 505 South Goodwin, Urbana

- 105. Environmental Biology.** Introduction to ecological principles in relation to understanding environmental problems; emphasizes impacts upon ecosystems by human activities such as air and water pollution, usage of pesticides and pest control measures, expansion of agriculture in tropics and arid regions, harvesting the oceans, and development of energy sources. 3 hours.
- 109. Sociobiology: The Evolution of Social Behavior.** Same as Anthropology 109. Examines the functional basis of social behavior in animals and humans; explores concepts such as altruism, kin selection, and sexual behavior; discusses the "sociobiology debate"; evaluates recent applications of sociobiological concepts to human behavior. 3 hours.
- 143. Biological Bases of Human Behavior.** Same as Anthropology and Human Development and Family Ecology 143. See Anthropology 143.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Behavior of Domestic Animals.** Same as Animal Science 203. See Animal Science 203.
- 212. Basic Ecology.** Lecture, discussion, laboratory, and field course dealing with the relationships between organisms and their environment; introduction to physiological bases for adaptations, population dynamics, community organization, and the structure and function of ecosystems. Prerequisite: One year of biology or concurrent registration in Biology 111. 5 hours. (Counts for advanced hours in LAS.)
- 232. Comparative Vertebrate Anatomy.** Classification and comparative anatomy of vertebrates including functions and evolution of their organs and organ systems. Prerequisite: Biology 111 or equivalent. 5 hours. (Counts for advanced hours in LAS.)
- 243. Natural History and Social Behavior of the Great Apes.** Same as Anthropology 243. See Anthropology 243.
- 246. Vertebrate Social Organization.** Same as Anthropology, Psychology, and Sociology 246. Introduction to the biosociology of vertebrates; emphasis on the behavioral, physiological, and population aspects of vertebrate social organizations, from fishes to primates. Prerequisite: One year of introductory biology. 3 hours. (Counts for advanced hours in LAS.)
- 290. Special Topics.** Supervised participation in research and scholarly activities in ecology, ethology, or evolution, usually as an assistant to the instructor. Prerequisite: Two years of life sciences or cognates, advanced standing, and consent of instructor. 1 to 5 hours.
- 294. Individual Topics.** Supervised independent investigation of individual topics in ecology, ethology, and evolution; requires a written report to instructor. Prerequisite: Two years of life sciences or cognates, advanced standing, and consent of instructor. 2 to 5 hours.
- 301. Introduction to Evolutionary Biology.** Introduction to the evidence for evolution and the origin and types of genetic variation, stressing various modes of selection and modern observations and experiments illustrating the evolutionary process. Prerequisite: Biology 210 or equivalent. 3 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Ecology, Ethology, and Evolution 301 and Biology 107.
- 311. Evolutionary Ecology.** Emphasizes the evolution of life-history strategies in plants and animals (reproductive rates, life cycles, sex ratios, breeding and mating systems) and the coevolution of animals and plants (pollination, dispersal, and herbivory). Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 320. Invertebrate Zoology.** Invertebrates: structure and development; application of biological principles: specific and comparative morphology of the invertebrates; and coordination of structure and function, origin, development, and life histories. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit. Offered in alternate years.

332. **The Evolution of Adaptive Systems.** Evolutionary mechanisms underlying adaptations; emphasizes origin and subsequent modification of major complex systems; pertinent evidence considered from several disciplines, including population biology, developmental biology, structural analysis, and paleobiology. Prerequisite: Biology 210. 3 hours or $\frac{3}{4}$ unit.
335. **Ornithology.** Structure, function, ecology, behavior, and evolution of the birds of the world; laboratory devoted to anatomy and identification; and field studies devoted to identification of and research on birds. Optional weekend field trip. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit. Offered in alternate years.
336. **Mammalogy.** Classification, distribution, life history, evolution, and identification of mammals. Lecture, laboratory, and field work. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit. Offered in alternate years.
339. **Field Vertebrate Natural History.** Laboratory and field course. An intensive study of North American vertebrates with emphasis on vertebrates of Illinois; taxonomy, life histories, habitats, and feeding habits of all the common resident species. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit.
340. **Natural History of the Vertebrates.** Lectures on vertebrate adaptations for survival and reproduction. Prerequisite: Biology 111 or equivalent, and junior standing. 3 hours or $\frac{3}{4}$ unit.
342. **Fish and Wildlife Ecology.** Application of ecological principles and modeling to management of fish and wildlife populations; significance of abiotic and biotic factors, including life-history parameters in population growth and management; and techniques and procedures for the development of management strategies for animal populations, emphasizing vertebrates. Prerequisite: Biology 111 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit.
343. **Limnology.** Fresh water biology; study of the lake, pond, and river with emphasis on the physical environment as well as on the plants and animals which live in fresh water. Lectures, discussions, laboratory, and field work. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
344. **Introduction to Primate Morphology and Behavior.** Same as Anthropology 343. See Anthropology 343.
345. **Population and Community Ecology.** Characteristics of populations and their evolution, population dynamics and regulation, and organization and structure of communities; lecture and field research projects. Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit. Offered in alternate years.
346. **Animal Behavior.** Same as Animal Science and Anthropology 346. An introductory course emphasizing how patterns of behavior promote survival, change through evolution, and are modified by the environment. Prerequisite: Biology 111 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
347. **Animal Behavior Laboratory.** Same as Animal Science and Anthropology 347. An introduction to observational, statistical, and experimental techniques in the field, through the completion of four projects (sequence analysis, variation in FAP's, acoustic discrimination and orientation, and biological rhythms); formal reports are written for each project. Prerequisite: Ecology, Ethology, and Evolution 346 or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
348. **Wildlife and Land Management.** Same as Forestry 348. Introduces principles of wildlife management; applies those principles to land management problems, especially forestry, range, and agricultural land-uses as they relate to aquatic and terrestrial wildlife; and discusses techniques for evaluating and improving wildlife populations. Prerequisite: Botany 100 and Biology 104 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Credit may not be received for both Ecology, Ethology, and Evolution 342 and 348. Offered in alternate years.
350. **Behavior-Genetic Analysis.** Same as Anthropology and Psychology 342. See Psychology 342.
352. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Psychology 347. See Psychology 347.

- 353. Hormones and Behavior.** Same as Psychology 343. Survey of the behavioral effects of hormones in vertebrates and invertebrates; emphasizes the extensive literature on hormonal effects on reproductive and social behavior. Students enrolled for graduate credit may write a term paper for an extra $1/4$ -unit credit. Prerequisite: Biology 111 or equivalent. 3 hours, or $3/4$ or 1 unit.
- 359. Aquatic Ecology.** Same as Civil Engineering 347. See Civil Engineering 347.
- 382. Advances in Ethology: Behavior of Marine Animals.** A survey of behavioral adaptations and the ecological and evolutionary forces which have shaped them, as revealed by studies upon marine invertebrate and vertebrate groups. Prerequisite: Biology 111; consent of instructor. 3 hours or $3/4$ unit. Offered in alternate years.
- 383. Advances in Ethology: Behavioral Ecology.** An in-depth examination of areas of current interest at the interface of behavior, ecology, and evolution; focuses on communication, foraging, and social behavior. Prerequisite: Ecology, Ethology, and Evolution 212 and 346, or consent of instructor. 3 hours or $3/4$ unit. Offered in alternate years.
- 407. Current Concepts in Evolution.** Examines current topics in evolutionary biology, including concepts such as modes of speciation, punctuated equilibrium vs. gradualism, neutralism, macroevolution, and molecular clocks. Prerequisite: Ecology, Ethology, and Evolution 301 or equivalent. 1 unit.
- 443. Problems in Primate Behavior and Ecology.** Same as Anthropology 443. See Anthropology 443.
- 444. Concepts in Ethology.** Discussion, review, and critical analysis of general concepts and specific problems in behavior with new topics each semester. Prerequisite: Ecology, Ethology, and Evolution 346. $1/2$ unit. May be repeated.
- 445. Seminar in Fish and Wildlife Ecology.** Modern ecological principles and concepts to specific problems in fisheries and wildlife. Prerequisite: Ecology, Ethology, and Evolution 342 or 345, or equivalent. $1/2$ unit. Offered in alternate years.
- 452. Concepts in Ecology.** Discussion, review, and critical analysis of general concepts and specific problems in ecology with new topics each semester. Prerequisite: An advanced course in ecology or consent of instructor. $1/2$ unit. May be repeated.
- 490. Individual Research.** Individual topics in research conducted under the supervision of faculty members in the Department of Ecology, Ethology, and Evolution. Prerequisite: Consent of adviser. $1/2$ to 3 units.
- 491. Topics in Population Biology.** Lecture and discussion of problems in population biology, with a different topic each semester. Prerequisite: Consent of instructor. $1/2$ unit. May be repeated to a maximum of 4 units.

ECONOMICS

Chairperson of Department: F. Shupp

Department Office: 330 Commerce Building (West), 1206 South Sixth, Champaign

- 101. Introduction to Economics.** A general survey of the operation of the economic system; emphasizes the determination of the level of national income, the pricing and allocation of products, and factors of production under existing conditions in the United States. 4 hours.
- 109. Current Economic Problems.** An economic analysis of specific economic problems dealing with poverty, economic development, international economics, and other contemporary issues. Prerequisite: Credit or concurrent registration in Economics 101. 1 hour.
- 171. Introductory Economic Statistics.** Introduces statistical methods as applied in economics and other social sciences: descriptive statistics, probability theory, and distributions; sampling methods and distributions; estimation and hypothesis testing; and simple regression. For noncommerce students only. Prerequisite: Credit or concurrent registration in Mathematics 134 or equivalent. 3 hours. Credit is not given for Eco-

nomics 171 if student has credit for any of the following: Economics 172 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Health and Safety Studies 321; Forestry 321; Geography 185 or 370; Social Work 327; or Statistics 100, 210, 310, or 311.

172. Economic Statistics, I. An introduction to the modern theory and methodology of statistics in the areas of economics and business; topics include descriptive statistics, probability theory, sampling theory and methodology, sampling distributions, estimation, and hypothesis testing. Prerequisite: Credit or registration in Mathematics 134 or equivalent. 3 hours. Students may not receive credit for Economics 172 if they have received credit for Economics 171 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Forestry 321; Geography 185 or 370; or Statistics 100, 210, 310, or 311.

173. Economic Statistics, II. Continuation of Economics 172. Emphasizes estimation and hypothesis testing for the linear statistical model; topics include contingency tables, goodness of fit, single and multiple regression, correlation, Bayesian decision theory, time series analysis, and index numbers. Prerequisite: Economics 172; Mathematics 134 or equivalent. 3 hours.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

214. Introduction to Public Finance. A general survey of the economics of the public sector at the federal, state, and local levels, including government expenditures, public budgeting, cost-benefit analysis, principles of taxation, tax reform, and intergovernmental fiscal relations. Prerequisite: Economics 101 or equivalent. 3 hours. Credit is not given for Economics 214 if the student has credit for Economics 314. Current or prospective economics majors are encouraged to take Economics 314.

228. Survey of International Economics. Introductory survey of major topics and issues in the theory and policy of international economics: theory of international trade, tariffs and commercial policy balance of payments, and adjustment and foreign exchange rate determination. Prerequisite: Economics 101 or equivalent. 3 hours. Credit is not given for both Economics 228 and 328.

236. American Economic History. Traces the course of growth and development of the economy from the colonial period to World War I; emphasizes conceptualization of key issues of the American experience and analysis of significant episodes and turning points. Prerequisite: Economics 101 or consent of instructor. 3 hours.

237. Contemporary Western Europe. Same as History 237. See History 237.

238. European Economic History. Economic structure and development of Europe since 1000 with respect to agriculture, industry, trade, technology, finance, and government; emphasis on those forces which contribute to the economic development of Europe and on the spread of these forces throughout the world. Prerequisite: Economics 101 or consent of instructor. 3 hours.

240. Labor Problems. Survey of the problems and analysis of U.S. labor markets and unions; topics include labor force participation, occupations, hours, wage determination, development and attributes of U.S. labor unions, and overview of collective bargaining and the effects of unions, unemployment, wages and inflation, and racial and sex discrimination; and selected current policy problems. Prerequisite: Economics 101. 3 hours.

245. Women in the Labor Market. Same as Women's Studies 245. Changing role of women in the labor market and the economy; supply and demand for women in the 1970s: nature, extent, and legal remedies for sex discrimination in employment; "earnings gaps" and variable employment costs, men versus women; new role of multi-earner families; and comparative use of women as a professional resource. Prerequisite: Economics 101 or equivalent. 3 hours.

255. Comparative Economic Systems. Analyzes the significant similarities and differences in the development, structure, and policies of capitalism, communism, and market socialism. Prerequisite: Economics 101 or equivalent. 3 hours.

273. Regression and Forecasting. Covers the methodology of multiple regression, partic-

ularly as it applies to time series data and forecasting; also examines the use of various exponential smoothing models, and autoregressive integrated moving average models in business forecasting. Prerequisite: Economics 173 or equivalent. 3 hours. (Counts for advanced hours in LAS.)

- 288. Government Regulation of Economic Activity.** Analyzes the economic bases, policies, and consequences of government regulation of economic activity; patterns of regulation in selected areas. Prerequisite: Economics 101. 3 hours.
- 294. Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 295. Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 299. Undergraduate Open Seminar, II.** An independent study course covering topics not treated by regular course offerings. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the department. While credit toward graduation is normally granted for this course, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. Prerequisite: Junior or senior standing. Economics 101 or equivalent is recommended. 0 to 9 hours. May be repeated.
- 300. Intermediate Microeconomic Theory.** Microeconomic analysis including value and distribution theory; analysis of the pricing of the factors of production integrated in a micro-general equilibrium context which builds towards explaining the resource allocation process. Prerequisite: Economics 101 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive graduate credit for both Economics 300 and Business Administration 400. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 301. Intermediate Macroeconomic Theory.** The modern theory of the determination of the level and rate of growth of income, employment, output, and the price level; discusses alternate fiscal and monetary policies to facilitate full employment and economic growth. Prerequisite: Economics 101 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive credit for both Economics 301 and Business Administration 401. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 303. Macroeconomic Policy.** Analyzes current macroeconomic policy issues, problems, and techniques; discusses various policy techniques including monetary, fiscal, incomes, and exchange rate policies, and their effectiveness for treating inflation, unemployment, productivity, resource and exchange rate problems. Emphasizes current issues in the U.S. but includes some discussion of other developed economies. Prerequisite: Economics 301 or equivalent. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
- 306. History of Economic Thought.** The development of economics; the examination of contributions of individual writers and schools of thought as they influenced economic thought and national policy. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 312. Economic Dynamics and Growth.** Analyzes the causes of economic instability; the requirements for economic growth in the national economy; and considers public policy relating to instability and growth. Prerequisite: Economics 101 or equivalent; Economics 301. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 313. Economics of Consumption.** Same as Family and Consumer Economics 313. See Family and Consumer Economics 313.
- 314. Public Sector Economics.** Economic analysis of government tax and expenditure policies; topics include public good and externality theory, public choice theory, income distribution, cost-benefit analysis, principles of taxation, tax incidence, economic effects and optimal structures of major taxes, and taxation in developing economies. Prerequisite: Economics 300 or consent of instructor; consent of instructor required for student with credit for Economics 214. 3 hours, or $1/2$ or 1 unit.
- 315. The Economics of Poverty and Income Maintenance.** Same as Labor and Industrial Relations 315. Analyzes the nature and causes of poverty with special emphasis on critical evaluation of programs to combat poverty in the United States. Prerequisite: Economics 101 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 328. International Economics.** Introduction to the theory of international trade and finance with selected application to current problems of commercial policy, balance of payments adjustment, and the international monetary system. Prerequisite: Economics 300 or equivalent, or consent of instructor; Economics 301 is recommended. 3 hours, or $1/2$ or 1 unit.
- 329. Contemporary Issues in the International Economy.** Analysis in depth of selected current issues and policy problems of the international economy, including (but not restricted to) the following: new approaches to the theory of international trade, reform of the international monetary system, role of the General Agreement on Tariffs and Trade and the United Nations Conference on Trade and Development in expanding trade between developed and undeveloped economies, problems of stabilizing international commodity markets, and balance of payments problems of the United States and other selected countries. Prerequisite: Economics 328 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 341. Economics of Labor Markets.** Same as Labor and Industrial Relations 341. Studies the microeconomic determinants of labor demand and supply, economic effects of unions, and macroeconomic labor market problems. Prerequisite: Economics 300 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 343. Unions, Bargaining, and Public Policy.** Analyzes the legal background and economic issues associated with unions and collective bargaining in the United States including theory of the labor movement; process of union wage determination; analysis of strikes; background, strategies, and principal issues in collective bargaining; and problems and policies of government intervention. Prerequisite: Economics 101 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 345. Economics of Human Resources.** Same as Labor and Industrial Relations 345. Education and training in economic growth; labor force characteristics; occupational structure and future human resources requirements; job information networks; economics of discrimination and underutilization; national human resources policies and programs; and private industry and union human resources planning. Prerequisite: Economics 300 or equivalent. 3 hours, or $1/2$ or 1 unit. Graduate credit is not given for both Economics 345 and 444.
- 346. Family Economics.** Same as Agricultural Economics 370 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
- 350. The Developing Economies.** Analyzes the economic problems associated with newly developing nations; emphasizes their economic structures, their factor scarcities, and their programs for development. Not open for graduate credit to graduate candidates in economics. Prerequisite: Economics 101 or equivalent. 3 hours, or $1/2$ to 1 unit. Graduate credit is not given for both Economics 350 and Economics 450 or 451.
- 351. The Development of the Japanese Economy.** Analyzes Japan's international trade, economic structure, standards of living policy-making process, and future prospect; additional attention to U.S.-Japanese economic relations and Japan's role in Asia. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 352. Economic Development in Latin America.** Same as Agricultural Economics 352. Studies economic activity and the processes of diversification and industrialization in

- Latin America, with comparative analysis of selected countries. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 353. Economic Development in India and Southeast Asia.** Same as Agricultural Economics 353. See Agricultural Economics 353.
- 354. Economic Development of Tropical Africa.** Same as Agricultural Economics 354. See Agricultural Economics 354.
- 356. Economics of Population and Resources.** Same as Sociology 356. Interactions of population size with output, natural and man-made resources, and environment; various policies for management of these interrelated elements; and economics of demographic change. Considers both more developed and less developed countries. Prerequisite: Junior standing or consent of instructor. Economics 101 is recommended. 3 hours, or $1/2$ or 1 unit.
- 357. The Soviet Economy.** Analytical survey of Soviet economic development; structure and performance of the economy, and problems of planning and control. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 358. The Economy of China.** Discusses changes in the patterns of production, exchange, and distribution in Communist China, with emphasis on their relation to social transformation; survey of Chinese economic history over the past century, dealing with the institutional background to and the structure of economic activities in China. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 359. The Israeli Economy.** Analyzes the economic structures, policies, and performance of modern Israel, emphasizing the pre-1948 Palestine economy; the development of the Histadrut, Kibbutz, and Moshav; the economic relations between Arab and Jewish populations; and the impact of post-1948 immigration on Israel's economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $1/2$ to 1 unit.
- 360. Regional Economics.** Survey of the theory and problems of regional economic development, including regional accounts, interregional income and trade theory, principles of the location of economic activity, theories of regional growth, and public policy for development of regions. Prerequisite: Economics 101 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 361. Urban Economics.** Same as Finance 367. Analyzes the urban economy. The theory of urban spatial structure; the theory of local public finance, pricing, and investment decisions in the urban public sector, and the application of cost-benefit analysis and user-charge pricing to such problems as housing, transportation, land-use controls, and pollution. Prerequisite: Economics 101 or equivalent; Economics 300 is recommended. 3 hours, or $1/2$ or 1 unit.
- 371. Introduction to Applied Econometrics.** Application of economic theory and statistical inference in the estimation and analysis of economic relations and predicting the outcomes of economic variables. Prerequisite: Economics 173 or equivalent; Economics 300 or 301. 3 hours, or $1/2$ to 1 unit.
- 372. Econometrics.** Studies econometric models and methods used in estimation and hypothesis testing in economics. Prerequisite: Mathematics 134; Economics 173, and Mathematics 225 or 315. 3 hours, or $1/2$ or 1 unit.
- 374. Mathematical Economics, I.** Mathematical reformulation and interpretation of traditional economic theory. Prerequisite: Mathematics 242 or equivalent; Economics 300 and 301. 3 hours, or $1/2$ to 1 unit.
- 375. Mathematical Economics, II.** Introduction to linear and nonlinear economic models; emphasizes the formulation and interpretation of modern economic theory and welfare economics. Prerequisite: Mathematics 123, 225, or 315; Mathematics 242 or equivalent; Economics 300. 3 hours, or $1/2$ to 1 unit.
- 384. Economics of Transportation.** Economic aspects of the transportation industry with special emphasis on problems of regulation and public policy. Prerequisite: Economics 101 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 386. Current Transportation Problems.** Analytical and critical study of selected problems of current interest in transportation. Prerequisite: Economics 384 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 388. Law and Economics.** Applications of economic theory to problems and issues in both

civil and criminal law and the effect of legal rules on the allocation of resources; includes property rights, liability and negligence assignment, the use of administrative and common law to mitigate market failure, and the logic of private versus public law enforcement. Prerequisite: Economics 300 or equivalent. 3 hours or $1/2$ or 1 unit.

- 389. Industrial Competition and Monopoly.** The organization and tactics of market control; the development of antitrust law and policy; public policy regarding competitive practices; special policies applying to natural resource industries; and regulated monopoly and government ownership as alternatives to the antitrust approach. Prerequisite: Economics 300 or equivalent. 3 hours, or $1/2$ or 1 unit.
- 400. General Economic Theory.** Emphasizes microeconomic theory; principal topics include a review of value and distribution theory, the theory of choice by households and firms, general microeconomic theory, and theoretical developments of current interest; and attention given to empirical studies intended to affirm or disaffirm economic principles. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 400 and Business Administration 400. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 401. General Economic Theory.** Emphasis on macroeconomic theory; principal topics include a review of Keynesian macroeconomic theory, formal growth theory, and selected business cycle theory. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 401 and Business Administration 401. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 402. Microeconomic Theory, I.** Introduction to the models and methods of modern microeconomic theory, concentrating on individual and firm decision making and on industry equilibrium; brief treatment of general equilibrium theory and welfare analysis. Topics include: consumer utility and demand theory; production and cost functions; firm supply, input demand, and price behavior; competitive, monopolistic, and oligopolistic industry analysis; and distribution theory. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
- 403. Macroeconomic Theory, I.** Development of modern macroeconomic theory, including national income accounts and their relation to input-output tables; classical, Keynesian, and monetarist aggregate models; behavior hypotheses of consumption, investment, and government; properties and the role of money and interest; foreign trade and investment; price rigidity, price flexibility, and employment; wage-price interaction and inflation; and ad hoc stabilization models. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
- 404. Microeconomic Theory, II.** General market equilibrium theory and welfare economics; discusses the problems of existence, stability, efficiency, and equity of economic equilibrium; and introduces social choice and the special problems created by public goods, externalities, and uncertainty. Prerequisite: Economics 402. 1 unit.
- 405. Macroeconomic Theory, II.** Development of modern macroeconomic theory, including disequilibrium theory, optimal short-term stabilization measures, and monetary, fiscal, incomes, and exchange rate policies; large-scale econometric models; linear and neoclassical growth models; aggregate distribution theory; money, capital movements, trade, and growth; optimal growth models; and exhaustible resources and growth. Prerequisite: Economics 403. 1 unit.
- 406. History of Economic Thought.** Analyzes economic thought from the Physiocrats to World War II; evaluation of the selected materials both as reflections of their times and as contributions to contemporary economic thought. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 407. International Macroeconomics.** Deals with the international aspects of macroeconomics. Discusses issues such as the determination of exchange rates, balance of pay-

- ments, the accumulation of foreign assets; considers both deterministic and stochastic systems; particularly emphasizes modelling issues. Prerequisite: Economics 405. 1 unit.
- 408. Philosophical Problems in Economics.** Studies philosophical problems in economics, with some emphasis on the methodology and epistemology of economic theory; use of the views of leading economists to show the development of broad philosophical problems of economic theory, the relation of theory and certain of its applied areas, and the relation of economics to other selected disciplines. These problems are treated in the light of modern philosophy. Prerequisite: One unit either in economic theory or in the history of economic thought. 1 unit.
- 409. Marxian Economics.** Analyzes Marx's economic theory and predictions; concentration on a critical evaluation of Marx's economic theory, a survey of contributions to the theory since Marx, and a Marxist evaluation of the neoclassical synthesis. Prerequisite: Economics 300 and 301, or consent of instructor. 1 unit.
- 410. Advanced Topics in Economic Theory, I.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
- 411. Advanced Topics in Economic Theory, II.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
- 413. Consumption Economics.** Same as Family and Consumer Economics 413. See Family and Consumer Economics 413.
- 414. Public Goods Theory.** In-depth analysis of the theory of public goods; includes public goods and externality theory, public choice, theory of cost-benefit analysis, optimal income redistribution, and fiscal federalism. Prerequisite: Economics 300 or equivalent. 1 unit.
- 415. Economics of Taxation.** Theoretical and empirical analysis of the impact of taxation on the economic system; topics include tax equity and excess burden, incentive effects of taxation, tax incidence, structure of major types of taxes (income, consumption, and wealth), normative tax analysis, and taxation in developing economies. Prerequisite: Economics 300 or equivalent. 1 unit.
- 418. Economics of Education, Health, and Human Capital.** Same as Administration, Higher and Continuing Education 418. Basic economic analysis of human capital and the value of human time, with applications to the economics of education and health; theory and analysis of consumer investment in human and physical capital over the life cycle; the returns to education and health, and their effects on growth; the theory of nonmarket time; public finance of education and health; and implications for the analysis of the distribution of income. Prerequisite: A course in microeconomic theory and a course in statistics, or consent of instructor. 1 unit.
- 420. Monetary Theory.** Micro- and macroeconomic theories of the supply of and demand for money; money substitutes and their significance; review of current empirical research; money in closed economy, macroeconomic, and static general equilibrium models; and analysis of inflation and unemployment. Prerequisite: Consent of instructor. 1 unit.
- 421. The Theory of Monetary Policy.** Monetarism and other current topics; stabilization policy; money in dynamic models; money in open economy macroeconomic models; and international aspects of monetary theory. Prerequisite: Consent of instructor. 1 unit.
- 428. International Trade Theory.** Development and use of the neoclassical theory of international trade for the analysis of tariffs, customs, unions, and the effects of trade on the distribution of income and welfare; analysis and use of the relations between the balance of payments and national income to study the role of income changes

combined with price changes in the balance of payments adjustment process. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.

- 429. International Financial Economics.** Examines the balance of payments, exchange rate, capital flows and international monetary system; fiscal and monetary policy in open economies. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 436. American Economic History.** Emphasizes, but is not limited to, the reading and criticism of current literature in American economic history; attempts to facilitate understanding of the use of economic analysis in interpreting events framed in historical context; includes British colonial policy, trade and tariffs, industrialization, technology, slavery and the southern economy, land policy, agriculture, transportation and internal improvements, capital mobilization and financial organization, and the measurement of economic growth. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 437. General Economic History.** Treatment of selected topics in the economic history of industrialized economies by applying economic theory and quantitative methods of analysis to historical problems; exploration of the implications for contemporary work in economics. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 438. Economic History of Europe.** Major lines of development since 1450; comparative study of forces and institutions inimical or favorable to growth; and selected readings on organization of economic activity, role of governments and the entrepreneur, commercial policy, monetary systems, land tenure, process of capital formation, industrialization, etc. Prerequisite: Consent of instructor. 1 unit.
- 440. Labor Economics.** Same as Labor and Industrial Relations 440. Survey of recent trends in the labor force, of real and money earnings, and of the distribution of national income used as the basis for a critical economic analysis of contemporary English and American wage theory. Prerequisite: Economics 300 and 301. 1 unit.
- 441. Labor Economics.** Same as Labor and Industrial Relations 411. Economic issues and implications involved in hours of work, employment and unemployment, and trade union institutionalism (the impact of the trade union upon the basic institution of a free enterprise economy); emphasis in all cases on the development of appropriate public policy. Prerequisite: Economics 300 and 301. 1 unit.
- 442. Collective Bargaining.** Same as Labor and Industrial Relations 442. See Labor and Industrial Relations 442.
- 443. Problems and Practices of Labor Dispute Settlement.** Same as Labor and Industrial Relations 443 and Law 361. See Labor and Industrial Relations 443.
- 447. Labor Union Organization and Administration.** Same as Labor and Industrial Relations 447. See Labor and Industrial Relations 447.
- 450. The Economics of Development and Growth.** Review and analysis of the theories and patterns of growth in developed and underdeveloped economies; consideration of the problems and methods of measuring growth; critical examination of the variables thought to be strategic in the growth process; and exploration of the policy implications of different theories. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 451. The Developing Economies.** Analyzes the newly developing economies, with emphasis on institutional factors affecting development and economic policy relating to development. Prerequisite: Economics 450. 1 unit.
- 455. Comparative Economic Systems.** Comparative analysis of the structures and policies of market-directed and planned economies. Prerequisite: Economics 101 or equivalent. 1 unit.
- 457. Economic Planning in the Soviet Union and Eastern Europe.** Intensive examination of the structure and performance of the Soviet and the East European economies, emphasizing analysis of the main theoretic and operational dimensions of economic planning; evaluation of choice, design, and efficacy of central planning instruments from both theoretical and historical perspectives. Prerequisite: Economics 300 and 301, or 357, or consent of instructor. 1 unit.
- 460. Urban Economics.** Examines the microeconomic theory of urban land-use and spatial structure (static and dynamic models); analyzes externalities caused by traffic congest-

- tion; normative and positive analysis of the provision of local public goods; and public policy issues (i.e., slums and urban decline, pollution). Prerequisite: Economics 402. 1 unit.
- 461. Urban and Regional Economic Development.** Measurement and analysis of interregional differences in economic growth. Prerequisite: Economics 300 and 301. 1 unit.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Environmental Studies, and Forestry 463. See Agricultural Economics 463.
- 464. Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Environmental Studies 464. Examines both theory and policy applications in the environmental area; selectively reviews the literature to provide a framework for understanding the relevant economic relationships and the criteria appropriate for policy assessment; emphasizes the characteristics of major environmental problems and policy choices; and considers the valuation of environmental amenities and the conflict between environmental quality and growth. Prerequisite: Economics 300 or consent of instructor. 1 unit.
- 466. Quantitative Analysis for Economics.** Studies topics in optimization: implicit function theorem, multipliers and Kuhn-Tucker conditions; topics in matrix algebra including characteristic roots and vectors, partitioned matrices, quadratic forms, special matrices; topics on difference and differential equations common in economic theory. 4 hours or 1 unit.
- 467. Mathematical Economics, I: Statics.** Studies quantitative techniques useful in economic analysis and decision making; mathematical programming; input-output analysis; point-set theory and game theory; existence, optimality, and stability conditions for static general equilibrium; and activity analysis, including welfare economics. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 468. Mathematical Economics, II: Dynamics.** Studies quantitative techniques useful in economic analysis and decision making; single and systems of difference and differential equations; dynamic programming; Pontryagin maximum principle; interaction of multiplier and accelerator; von Neumann model; Turnpike theorem; growth models; and control systems. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 470. Economic Statistics.** Classical statistics and regression analysis; descriptive statistics, probability and point and interval estimation; decision theory; variance analysis; and linear regression and least-squares estimates. Prerequisite: A course in statistics or consent of instructor. 1 unit.
- 471. Econometric Analysis.** Part 1: the construction of econometric models; characteristics of models and choice of estimating methods; and estimates of parameters by various methods. Part 2: Bayesian statistics and decision theory. Prerequisite: Economics 470 or equivalent. 1 unit.
- 472. Applied Econometrics.** Develops a general methodological basis for searching for quantitative economic knowledge; integrates and gives operational content to the topics of economic, statistical, and econometric theory. Prerequisite: Economics 471 or 476, or equivalent. 1 unit.
- 473. Time Series Analysis in Economics.** Modern time series analysis techniques for handling economic data which arises in a happenstance fashion through time and their application to specific economic problems. Prerequisite: Economics 471 or Statistics 478, or equivalent. 1 unit.
- 476. Econometrics, I.** Estimation of parameters for single-equation models; tests of hypotheses and confidence regions for regression models; large-sample theory in single-equation models; and Bayesian statistics in regression models. Prerequisite: Mathematics 315 and Statistics 310. 1 unit.
- 477. Econometrics, II.** Considers the specification of models with systems of simultaneous equations; identification problem, distributed lag models, K-class estimators, maximum likelihood estimators, three-stage least-squares, and effects of specification errors. Prerequisite: Economics 476. 1 unit.
- 478. Bayesian Inference in Econometrics.** Examines some standard econometric prob-

lems from the Bayesian perspective and compares Bayesian and classical inference. Prerequisite: Economics 476 or equivalent. 1 unit.

- 480. Industrial Organization.** Theory of the organization of markets and firms, behavior of firms, functioning of competitive systems, and performance of markets. 1 unit.
- 481. Anti-Trust and Business Policy.** Economic analysis of public policy for market structure and conduct; topics include anti-trust and mergers, predatory pricing, advertising, and technological advance. Prerequisite: Economics 480. 1 unit.
- 482. Government Regulation of Industry.** Microeconomic and econometric analyses of market failure and government response in selected industries; topics include economic effect of regulation, bureaucratic behavior, optimal policy, and strategies for regulatory reform. Prerequisite: Economics 402; Economics 480; or consent of instructor. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. $\frac{1}{4}$ to 1 unit.
- 491. Workshop and Research Seminar.** Workshops are offered in all areas of specialization in which graduate students are writing Ph.D. dissertations. The specific format varies, but in general workshop sessions include presentations by graduate students of thesis research, by faculty members of their current research, and by occasional outside speakers. Prerequisite: Admission to the Department of Economics Ph.D. program. $\frac{1}{2}$ unit. One unit of Economics 491 is required of all students in the Ph.D. program.
- 499. Thesis Research.** Preparation of thesis required of all students writing master's or doctoral theses in economics. 0 to 4 units.

EDUCATION

Dean of College: N. S. Cole

College Office: 110 Education Building, 1310 South Sixth, Champaign

- 111. Introduction to Education.** Introduces American public education, especially the goals, organization, structure and finance of schooling, and some of the typical problems teachers face. 1 hour.
- 112. Contemporary Issues in Education.** In depth analysis of how the issues of racism, sexism, IQ, bilingual/bicultural education, and mainstreaming impact on public schooling in the United States. Prerequisite: Education 111. 1 hour.
- 113. The Nature of Teaching.** Examines the general nature of the activity called teaching and the nature of the occupation of teaching in the United States; exposes students to various views of the concept of teaching, styles of teaching, teacher characteristics, the nature of the work itself, and an overview of the teacher's "role set." Prerequisite: Education 112. 2 hours.
- 114. Field Experience in Education.** Provides students with practical field experience in education; places students considering teaching as a career in public school classrooms where they will have a limited "hands on" experience; and provides students who have decided against teaching as a career the opportunity to investigate educational issues of interest to them under the supervision of the instructor. Prerequisite: Education 113. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 400. Methods of Educational Inquiry.** Critical consideration of research concepts and methods used in alternative means of contemporary educational inquiry. 0 or 1 unit.
- 449. Independent Study.** Offers opportunity of self-directed independent study, that is, develops the individual's ability as an independent student and enables the student to pursue interdisciplinary studies for which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the associate dean for graduate programs prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL POLICY STUDIES

Chairperson of Department: C. J. Karier

Department Office: 360 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Foundations of American Education.** Studies some of the problems of formulating and justifying aims and policies in American education, of designing and systematizing the curriculum, of organization and social context of the public school system, and of the teaching-learning process; examined in terms of perspectives provided by social philosophy, history, sociology, and philosophy of education. 3 hours.
- 249. Independent Study.** Designed for students who wish to do advanced readings and research in greater depth and to investigate further ideas and themes that have been explored in Educational Policy Studies 199 and 201. Prerequisite: Educational Policy Studies 201; interest as attested to by instructors; and consent of adviser and staff member who supervises the work. 2 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 299. Undergraduate Seminar in Educational Policy Studies.** An advanced undergraduate seminar that builds upon introductory work in Educational Policy Studies 201 and includes historical, philosophical, legal, and social science perspectives on education. Requests for activation of this course may come from students or faculty. Prerequisite: Educational Policy Studies 201 or equivalent, and consent of instructor. 0 to 9 hours. May be repeated.
- 300. The History of Education.** Brief introductory survey of ancient and medieval education followed by a more extended study of educational developments since the Italian Renaissance; emphasis on the relation of educational trends to broader social, economic, political, and intellectual movements. Prerequisite: Junior standing. 3 hours or $\frac{1}{2}$ unit.
- 301. Philosophy of Education.** Philosophical examination of selected educational issues; conveys a grasp of the complexities of the issues and some philosophical methods for dealing with them. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 302. History of American Education.** The development of American education in relation to political, social, and cultural developments; attention to the influence of movements in the cultural environment upon evolving conceptions of educational theory and practice. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 303. Comparative Education.** Introduction to the cross-cultural, cross-national study of educational institutions and their relationship to society. Topics may vary. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 304. Social Foundations of Education.** Introductory survey of the interrelationship between school and society, and of the impact on public education of the major social trends and forces operating in our society. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 305. History of Educational Ideas.** Studies selected educational theorists and intellectual movements; provides familiarity with the major educational ideas of the past and historical perspectives on current issues and problems in education; and readings in such authors as Aristotle, Plato, Quintilian, St. Augustine, Loyola, Comenius, Rousseau, Pestalozzi, Froebel, Herbart, and Dewey. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 306. Aesthetics, the Arts, and Education.** Theoretical introduction to the problems involved in teaching critical appreciation of the arts; examines materials from aesthetics, art history, and criticism for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 307. Aesthetics, Mass Communications, and Education.** Theoretical introduction to the problems involved in teaching a critical understanding of mass communications; examines materials from aesthetics, communication theory, and the social sciences for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.

- 308. Critical Thinking for Teachers.** An examination of critical thinking dispositions and abilities; the process of infusing critical thinking into subject-matter instruction. 4 hours or 1 unit.
- 309. The Politics of Education.** An overview of the political structure and processes through which many of the major issues in education are treated; analyzes the nature of the policymaking process in education and discusses the roles of principal participants in the process of educational decision making, but focuses on fundamental recurring issues in education and the ways these issues have been resolved or not resolved by the overall system. Particular attention to the role that both the federal and state judiciary as well as legislative authority have had in shaping educational policy. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 310. Economics of Education.** An introduction to economic concepts and their application to education, including investment and consumption theories of education and the role of human capital in economic growth and development; cost-benefit analyses in education, education and the distribution of income, and manpower and educational planning. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 315. Sociology of Education.** Same as Sociology 315. Education as a social process in various cultures and historical periods, emphasizing current systems in Westernized countries. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 385. Anthropology of Education.** Same as Anthropology and Educational Psychology 385. Introduction to the contribution of anthropology to the cross-cultural study of education, including discussion of material from representative cultures ranging from primitive social groups to present-day national states; special attention to education of minority ethnic and subordinate cultures; and emphasis on both informal and formal education as cultural process in relation to culture transmission, evolution, change, and development. Prerequisite: A course in anthropology or sociology, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 399. Issues and Developments in Educational Policy Studies.** Seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 400. Problems of Educational Theory.** Analysis of the kinds of problems encountered in constructing an educational theory, and of relations between educational theory and other disciplines, especially philosophy and the social sciences. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 401. Modern Theories of Education.** Critical analysis of the theories of educational research and practice as found in contrasting traditions of educational thought. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 402. Educational Movements in the Twentieth Century.** Historical study of significant educational trends during the past sixty years, with special reference to their influence on American education; an analytical examination of the principal transition movements in the last decade of the nineteenth century and of efforts to solve the problems since 1900. 1 unit.
- 403. The Historical Foundations of American Educational Thought.** Studies the evolution of educational theories and philosophies since the eighteenth century; particular reference to their impact upon educational developments in the United States; a broad view of the general growth of American educational thought; and attention to selected major educational theorists, or schools of thought, exploration of their fundamental ideas, and the relation of these ideas to significant intellectual currents in American culture. Prerequisite: Consent of instructor. 1 unit.
- 404. Seminar in Educational Classics.** Reading and group discussion of a limited number of the most important writings in educational philosophy which have had a profound influence on the progress of educational thought and practice. Prerequisite: Educational Policy Studies 305 or equivalent; consent of instructor. 1 unit.

- 405. Foundations of Aesthetic Education.** Philosophical approach to the problems of teaching for appreciation in formal education; appraisal of the status of aesthetic education, its nature and function, and its relation to other types of education. Prerequisite: Educational Policy Studies 306 or equivalent. 1 unit.
- 406. Seminar in the History of Education.** Intensive group study of a small number of selected problems to assist individual students to develop an understanding of and the ability to use the techniques of historical research in furthering such study; problems studied are selected in the light of the interests and previous training of the group of students enrolled. Prerequisite: Two courses in the history of education or consent of instructor. 1 unit.
- 407. Logical Foundations of Methods.** Studies the application of principles of logic broadly construed to methods and curriculum at all levels. Prerequisite: A course in philosophy of education and teaching experience, or consent of instructor. 1 unit.
- 408. Epistemology in Education.** Explores knowledge and inquiry as they relate to problems of formulating educational policy, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of epistemology—for example, Philosophy 329, 330, or 371—or equivalent; consent of instructor. 1 unit.
- 409. Values and Education.** Studies the nature of value as it relates to problems of formulating and justifying educational aims and policies, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of ethics or value theory, or equivalent; consent of instructor. 1 unit.
- 410. Seminar in Theories of Educational and Social Change.** Designed to help prospective educational leaders acquire an understanding of current theories of social change as these relate to educational institutions. There is now an extensive body of knowledge on the nature and control of social change; this needs to be made available to all prospective educational leaders in order that they may go about their duties with greater understanding and skill. Designed to aid students in bringing this knowledge to bear upon the problems of leadership in educational and social change. Prerequisite: Educational Policy Studies 304 or equivalent. 1 unit.
- 411. Philosophy of Educational Research.** Examines some crucial assumptions and concepts of contemporary research in education from the point of view both of the consumer and the practitioner of educational research. Prerequisite: A course in philosophy of education and a course in the quantitative treatment of educational data, or equivalent, or consent of instructor. 1 unit.
- 412. Seminar: Dewey's Philosophy of Education.** Critical study of John Dewey's philosophy of education involving intensive study of original works. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 413. Seminar in Educational Concepts.** Some significant concepts, such as equality, authority, freedom, neutrality, indoctrination, objectivity, and teaching, are selected and examined in depth. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit. May be repeated.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. 1/2 or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 483. Methods in Comparative Education.** Designed to develop skills and understanding for field work related to the cross-national and cross-cultural study of education. Prerequisite: Consent of instructor. 1 unit.
- 484. Education in the Industrialized Nations.** Examines the social, political, and economic functions of educational systems in industrialized countries with emphasis upon the development of educational policy; focuses on Western Europe and North America. Prerequisite: Consent of instructor. 1 unit.
- 485. Education in the Developing Countries.** Analyzes of the role and functions of ed-

ucation in social, political, and economic development, with particular reference to the new and the developing countries. Prerequisite: Consent of instructor. 1 unit.

- 486. Education and International Relations.** Analyzes the role of education in international relations; emphasizes the policies and programs of the former colonial powers and the contemporary major national and international donor agencies, the competition among these agencies, and the results of foreign assistance programs in the developing countries. Prerequisite: Educational Policy Studies 303 or consent of instructor. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in educational policy studies; sections offered in the following fields: (a) history of education; (b) philosophy of education; (c) comparative education; (d) social foundations of education; (e) philosophy of educational research; and (f) historical methods in education. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL PRACTICE

Offices for Student Teaching: Secondary Education, 398 Education Building; Elementary Education, 306 Education Building; Special Education, 288 Education Building; Vocational and Technical Education, 347 Education Building; Art Education, 121 Art and Design Building; Dance Education, 4-305 Krannert Center for the Performing Arts; Health and Safety Studies, 113 Huff Hall; Music Education, 3004 Music Building; Physical Education, 111 Huff Hall; Speech and Hearing Science, 901 South Sixth Street; and Foreign Language, G-70-D Foreign Language Building.

NOTE: Students entering teacher education curricula with 55 or more semester hours should apply for student teaching assignments during the first semester in the curriculum. However, such students must complete at least a semester before they may be admitted to educational practice.

- 150. School and Community Experiences.** Early field experiences in teacher education, including observation and laboratory experiences in public schools; designed to provide opportunities for career exploration, professional orientation, the development of insight into the interrelationship of theory and practice, and the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. Educational Practice in the Education of Exceptional Children.** A course in practice teaching which provides teaching experience with exceptional children. Prerequisite: Senior standing; consent of department; sufficient hours of background courses; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.
- 232. Educational Practice in Elementary Education.** A course in practice teaching to meet certification requirements for teaching in the elementary school. Prerequisite: Elementary and Early Childhood Education 233, 234, or 237 as required by the student's curriculum; senior standing; 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.
- 238. Educational Practice for Special Fields in Elementary Schools.** A course in student teaching to meet requirements for certification in special fields at the elementary school level. Prerequisite: For students in the early childhood education curriculum, Elementary and Early Childhood Education 334 required; consent of instructor; 100 hours of

early field experience; 3.5 cumulative and University of Illinois grade point average. 3 to 8 hours.

- 242. Educational Practice in Secondary Education.** A course in practice teaching to meet certification requirements for teaching in the secondary school. Prerequisite: Satisfactory progress in an approved teacher education program, including 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.

EDUCATIONAL PSYCHOLOGY

Chairperson of Department: M. Saville-Troice

Department Office: 210 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Educational Psychology.** Basic undergraduate course in psychology of education for prospective teachers; materials and principles from the various areas of psychology (mental hygiene, psychology of learning, etc.) applied to the practical problems of teaching. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 236. Child Development for Elementary Teachers.** Study of child growth and development designed particularly for those preparing to teach in the elementary school; special emphasis on the significance of the developmental process for educational programs and procedures; and systematic experience in studying and evaluating children's behavior and in supporting their learning and development. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 241. Sex Role Socialization: Implications for Schooling.** Reviews research and practice related to sex role socialization in education; examines sex differences in academic achievement and motivation and the effect of differential classroom environments on males and females. 3 hours.
- 249. Independent Study.** Study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclass status; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructor; consent of adviser and staff member who supervises the work. 1 to 4 hours.
- 250. Career Development Theory and Practice.** The design and implementation of an innovative life planning process; a participatory experience that includes a survey of theories, models, and research on life planning and that encourages systematic skill identification, values clarification, and the development of job search strategies. 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 311. Psychology of Learning for Teachers.** A study of the psychology of human learning as it applies to instruction, educational issues, and educational problems. Prerequisite: Educational Psychology 211 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 312. Mental Hygiene and the School.** Examination of social and emotional adjustment; study of normal personality, integration, feelings of inferiority, adjustment mechanisms, classroom therapy, and behavior disorders in children; and introduction to methods of child study and provision for emotionally disturbed children. Prerequisite: Educational Psychology 211; practice teaching or teaching experience. 2 hours or $\frac{1}{2}$ unit.
- 313. Child Language and Education.** Provides an overview of current knowledge about children's acquisition of communicative competence together with a consideration of the educational import of this developmental process. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 314. Sociocultural Influences on Learning.** Provides a general overview of the relationship of language, culture, and society to the teaching-learning process; gives broad exposure to research and theory concerned with the effects of sociocultural factors on cognition,

perception, and motivation; also considers the effect of such factors on classroom interaction. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.

315. Personality and Social Development. Same as Psychology 365. See Psychology 365.

316. Discipline and Classroom Management. A general overview of theories related to analyzing student behaviors in the classroom; the incidence and etiology of conduct problems and behavior disorders in the classroom, with emphasis upon preventive strategies and guiding principles for maintaining classroom discipline. Prerequisite: Educational Psychology 211 or 236, or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.

341. Applications of Sex Role Theory to Counseling. Same as Women's Studies 341. Reviews research on sex role socialization related to career, family, and personal roles for both sexes; discusses counseling strategies aimed at freeing persons from attitudes and behaviors that limit their freedom to choose; and reviews strategies for change at policy, agency and individual levels. 4 hours or 1 unit.

343. Individual Intelligence Testing. Fundamental concepts relevant to the general problem of the individual testing of learning aptitude; acquisition of psychometric competence in the use of the 1960 Binet and the Wechsler tests; and acquaintance and limited practice in the administration, scoring, and interpretation of results obtained by performance scales and other devices appropriate for use with individuals having sensory, associative, and/or motor impairments. Prerequisite: Consent of instructor and 6 hours of psychology and Special Education 324, or Educational Psychology 392 or Psychology 390. 3 hours or 1 unit.

359. Professional Skill Development Workshop in Educational Psychology. Laboratory, pre-practica, or workshops designed to teach practitioner-oriented skills in specialized areas of educational psychology; requests for initiation of sections in this course may be made by students or by faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.

362. Adult Learning and Development. Same as Administration, Higher, and Continuing Education 362. See Administration, Higher, and Continuing Education 362.

363. Instructional Design. Same as Administration, Higher, and Continuing Education 363. The design, systematic development, and evaluation of instructional programs, including delineation of performance outcomes, analysis of concepts, design of instructional sequences, assessment of student performance, and survey of current research. Each student develops an instructional program. Prerequisite: A foundation course in educational psychology or psychology. 4 hours or 1 unit.

364. Psychological and Social Distortion of Information. Study of how information is psychologically and socially constructed and distorted; implications for consumerism, political involvement, media monitoring, problem solving, policy making, and education. Prerequisite: Psychology 100. 3 hours or 1 unit.

385. Anthropology of Education. Same as Anthropology and Educational Policy Studies 385. See Educational Policy Studies 385.

387. Computer Use in Education. Overview of the nature and development of automation in education; use of electronic data processing systems for administrative purposes, for instruction, and for research; discussion of problems of computer management, natural language analysis, and simulation CAI applications; and laboratory experience with on-line terminals, remote entry devices, and peripheral equipment. Prerequisite: Educational Psychology 390 or equivalent, or consent of instructor. 3 hours or 1 unit.

390. Elements of Educational Statistics. Designed for terminal value for professional training of students not intending to pursue advanced graduate work, and for introductory value for students continuing graduate study in education; descriptive statistics, introduction to correlation and regression, the normal curve, statistical inference, and the presentation and interpretation of statistical data in educational literature. Prerequisite: Junior standing. 3 hours or 1 unit.

391. Construction and Use of Tests in Teaching. The relationship of classroom testing to educational objectives and the curriculum; the construction, administration, and scoring of the various types of essay and short-answer tests; and other means of mea-

- suring the attainment of objectives and marking procedures. Designed primarily for classroom teachers. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
- 392. Introduction to the Principles of Measurement.** Study of the selection, preparation, administration, and interpretation of psychological and educational tests and diagnostic devices; emphasis on theory at a beginning level, with application to hypothetical school situations as a teaching device; and consideration of the sources of standard tests, criteria for their evaluation, methods of scoring, interpretation, and general and special areas. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
- 398. Evaluation Methods.** Introduces the methodology of educational program evaluation, including the design of an evaluation, the data collection techniques, approaches to data summarization, and the reporting and utilization of evaluative information; each student designs and conducts an evaluation project. Prerequisite: Educational Psychology 390. 3 hours or 1 unit.
- 399. Issues and Developments in Educational Psychology.** Experimentation or seminar on topics not treated by regularly scheduled courses. Requests for initiation of the course may be made by students or by faculty members. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 411. Psychology of Adolescence for Teachers.** Psychological significance of adolescence, its biological and social foundations, and its implications for education. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 412. Advanced Child Development for Students of Education.** Considers the nature of the child and the child's development during the preschool and elementary school years; emphasis on development as a process of social learning; interpretation of the scientific literature as it concerns the educative process; and discussion of methods of studying and evaluating the behavior of the child as an individual and in group situations. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 413. Social Psychology and the Problems of Education.** Consideration of the concepts and methods of social psychology as applied to the professional functions of teachers, administrators, and other persons engaged in education; opportunity to work upon field problems. Prerequisite: Educational Psychology 311, 312, and 390. 1 unit.
- 414. The Psychology of College Teaching.** Designed particularly for graduate students minoring in education or preparing for college teaching. Psychoeducational problems in undergraduate and graduate teaching; special emphasis upon individual differences, remedial procedures, principles of learning, the technology of teaching and learning, adjustment problems of college students, counseling and advisory services, test construction, and analysis and use of test results and resource materials. Prerequisite: A course in psychology; consent of instructor. 1 unit.
- 415. Psychological Theories Applied to Education.** An advanced course in human behavior; special attention given to contemporary systems of psychology and their relationship to educational practice. Prerequisite: Educational Psychology 311 and 312; Educational Psychology 411 or 412. 1 unit.
- 420. Professional Seminar in Counseling Psychology.** Reviews the psychologists' professional code of ethics, the history of counseling psychology as a profession, and current theoretical and applied issues within the field of counseling psychology. 0 or 1 unit.
- 422. Basic Principles of Counseling.** Study of counseling processes that are especially applicable to the problems of normal individuals; study of the theories of education and personality which underlie counseling procedures for the purpose of developing the student's ability to evaluate these procedures. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 423. Use of Tests in Counseling.** Provides instruction and practice in the critique, selection, administration, and interpretation of tests of four basic types used in counseling: aptitude, achievement, interest, and personality; builds on knowledge and skill obtained in prerequisite courses in measurement and counseling psychology. Prerequisite: Educational Psychology 392 and 422. 1 unit.
- 424. Supervised Practice in Educational Psychology.** Intensive supervised experiences in applied educational psychology; use of a wide variety of diagnostic and observational techniques and treatment. Students may take more than one section. Prerequisite:

Master's degree in educational psychology or equivalent; consent of instructor. 1 to 2 units.

- 425. Principles and Practices of Student Personnel Services.** For teachers, administrators, student advisers, and others who are interested in basic guidance principles and in guidance methods useful to schools and to agencies dealing with out-of-school youth and adults; consideration of the role of guidance specialists and the guidance functions of community agencies. 1 unit.
- 426. Interpersonal and Personal Problem Solving for Counselors and Educators.** Studies how to facilitate the growth of persons experiencing difficulty with developmental tasks, stressful transitions, and life crises; builds on a knowledge of the problem-solving process, life span development, and of counseling theory and practice. Prerequisite: Admission to doctoral study or consent of instructor. 1 unit.
- 427. Principles and Techniques of Group Guidance.** Study of the principles of group guidance and their application; review of the historical development of group guidance and the study of pertinent research. Discussion and role playing have an important part in the work of the course, and case materials are utilized. Prerequisite: Educational Psychology 311, 312, 422, 423, and 425; or consent of instructor. 1 unit.
- 428. Theories of Career Development and the Use of Occupational Information.** Results of recent occupational research and use of these results by teachers and counselors; attention given to research techniques suitable for use in local occupational studies. Prerequisite: Educational Psychology 425 or an introductory course in counseling. 1 unit.
- 429. Field Instruction in Educational Psychology.** Individual instruction designed to help the advanced student apply basic principles of education or psychology in institutional settings. Each student is assigned to a school, community agency, or other applied settings for a supervised field experience in some aspect of educational psychology. Prerequisite: Master's degree in educational psychology or equivalent, and consent of instructor. 1 to 4 units. May be repeated to a maximum of 4 units; no more than 2 units may be taken in any given semester.
- 440. Social Development.** Research and theory relating to the social development of children; special attention to processes of social learning, environmental influences on social behavior, and the role of education in facilitating the development of social skills; and emphasis on experimental research conducted in naturalistic settings. Prerequisite: Educational Psychology 236 or Psychology 216, or equivalent; and Educational Psychology 390, Psychology 235, or equivalent. 1 unit.
- 445. Motivation and Achievement.** Examines the social, cultural, and psychological antecedents of achievement behavior; reviews current theories of achievement motivation, research, issues, and methodologies; and emphasizes applications to such areas as education, sport, and work. Gives special attention to age-related changes in motivation and achievement patterns. Prerequisite: Educational Psychology 390 or equivalent; Psychology 373 is recommended. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student; and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairperson prior to enrollment. 1/2 or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 451. Evaluation of Educational Programs.** Same as Elementary and Early Childhood Education 451. See Elementary and Early Childhood Education 451.
- 460. Field Research in Educational Settings.** Examination of the conduct of research in educational settings with a focus on researcher-practitioner research collaboration; considers social psychological and design aspects of field research. Students engage in research in cooperation with local schools. Prerequisite: Educational Psychology 390 or equivalent, and consent of instructor. 1 unit.
- 461. School-University Research Practicum.** Focuses on developing skills in field-initiated research; includes research methods, implementation and evaluation of new education programs, and school district policy and operation. Students do a project

designed to meet specific school needs under the direction of practicum advisers. Prerequisite: Educational Psychology 460; and Educational Psychology 496 or Psychology 306, or equivalent; or consent of instructor. 1 unit.

- 483. Single Subject Research Design.** Same as Special Education 483. See Special Education 483.
- 485. Multivariate Correlational Techniques in Educational Research.** Same as Psychology 486. Emphasis on educational research applications of correlational techniques; special attention to issues in principles of research design underlying appropriate uses of such techniques as multiple, partial, and part (semipartial) correlation and factor analysis; and illustration of techniques by examples drawn from published studies and projects conducted on this campus. Emphasis will be placed on application and interpretation of techniques rather than on theoretical rationales. Prerequisite: Educational Psychology 496 or equivalent; consent of instructor. 1 unit.
- 487. Research on Classroom Instruction.** An advanced course that reviews research findings on efficient and effective instruction in classrooms including research instruments, research procedures, and results; implementation of these findings for inservice and preservice programs; observation in ongoing classrooms; emphasis on conducting research and synthesizing research findings. Prerequisite: Educational Psychology 390; doctoral standing. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in educational psychology; topics relate to the areas of specialization represented by the various divisions within the department. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated to a maximum of 2 units in any area of specialization.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 492. Psychology of Learning and Instruction.** Same as Psychology 492. An advanced course in the nature and conditions of long-term cognitive learning and retention in classroom and similar situations; intended for doctoral students with a special interest in research leading to the improvement of classroom teaching and learning, in psychological aspects of curriculum research, and in the cognitive aspects of military and industrial training. Prerequisite: Consent of instructor. 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Psychology 494 and Sociology 494. See Psychology 494.
- 495. Theories of Measurement.** Same as Psychology 495. Classical test theory (true score, error of measurement, reliability and validity of test scores, composite measures); proposed alternatives to the classical model (generalizability theory, matrix sampling, latent trait theory, criterion-referenced measurement). Prerequisite: Educational Psychology 496 or Psychology 307, or equivalent; Educational Psychology 392 or Psychology 390, or equivalent. 1 unit.
- 496. Statistical Methods in Education.** Introduction to inferential statistical methods in education: includes probability theory, distribution theory, interval estimation, hypothesis testing, regression and correlational analysis, and analysis of variance. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
- 497. Advanced Statistical Methods in Education.** Advanced topics in analyses of variance and covariance, and principles of experimental design; brief introduction to multivariate analysis, including rudiments of matrix algebra. Prerequisite: Educational Psychology 496, Psychology 307, or equivalent. 1 unit.
- 498. Theories of Educational Evaluation.** Study of the process of educational program evaluation, its purpose and procedures, with emphasis on settings, personnel, and performance; review of principal theories; and study of models, histories, political contexts, ethics, and epistemology of evidence as they relate to the observation, judging,

and reporting of educational programs. Prerequisite: Educational Psychology 390 and 392, or consent of instructor. 1 unit.

499. Thesis Research. Individual direction of research and thesis writing. 0 to 4 units.

ELECTRICAL ENGINEERING

Head of Department of Electrical and Computer Engineering: T. N. Trick

Department Office: 155 Electrical Engineering Building, 1406 West Green, Urbana

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

200. Seminar. Discussions of educational programs, career opportunities, and other topics in electrical engineering. For electrical engineering students. 0 hours.

220. Basic Electric Circuit Analysis. Fundamentals of electric circuit analysis including network theorems, transient, sinusoidal steady-state, and three-phase circuits. Prerequisite: Physics 107; Mathematics 242 or 245. 3 hours. Credit is not given for more than one of Electrical Engineering 220, 260, and 270. Electrical Engineering students receive no credit.

229. Introduction to Electromagnetic Fields. Elementary electromagnetic field theory as summarized in Maxwell's equations in integral and differential form; wave propagation; and energy and power in electromagnetic fields. Prerequisite: Physics 107; Mathematics 345. 3 hours.

244. Electrical Engineering Laboratory, I. Introduction to electronic instruments, basic measurement techniques, and basic electronic components; preparation for experimental projects. Prerequisite: Credit or concurrent registration in Electrical Engineering 260 or 270. 2 hours.

246. Project Laboratory. Planning, designing, executing, and evaluating various experimental projects by the student along with discussion of the actual examples of experimental design, error control, and data processing. Prerequisite: Senior standing in electrical engineering; consent of instructor. 2 to 4 hours.

249. Digital Systems Laboratory. Introduction to the experimental analysis and synthesis of digital networks. Prerequisite: Electrical Engineering 244 and 290, or consent of instructor. 2 hours. Students may not receive credit for both Electrical Engineering 249 and Computer Science 265.

250. Laboratory Applications of Microcomputers. Introduction to microcomputer function and use at the board level; hardware and software design for interfacing; control, data-logging, and signal-conditioning applications; and peripherals and expansion. Laboratory assignments accompany the lectures and an individual project is completed at the end of the course. Prerequisite: Electrical Engineering 290 or equivalent. 4 hours. Credit is not given for both Electrical Engineering 250 and 291.

251. Interactive Language Organization for Microcomputer Systems. Examines the implementation of interactive languages on microcomputers; studies operating systems, properties of interactive languages, outer and inner interpreters, combining with machine code, and interfacing to peripheral devices; laboratory assignments on microcomputer systems. Not intended for computer science or computer engineering majors. Prerequisite: Electrical Engineering 290 or equivalent. 3 hours.

260. Introduction to Electric Circuits. Elementary signals; basic principles of network analysis; and sinusoidal steady-state analysis. Prerequisite: Physics 107 and credit or registration in Mathematics 345 and Computer Science 101 or 121. 3 hours. Credit is not given for more than one of Electrical Engineering 220, 260, and 270.

270. Introduction to Circuit Analysis. Basic principles of circuit analysis including Kirchhoff's laws, node and mesh equations, matrix methods, equivalent circuits, operational amplifiers, transient analysis, sinusoidal steady-state analysis, three-phase circuits, transformers, network functions, and frequency responses. Prerequisite: Phys-

ics 107 and credit or concurrent registration in Math 345. 4 hours. Credit is not given for more than one of Electrical Engineering 220, 260, and 270.

- 271. Electrical Engineering Special Topics.** Prerequisite: As specified by department or instructor. 0 to 4 hours.
- 272. Electrical Engineering Problems.** Prerequisite: Approved written application to department as specified by department or instructor. 0 to 4 hours.
- 290. Introduction to Computer Engineering.** Introduction to digital logic and computer systems. Representation of information; combinational network analysis and design; sequential network analysis and design; computer organization and control; machine level programming. Prerequisite: Computer Science 101 or 121. 3 hours. Students may not receive credit for both Electrical Engineering 290 and Computer Science 264.
- 291. On-Line Computing.** On-line computer use; includes assembly language programming, I/O processes and devices, interrupts and priority, semaphores, real-time operations, multi-tasking, data acquisition, and computer-based control and communication. Prerequisite: Electrical Engineering 290, Computer Science 264, or consent of instructor. 3 hours. Credit is not given for both Electrical Engineering 291 and either Electrical Engineering 250 or Computer Science 221.
- 296. Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 299. Thesis.** Preliminary reading and investigation. 0 to 3 hours.
- 302. Electronic Music Synthesis.** Survey of methods of electronic music production; musical notation translated into engineering terms; analysis and synthesis of sound spectra; electronic circuits for synthesis of musical sounds; and digital computer sound synthesis. Prerequisite: Music 100 or equivalent, Electrical Engineering 290 and 342. 3 hours or $\frac{3}{4}$ unit.
- 303. Topics in Audio Engineering.** Sound perception related to audio; review of wave phenomena; acoustics of rooms and auditoriums; characteristics of microphones and loudspeakers; magnetic recording; and topics of specialized interest. Prerequisite: Electrical Engineering 260 or 270 and 373, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 309. Signal and System Analysis.** Introduction to continuous-time and discrete time signals and linear systems; includes difference equations, convolution, frequency response, Fourier series, Fourier transform, Laplace transform, z-transform, transfer functions, and stability. Prerequisite: Electrical Engineering 270. 4 hours or 1 unit. May not be taken for credit by graduate students in Electrical and Computer Engineering.
- 310. Digital Signals and Systems.** Discrete-time signals and systems; convolution sum; difference equations; Z-transform; sampling theorem and data conversion; digital filter design and implementation; discrete signal analysis and the Fast Fourier Transform; and state variable methods with application to digital control and communications. Prerequisite: Electrical Engineering 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 311. Microcomputer Laboratory.** Design, construction, and use of a small general purpose computer with a micro-processor CPU; MSI and LSI circuits used extensively; control panel, peripheral controllers, control logic, central processor, and programming experiments; and open lab format. Prerequisite: Electrical Engineering 249 or Computer Science 265; Electrical Engineering 291 or Computer Science 221. Credit or concurrent registration in Electrical Engineering 312 is recommended. 3 hours or $\frac{3}{4}$ unit.
- 312. Computer Organization and Design.** Basic computer organization, design constraints for digital circuits, arithmetic algorithms and hardware implementation, memory devices and system organization, control logic and microprogramming, and input-output devices and intrasystem communication. Prerequisite: Electrical Engineering 290 or Computer Science 264; Electrical Engineering 250 or 291, or Computer Science 221. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 313. Probabilistic Methods of Signal and System Analysis.** Introduction to probabilistic methods, analysis of random signals and noise, and applications to electrical engi-

neering problems, including reliability of circuits and systems and effects of noise systems. Prerequisite: Electrical Engineering 309. 3 hours or $\frac{3}{4}$ unit. Electrical Engineering majors may not receive graduate credit.

- 314. Biomedical Instrumentation.** Same as Bioengineering 314. Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical transducers for measurements of biopotentials, ions and gases in aqueous solution, force, displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; and therapeutic and prosthetic devices. Prerequisite: Electrical Engineering 260 or 270 and 244, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 315. Biomedical Instrumentation Laboratory.** Same as Bioengineering 315. Laboratory to accompany Electrical Engineering 314. Studies medical instrumentation and transducers for static and dynamic nonbiological inputs and measures actual biomedical signals; requires some animal experiments. Prerequisite: Credit or concurrent registration in Electrical Engineering 314. 2 hours or $\frac{1}{2}$ unit.
- 319. Applied Modern Algebra.** Same as Mathematics 319. See Mathematics 319.
- 321. Introduction to Controlled Thermonuclear Fusion.** Same as Nuclear Engineering 321. See Nuclear Engineering 321.
- 324. Analog Filter Design.** Properties of passive network functions; synthesis of RC and LC passive network functions; operational amplifier; RC active circuit synthesis; sensitivity of networks; approximation theory; and practical filter design. Prerequisite: Electrical Engineering 309. 3 hours or $\frac{3}{4}$ unit.
- 325. Introduction to the VLSI System Design.** Same as Computer Science 335. Introduction to the design and layout of VLSI (very large scale integrated) chips for complex digital systems using integrated circuit cells as building blocks and employing hierarchical design methods; novel architectures are designed and implemented, using given technology and design rules on a mini-computer system in the lab. Prerequisite: Electrical Engineering 249 and 312 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 328. Computer Networks and Distributed Systems.** Same as Computer Science 328. See Computer Science 328.
- 330. Electromechanics.** Quasi-static electromagnetic fields; lumped-parameter electromechanics; rotating machines; dynamics of electromechanical systems; fields and moving media; and transducers and actuators. Prerequisite: Electrical Engineering 229 and 260 or 270. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in electrical engineering.
- 333. Electric Machinery.** Theory and laboratory experimentation with three-phase power, power factor correction, single- and three-phase transformers, induction machines, DC machines, and synchronous machines; includes project work on energy control systems; digital simulation of machine dynamics. Prerequisite: Electrical Engineering 330. 4 hours or 1 unit. May not be taken for credit by graduate students in electrical engineering.
- 336. Advanced Electric Machinery.** Advanced rotating machine theory and practice, dynamic analysis of machines using reference frame transformations, tests for parameter determination, reduced order modeling of machines; mechanical subsystems including governors, prime movers, excitation systems, digital simulation of inter-connected machines. Prerequisite: Electrical Engineering 333. 3 hours or $\frac{3}{4}$ unit.
- 338. Communication Networks for Computers.** Same as Computer Science 338. See Computer Science 338.
- 339. Computer Aided Design for Digital Systems.** Same as Computer Science 339. See Computer Science 339.
- 340. Solid State Electronic Devices.** Semiconductor materials and their electronic properties and applications to electronic devices: p-n junctions, transistors, and other diode and triode devices; and low-frequency applications of diodes. Prerequisite: Physics 108; Mathematics 345. 3 hours or $\frac{3}{4}$ unit.
- 341. Advanced Solid State Electronic Devices.** Detailed presentation of advanced concepts such as generation-recombination, hot electron effects, and breakdown mechanisms; includes essential features of small AC signal characteristics, switching and transient behavior of p-n junctions, bipolar and MOS transistors; addresses funda-

- mental issues for device modeling and discusses the perspective and limitations of Si-devices. Prerequisite: Electrical Engineering 340. 3 hours or $\frac{3}{4}$ unit.
- 342. Electronic Circuits.** Introduces analysis and design of analog and digital integrated circuits using bipolar and MOS field effect transistors. Prerequisite: Electrical Engineering 340; credit or concurrent registration in Electrical Engineering 309. 3 hours or $\frac{3}{4}$ unit. May not be taken for graduate credit by students in Electrical Engineering.
- 343. Electronic Circuits Laboratory.** Laboratory to accompany Electrical Engineering 342. Prerequisite: Concurrent registration in Electrical Engineering 342. 1 hour or $\frac{1}{4}$ unit. May not be taken for graduate credit by students in Electrical Engineering.
- 344. Theory and Fabrication of Solid State Devices.** Laboratory and lecture course on the physical theory, design, and fabrication of solid state devices; includes the electronic properties of semiconductors (such as mobility, carrier concentration, lifetime, energy gap), and techniques for fabricating (oxidation, diffusion, oxide masking, alloying) p-n junction devices. Prerequisite: Electrical Engineering 340. 4 hours or 1 unit.
- 345. Senior Design Project Laboratory.** Individual design projects in various areas of electrical and computer engineering; projects are chosen by students with approval of the instructor; a written report, prepared to journal publication standards, and an oral presentation are required. Prerequisite: Electrical Engineering 343. 2 hours or $\frac{1}{2}$ unit. No credit for graduate students in Electrical and Computer Engineering.
- 346. Hybrid Circuit Fabrication Laboratory.** Same as Ceramic Engineering 346. Laboratory course on the basics of fabricating thin- and thick-film components as used in hybrid electronic circuits; experiments covering vacuum deposition, sputtering, anodization, resist processes, screen preparation, screen printing, and firing and trimming. Lectures provide background material and cover trade-offs of the two technologies. Prerequisite: Electrical Engineering 340. 2 hours or $\frac{1}{2}$ unit.
- 347. High-Frequency Circuit Design Using Scattering Parameters.** Laboratory and lecture on the use of scattering parameters for the design of high-frequency amplifiers. Prerequisite: Electrical Engineering 353. 2 hours or $\frac{1}{2}$ unit.
- 348. Introduction to Artificial Intelligence.** Same as Computer Science 348. An introductory description of the major subjects and directions of research in artificial intelligence; topics include AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Prerequisite: Electrical Engineering 291 or Computer Science 225; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 350. Lines, Fields, and Waves.** Wave equation, free and guided wave propagation, waveguides, and radiation. Prerequisite: Electrical Engineering 229 and 260 or 270. 3 hours or $\frac{3}{4}$ unit.
- 351. Automated Microwave Measurements.** Manual and computer controlled laboratory analysis of circuits at microwave frequencies. Prerequisite: Electrical Engineering 350. 3 hours or $\frac{3}{4}$ unit.
- 352. Electromagnetic Fields.** Plane waves at oblique incidence, wave polarization, anisotropic media, radiation, space communications, and waveguides. Prerequisite: Electrical Engineering 350. 3 hours or $\frac{3}{4}$ unit.
- 353. Radio Communication Circuits.** Design of a radio system for transmission of information; types of receivers, matching techniques, receiver and antenna noise, types of modulation, high-frequency circuitry, and point-to-point and satellite communications. Prerequisite: Electrical Engineering 309 and 342; credit or concurrent registration in Electrical Engineering 350. 4 hours or 1 unit.
- 354. Antennas.** Antenna parameters: polarization of electromagnetic waves; basic antenna types; antenna arrays; broadband antenna design; and antenna measurements. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 355. Optical Electronics.** Optical beams and cavities; semiclassical theory of gain; characteristics of typical lasers; and application of optical devices. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or 1 unit.
- 356. Applied Electrostatics.** Discusses commercial and industrial applications of electro-

- statics, emphasizing general physical laws which govern their behavior; selects examples from a variety of areas, including computer peripherals, copying equipment, electric power transmission, biomedical instrumentation, and smoke detectors. Prerequisite: Electrical Engineering 229 or equivalent, and senior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 358. Applications of Radio Wave Propagation.** Terrestrial atmosphere, radio wave propagation, and applications to radio sensing and radio communication. Prerequisite: Electrical Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 359. Analog and Pulse Communication Systems.** Introduction to amplitude, phase, frequency, and pulse code modulation systems; discusses bandwidth requirements, effects of noise and applications in commercial broadcast, and telephone and satellite communications. Prerequisite: Credit or concurrent registration in Electrical Engineering 313 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 360. Coherent Optics Laboratory.** Introduction to the properties and applications of coherent laser light; experiments in interferometry, optical processors and spatial filtering, holography, optical communications, fiber optics, and special projects. Prerequisite: Credit or concurrent registration in Electrical Engineering 309 and 350; or Physics 371; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 361. Introduction to Digital Communication Systems.** Introduction to signals and noise in digital communication systems; analysis and design of efficient digital communication receivers; and signal design for, and performance of, practical communication systems. Prerequisite: Electrical Engineering 313 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 364. Power Electronics.** Existence of switching functions and methods of control such as pulse-width, pulse modulation, and phase control; studies the various converters including DC-DC, AC-DC, AC-DC DC-AC, AC-AC, and cycloconverters; examines switching devices. Prerequisite: Electrical Engineering 309 or equivalent; credit or concurrent registration in Electrical Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 366. Introduction to Surface Acoustic Waves.** Basic ultrasonic principles; piezoelectricity; transducer equivalent circuits; and radar and communication system applications; delay lines, bandpass filters, oscillators, synthesizers, matched filters, convolvers, and Fourier transformers. Prerequisite: Electrical Engineering 309 and 350, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 368. Solid-State Motor Drive Systems.** General principles of solid-state motor drives using silicon-controlled rectifiers and integrated circuits; discusses drive systems and components including inverters, frequency converters, motors, generators, and control systems; and industrial applications. Prerequisite: Electrical Engineering 330. 3 hours or $\frac{3}{4}$ unit.
- 369. Semiconductor Device and Linear IC Applications Laboratory.** Laboratory study of applications of unijunction transistors, silicon-controlled rectifiers, triacs, field effect transistors, and linear integrated circuits such as differential amplifiers, operational amplifiers, and linear communications integrated circuits. One hour of lecture and a three-hour laboratory each week. Prerequisite: Electrical Engineering 342. 2 hours or $\frac{1}{2}$ unit.
- 371. Topics in Electrical Engineering.** Lectures and discussions relating to new areas of interest. Prerequisite: Specified by department or instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 373. Fundamentals of Engineering Acoustics.** Same as Theoretical and Applied Mechanics 373. Development of the basic theoretical concepts of acoustical systems; mechanical vibration, plane and spherical wave phenomena in fluid media, lumped and distributed resonant systems, and absorption phenomena and hearing. Prerequisite: Mathematics 345 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 374. Ultrasonic Techniques.** Ultrasonic wave propagation, generation, detection, and measurement in liquid and solid media, acoustic impedance concepts, ultrasonic absorption and velocity measurement techniques, piezoelectricity, and discussion of industrial, experimental, bioengineering, and medical applications. Prerequisite: Electrical Engineering 373 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 375. Modeling of Bio-Systems.** Same as Bioengineering 375. Application of linear systems theory and feedback control systems analysis to biological systems; sensory receptors, neuro-muscular system models, control of eye movement, the pupil control system, man-machine interactions, parameter identification in biological systems; and optional project laboratory. Prerequisite: General Engineering 222, Mechanical Engineering 265, or Electrical Engineering 309; or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 376. Power System Analysis.** Examines the development of power system equivalents, per phase network analysis, load flow, symmetrical components, sequence networks, fault analysis, and digital simulation. Prerequisite: Electrical Engineering 330. 3 hours or $\frac{3}{4}$ unit.
- 378. Power System Operation and Control.** Studies economic operation of power systems, system protection, power system stability, dynamics and control of power systems, high voltage DC transmission, load flow interface, digital simulation. Prerequisite: Electrical Engineering 376. 3 hours or $\frac{3}{4}$ unit.
- 382. Large Scale Integrated Circuit Design.** Bipolar and MOS field effect transistor characteristics; VLSI fabrication techniques for MOS and bipolar circuits; calculation of circuit parameters from the process parameters; and design of VLSI circuits such as logic, memories, charge-coupled devices, and A/D and D/A converters. Prerequisite: Electrical Engineering 290, 340, and 342. 3 hours or $\frac{3}{4}$ unit.
- 383. Principles and Application of Linear Integrated Circuits.** Techniques of analysis and synthesis of linear integrated circuits, concentrating on linear integrated circuit biasing systems, building blocks, differential amplifiers, operational amplifiers, and integrated circuits used in communications; analysis of integrated circuits by hand calculations and by specialized computer analysis programs. Prerequisite: Electrical Engineering 342. 3 hours or $\frac{3}{4}$ unit.
- 386. Control Systems.** Analysis and design of control systems with emphasis on modeling, state variable representation, computer solutions, modern design principles, and laboratory techniques. Prerequisite: Electrical Engineering 309 or consent of instructor. 4 hours or 1 unit.
- 387. Introduction to Quantum Electronics for Electrical Engineers.** Introduction for the senior electrical engineering student to the application of quantum mechanical concepts to electronics problems; specifically, application of elementary quantum mechanics to the detailed study of a calculable two-state laser system; and incidental quantum ideas bearing on electronics. Prerequisite: Physics 383 or consent of instructor. 3 hours or 1 unit.
- 388. Compound Semiconductors and Devices.** Advanced semiconductor materials and devices course covering elementary band theory, heterostructures, transport issues, three-terminal devices, and two-terminal devices, including lasers and light modulators. Prerequisite: Electrical Engineering 340, and either Electrical Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 390. Introduction to Optimization.** Basic theory and methods for the solution of optimization problems; iterative techniques for unconstrained minimization; and introductory presentation of linear and nonlinear programming with engineering applications. Prerequisite: Computer Science 101 or Mathematics 343, or consent of instructor. 3 hours or 1 unit.
- 391. Switching Theory.** Same as Computer Science 391 and Mathematics 391. Combinational electronic and relay switching networks; two-level design methods; and pulse-mode and fundamental mode sequential networks. Prerequisite: Computer Science 264, Electrical Engineering 290, or Mathematics 319, or consent of instructor. 3 hours or 1 unit.
- 397. Projects and Lectures in Quantum Electronics.** Studies processes involving quantum mechanical energy transfers in energized media leading to various laser devices and their applications. A series of lectures, supplementing the special projects, offers background information on spectroscopy, collisional energy transfer, laser pumping schemes, modulation at optical frequencies, holography, and other related topics. Pre-

requisite: Senior standing; consent of instructor. Electrical Engineering 387 is recommended. 3 hours or $3/4$ unit.

400. Seminar. Required of all graduate students. 0 units.

412. Computer Architecture. Advanced concepts in computer architecture: design, management, and modeling of memory hierarchies, stack-oriented processors, associative processors, pipelined computers, and multiple processor systems, and focuses on hardware alternatives in detail and their relation to system performance/cost. Prerequisite: Electrical Engineering 312 or Computer Science 333, or consent of instructor. 1 unit.

415. Control System Theory and Design. Synthesis of feedback control systems to meet design specifications, including sensitivity, multivariable systems, introduction to systems with random inputs; state variable techniques; and nonlinear systems. Prerequisite: Electrical Engineering 386 or equivalent, or consent of instructor. 1 unit.

416. Analysis of Networks and Systems. Dynamic equations of linear lumped networks and systems; time-domain analysis and state space methods; frequency-domain analysis and transform methods; stability criteria; and applications to various problems in electrical engineering. Prerequisite: Electrical Engineering 309. 1 unit.

417. Nonlinear and Adaptive Control. Studies design of nonlinear control systems based on stability considerations; examines Lyapunov and hyperstability approaches to analysis and design of model reference adaptive systems, identifiers, observers, and controllers for unknown plants. Prerequisite: Electrical Engineering 415. 1 unit.

418. Electric and Magnetic Fields. Rigorous treatment of basic laws, static fields, typical field systems, harmonic functions, conjugate functions, and conformal transformation. 1 unit.

420. Electromagnetic Waves and Radiating Systems. Fundamental electromagnetic theory with applications to transmission lines, waveguides, and antennas; introduction to the solution of advanced problems in static electric and magnetic fields. Prerequisite: Electrical Engineering 352. 1 unit.

421. Advanced Electromagnetic Engineering. Reciprocity and equivalence principles; formulation of scattering and diffraction problems; approximations for large and for short wavelengths; plane, cylindrical, and spherical wave problems; variational methods; Wiener-Hopf techniques; and applications to antennas and waveguide problems. Prerequisite: Electrical Engineering 420. 1 unit.

422. Controlled Fusion Systems. I. Same as Nuclear Engineering 422. See Nuclear Engineering 422.

423. Gaseous Electronics and Plasmas. Basic concepts and techniques, both theoretical and experimental, which are used in the areas of gaseous electronics, gas and solid plasmas, controlled fusion, aeronomy, gas lasers, and magnetohydrodynamics. Prerequisite: Physics 383 or Electrical Engineering 352, or equivalent, or consent of instructor. 1 unit.

425. Nuclear-Electrical Energy Conversion. Same as Nuclear Engineering 425. See Nuclear Engineering 425.

428. Analysis of Nonlinear Systems. Same as Theoretical and Applied Mechanics 428. Treatment of singular points and stability considerations, consideration of graphical and analytical methods, including the perturbation method, variation of parameters, Galerkin's method, and the Ritz method for solving nonlinear differential equations. Prerequisite: Mathematics 341; consent of instructor. 1 unit.

431. Theory of Guided Waves. Propagation of electromagnetic waves in general cylindrical waveguides; stationary principles; non-uniform inhomogeneously filled waveguides; mode and power orthogonality, losses in waveguides; analytical and numerical techniques; microwave integrated circuits waveguides; and optical waveguides. Prerequisite: Electrical Engineering 420; Physics 440 and Mathematics 455 recommended. 1 unit.

432. Compound Semiconductors (Optical Devices). Properties of III-V and II-VI compound semiconductors and the devices which are unique to these materials, emphasis on materials such as GaAs, Ga(AsP), GaP, CdSe, Cd(SeS), etc., and on luminescence, semiconductor lamps, and semiconductor lasers. Prerequisite: Graduate standing in

electrical engineering with some background in modern physics, elementary quantum mechanics; elementary semiconductor theory or equivalent. 1 unit

- 433. Theory of High-Speed Parallel Computation.** Same as Computer Science 433. See Computer Science 433.
- 434. Random Processes.** Basic concepts of random processes, spectral analysis, linear systems with random inputs; Markov chains and Markov processes, and applications to communications and control systems engineering. Prerequisite: Mathematics 361 or equivalent, or Electrical Engineering 361. 1 unit
- 435. Theory of Semiconductors and Semiconductor Devices.** Same as Physics 435. Introductory quantum mechanics of semiconductors; energy bands; dynamics of Bloch electrons in static and high-frequency electric and magnetic fields; equilibrium statistics; transport theory, diffusion, drift and thermoelectric effects; and characteristics of p-n junctions, heterojunctions, and transistor devices. Prerequisite: Senior-level course in quantum mechanics or atomic physics. 1 unit.
- 437. Principles of Microwave Measurements.** Generation and detection of the laboratory signal; the generalized impedance concept; matrix representation of waveguide discontinuities; determination of equivalent network parameters; analysis of measurement techniques by signal flow graphs; and accuracy criteria. Prerequisite: Electrical Engineering 355. 1 unit.
- 439. Advanced Theory of Semiconductors and Semiconductor Devices.** Continuation of Electrical Engineering 435. Selected advanced topics of current interest in the physics of semiconductors and solid-state devices. Prerequisite: Electrical Engineering 435. 1 unit.
- 441. Computer Systems Analysis.** Same as Computer Science 441. See Computer Science 441.
- 442. Design of Fault-Tolerant Digital Systems.** Advanced concepts in hardware and software fault tolerance; topics addressed include fault models, voting in computer systems, module and system level fault detection mechanisms, reconfiguration techniques in multiprocessor systems and VLSI processor arrays, software fault tolerance techniques such as recovery blocks, N-version programming, checkpointing and recovery, survey of practical fault-tolerant systems. Prerequisite: Electrical Engineering 312 or equivalent. 1 unit.
- 443. Digital System Testing and Design for Testability.** Fundamental techniques of detecting failures in complex digital systems; algorithms for automatic test generation; schemes for designing systems to be easily testable and with self test capability; hands-on experience with state-of-the-art computer-aided test tools in the laboratory. Prerequisite: Electrical Engineering 312 and 391, or equivalent. 1 unit.
- 445. Advanced Physical Acoustics.** Same as Theoretical and Applied Mechanics 445. Advanced topics in acoustics including physical properties of a fluid; linear propagation phenomena; nonlinear phenomena such as radiation force, streaming, and harmonic generation; cavitation; and absorption and dispersion. Prerequisite: Electrical Engineering 473 or 491, or Theoretical and Applied Mechanics 450, or equivalent; or consent of instructor. 1 unit.
- 446. Advanced Artificial Intelligence Programming Methods.** Same as Computer Science 446. Concepts and implementation techniques for advanced artificial intelligence programming algorithms and practices using Common LISP; data-driven programming, constraint computations, agenda control, discrimination nets, deductive retrieval, production systems, inheritance, object-oriented programming, backtracking, and knowledge representation. Prerequisite: Electrical Engineering 346 or consent of instructor. 1 unit.
- 447. Image Processing.** Examines fundamental concepts, techniques, and directions of research in image processing; topics include two-dimensional Fourier transform and filtering, image digitization, coding, restoration, reconstruction, analysis, and recognition. Prerequisite: Electrical Engineering 310 and 313; or equivalent. 1 unit.
- 448. Computer Models of Cognitive Processes.** Formal models and examples in vision and language; detailed analysis of computer vision, language, and learning processes.

relevant psychological results and linguistic systems; and survey of the state of the art in artificial intelligence. Prerequisite: Electrical Engineering 348. 1 unit.

- 449. Computer Vision.** Examines information processing approaches to computer vision, and algorithms and architectures for artificial intelligence and robotics systems capable of vision: inference of three-dimensional properties of a scene from its images, such as distance, orientation, motion, size and shape, acquisition and representation of spatial information for navigation and manipulation in robotics. Prerequisite: Electrical Engineering 348 or Computer Science 225, or consent of instructor. 1 unit.
- 451. Digital Signal Processing.** Reviews basic concepts of digital signals and systems; examines computer-aided digital filter design, quantization effects, decimation and interpolation, fast algorithms for convolution and the DFT; and introduces adaptive signal processing. Prerequisite: Electrical Engineering 310 and 313, or equivalent. 1 unit.
- 452. Computational Techniques for Circuit Analysis and Design.** Formulation of circuit equations; sparse matrix algorithms for the solution of large systems, AC, DC, and transient analysis of electrical circuits; sensitivity analysis; decomposition methods. Prerequisite: Mathematics 315 and Electrical Engineering 309. 1 unit.
- 453. Optimum Control Systems.** Formulation of the optimization problem; controllability; observability; stability; Lyapunov's second method; application of variational calculus, maximum principle, and principle of optimality to control problems; stochastic control; and adaptive control. Prerequisite: Electrical Engineering 415. 1 unit.
- 454. Sampled-Data Control Systems.** Analysis and design of feedback control systems with digital and sampled data. Prerequisite: Electrical Engineering 415 or equivalent. 1 unit.
- 455. Control of Stochastic Systems.** Stochastic control models; development of control laws by dynamic programming; separation of estimation and control; Kalman filtering; self-tuning regulators; dual controllers; decentralized control. Prerequisite: Electrical Engineering 415 and 434. 1 unit.
- 456. Coding Theory.** Same as Computer Science 456 and Mathematics 476. General discussion on coding theory with emphasis on the algebraic theory of cyclic codes; error-control procedures and circuits; and applications to computers and data-transmission systems. Prerequisite: Mathematics 317 or equivalent, or consent of instructor. 1 unit.
- 458. Multidimensional Digital Signal Processing.** Multidimensional signals, convolution, transforms, stability, sampling, windowing; design of two-dimensional digital filters; fast algorithms for multidimensional convolution, DFT, and corner turning; sensor array processing, including tomography and synthetic aperture radar; multi-dimensional interpolation. Prerequisite: Electrical Engineering 451. 1 unit.
- 460. Principles of Optical Communications Systems.** Characteristics of optical communication systems; topics include optical fibers, integrated optics, transmitter and receiver optics, detection techniques, photon counting, digital and analog communication, and lidar. Prerequisite: Electrical Engineering 313 and 420, or equivalent. 1 unit.
- 461. Signal Detection and Estimation.** Introduction to detection and estimation theory, with applications to communication, control, and radar systems; decision-theory concepts and optimum-receiver principles; detection of random signals in noise, coherent and noncoherent detection; and parameter estimation, linear and nonlinear estimation, and filtering. Prerequisite: Electrical Engineering 434 or equivalent, or consent of instructor. 1 unit.
- 462. Topics in Signal Detection and Estimation.** Topics selected from the following: nonlinear filtering; robust detection, estimation, and filtering; detection and estimation of point processes; quantum detection; advanced computational methods in linear filtering; white noise calculus for nonlinear systems. Students must complete a project. Prerequisite: Electrical Engineering 461 or consent of instructor. 1 unit.
- 463. Information Theory.** Same as Computer Science 463 and Mathematics 463. See Mathematics 463.
- 465. Topics in Automata Theory.** Same as Computer Science 465 and Mathematics 465. See Mathematics 465.

- 467. Communication Network Analysis.** A first high-level course in performance analysis and design of multiple-user communication systems, emphasizes rigorous formulation and analytical and computational methods. Includes queueing networks, decentralized minimum delay routing and dynamic network flow control. Prerequisite: Computer Science 138, and either Electrical Engineering 404 or Mathematics 366, or consent of instructor. 1 unit.
- 468. Modeling and Control of Electro-Mechanical Systems.** Same as Mechanical Engineering 468. Examines fundamental electrical and mechanical laws for derivation of machine models simplifying transformations of variables in electrical machines, power electronics for motor control, time-scale separation, Jacobian linearization and nonlinear control as applied to electrical machines. Typical electromechanical applications in actuators, robotics, and variable speed drives. Prerequisite: Electrical Engineering 313 or Electrical Engineering 413, or consent of instructor. 1 unit.
- 469. Introduction to Coherent Optics and Holography.** Same as Computer Science 469. The diffraction transformation of aperture distributions between parallel planes and the imaging and Fourier-transforming properties of lenses; the theory of interference; the principles of optical and digital holographic, and devices and systems for optical data processing. Prerequisite: Consent of instructor. 1 or 1.5 unit.
- 470. Nonlinear Optics.** Light propagation in uniaxial crystals, second- and third-order nonlinear susceptibility and electro-optic effects, and discussion of the relationship of these effects along with such applications as light modulation, harmonic generation, and optical parametric amplification and oscillation. Prerequisite: Electrical Engineering 426. 1 unit.
- 471. Quantum Electronics.** Brief theoretical introduction to quantum mechanics and atomic physics, with many applications in spin electronics and modern laser theory. Prerequisite: Physics 393 recommended. 1 unit.
- 472. Power System Control.** Studies energy control center functions, state estimation and steady state security assessment techniques, economic dispatch, optimal power flow, automatic generation control, and dynamic equivalents. Prerequisite: Electrical Engineering 376 or consent of instructor. 1 unit.
- 473. Topics in Graph and Geometric Algorithms.** Same as Computer Science 473. Design and analysis of computational methods for problems in graph theory and computational geometry, graph connectivity, and isomorphism, flow in networks, and matching and covering, and geometric location, proximity intersection and reachability, and applications to computational geometry. Prerequisite: Computer Science 371, or Computer Science 373, and either Mathematics 313 or Mathematics 314, or equivalent, or consent of instructor. 1 unit.
- 474. Ionospheric Radio Propagation.** Propagation in a stratified medium, WKB solutions, ray theory, ionospheric sounding, ionospheric transmission problems, scattering by irregularities, propagation in a random medium cross-modulation and nonlinear effects, magneto-ionic theory, Faraday effect, studies propagation coupling of characteristic waves, magneto-ionospheric waves, formation of ionospheric E-region, and formation of F-region. Prerequisite: Electrical Engineering 426 or equivalent. 1 unit.
- 475. Power System Dynamics and Stability.** Detailed modeling of the synchronous machine and its control, such as excitation system and turbine-generator, dynamic time-domain and reduced order models, non-linear and linear multi-machine model, stability analysis using energy functions, power system stabilizer. Prerequisite: Electrical Engineering 376 or consent of instructor. Concurrent registration in Electrical Engineering 471 is recommended. 1 unit.
- 476. Advanced Antenna Theory.** Selected topics from current engineering literature on antennas supplemented by advanced topics in electromagnetic theory needed for comprehension, current techniques for analysis of wire and horn, frequency independent, quasi-optical, and array antennas. Prerequisite: Electrical Engineering 426. 1 unit.
- 477. Advanced Electromagnetic Diffraction and Radiation.** Asymptotic solutions of Maxwell's equations, geometrical optics, edge diffraction, uniform theories, creeping waves, advanced antenna theory, and topics of current interest. Prerequisite: Electrical

Engineering 420 or Physics 442; Electrical Engineering 421 or 477 is recommended for supplemental background. 1 unit.

- 479. Computational Complexity.** Same as Computer Science and Mathematics 479. Turing machines; determinism and non-determinism; time and space hierarchy theorems; speed-up and tape compression; Blum axioms; structure of complexity classes NP, P, NL, L, PSPACE; complete problems; randomness and complexity classes RP, RL, BPP; alternation, polynomial-time hierarchy; circuit complexity, parallel complexity, NC, RNC; relativized computational complexity; time-space trade-offs. Prerequisite: Computer Science 373 or 375, or consent of instructor. 4 hours or 1 unit.
- 480. Optimization by Vector Space Methods.** Same as Mathematics 480. See Mathematics 480.
- 490. Seminar in Special Topics.** Lectures and discussions on current research and literature on advanced topics in electrical engineering. Prerequisite: Advanced standing; consent of instructor. 0 to 1/2 unit. May be repeated for credit.
- 497. Electrical Engineering Problems.** Lectures and discussions relating to new areas of interest. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated for credit.
- 498. Individual Study.** Individual projects. Prerequisite: Consent of instructor. 1/4 to 2 units.
- 499. Thesis Research.** 0 to 4 units.

ELEMENTARY AND EARLY CHILDHOOD EDUCATION

Chairperson of Department: P. D. Pearson

Department Office: 311 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 230. Principles, Problems, and Issues in Elementary and Early Childhood Education.** Focuses on the problems and issues facing the classroom teacher in curriculum development, planning, and evaluation; develops and applies educational principles which serve to guide the teacher in dealing with these problems and issues. Prerequisite: Elementary and Early Childhood Education 237 and concurrent registration in Educational Practice 232. 3 hours.
- 234. Fundamentals of Nursery-Kindergarten Education.** Assists the preservice teacher in understanding his/her role in implementing curriculum in early childhood settings. Prerequisite: Educational Psychology 236. 3 hours.
- 237. Theory and Process in Elementary School Teaching.** Directed toward affecting prospective teacher insight with regard to classroom behavior in teaching; includes materials dealing with child learning, teaching theory, and elementary school curriculum. A six-week morning assignment to a public school classroom is part of the course structure. Prerequisite: Educational Psychology 236. 5 hours.
- 249. Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 305. Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Human Development and Family Ecology 305. See Foods and Nutrition 305.
- 321. Principles and Practices in Early Childhood Education.** Studies the principles and practices of using play as an educational tool in early childhood education; reviews historical, philosophical, and psychological foundations of nursery-kindergarten methods; assesses techniques relating play to various aspects of instruction; surveys materials and equipment; and presents methods of classroom evaluation. Prerequisite: Elementary and Early Childhood Education 234. 3 hours, or 1/2 or 1 unit.

- 322. Parent Involvement Techniques for Teachers.** Principles and practices in working with parents in programs of involvement, education, and participation for elementary and early childhood teachers; includes techniques of reporting to parents, counseling with parents, guiding parent participation in schools, and developing relations with community agencies. Prerequisite: Elementary and Early Childhood Education 234 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 330. Principles and Practices in Elementary Mathematics Education.** Organization, scope, and sequence of the elementary mathematics program and the functional nature of mathematics; methods, techniques, experiences, and materials of value in teaching elementary mathematics; and the role of classroom teacher. Prerequisite: Mathematics 202 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 341. Science in the Elementary School.** The principles, place, and practice of science education in the elementary school and in the lives of children; stresses the functional nature of science and its place in the curriculum; and considers the organization of the science program, experiences and techniques of value in teaching, and the role of the classroom teacher and specialist. Opportunity for experience in field and laboratory work. Prerequisite: Elementary and Early Childhood Education 237, or equivalent; two years of college science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Teaching Social Studies in the Elementary School.** Emphasizes the role of social education in the elementary school; the formal instructional program in social studies, including the knowledge, skills, and sensitivities to be taught; the teaching strategies and materials employed; and the organization of learning experiences and the total program in addition to the educative impact of the elementary school as a social system. Prerequisite: Elementary and Early Childhood Education 237; junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 348. Speech and Language Clinical Methods in the Schools.** Same as Speech and Hearing Science 348. See Speech and Hearing Science 348.
- 359. Workshop and Laboratory in Curriculum Development.** Curriculum development projects in specialized fields of elementary and early childhood education. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units toward any one degree.
- 360. The Teaching of Language Arts in the Elementary School.** Goals, content, and teaching problems involved in the devising of programs in the area of elementary school language arts that are cumulative and sequential from kindergarten through the elementary school. Prerequisite: Elementary and Early Childhood Education 237; Educational Psychology 236. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 361. Culture in the Classroom.** Overview of the social and cultural factors which affect learning and teaching, and application of cultural information to curriculum development, classroom practices, and evaluation. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 367. Literature for Elementary School Children.** Examines literature written for children and the uses of literature in the elementary school curriculum. Prerequisite: One college course in literature. 3 hours, or $\frac{1}{2}$ or 1 unit. Students may not receive credit for both Elementary and Early Childhood Education 367 and Library and Information Science 303.
- 370. Fundamentals of Reading Techniques.** Same as Secondary Education 336. Basic principles, techniques, and materials for the developmental reading program; emphasis on methods and materials which provide for differentiated instruction. Prerequisite: Junior standing; registration in a teacher education curriculum. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 371. Principles and Practices for Fostering Independence in Reading.** Comprehension, study, and reference skills as they pertain to reading in the content fields; appropriate for elementary and junior high school majors, K through Grade Eight. Prerequisite: Elementary and Early Childhood Education 370. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 399. Issues and Developments in Elementary and Early Childhood Education.** A seminar course on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.

- 400. Elementary School Classroom Programs.** Explores organizational centers for determining selection and sequence of educative experiences in the elementary school classroom; emphasizes the role of the teacher in curriculum construction. 1 unit.
- 401. Fundamentals of Curriculum Development.** Explores the several theoretical bases of curriculum planning and the implications of these approaches for practice. 1 unit.
- 410. Principles of Inservice Education.** Examines theoretical constructs relating to continuing professional growth with particular emphasis on incentive structures and on the organization, delivery, and evaluation of professional development activities. Prerequisite: Elementary and Early Childhood Education 400 and 401. 1 unit.
- 411. Theory and Practice of Staff Development.** Surveys the relationship between curriculum change and staff development; gives primary attention to various forms of curricular modification and corresponding staff development requirements; in addition, compares alternative approaches to staff development in order to determine their specific applicability in instructional improvement. Prerequisite: Elementary and Early Childhood Education 410 (recommended), or 400, or 401. 1 unit.
- 420. Programs in Early Childhood Education.** Advanced course intended primarily for teachers and supervisors of younger children, ages three to eight; reviews and analyzes research findings, experimentation, and current trends in curriculum organization, procedures, and materials essential to developing classroom programs for children. 1 unit.
- 421. Curriculum Problems and Trends in Early Childhood Education.** Includes principles underlying education practices in day care centers, preschool/nursery and kindergarten settings derived from theory and research in developmental psychology, social psychology, anthropology, and other related disciplines. Prerequisite: Educational Psychology 236, Psychology 216, or Human Development and Family Ecology 203; or equivalent. 1 unit.
- 430. Trends and Issues in Elementary Mathematics Programs.** Deals with theories of learning, research studies, curriculum development projects, and other events which have influenced elementary mathematics programs; also considers problems and issues in contemporary programs. Prerequisite: Elementary and Early Childhood Education 400 or 420. 1 unit.
- 431. Development of Elementary Mathematics Programs.** Deals with procedures for developing curricula in the major content areas of elementary mathematics and alternative instructional procedures. Prerequisite: Elementary and Early Childhood Education 330 or equivalent; or consent of instructor. 1 unit.
- 440. Current Issues in Elementary Science Education.** Advanced seminar in science education for teachers, consultants, and administrators, preschool through the elementary grades; identifies major problems and issues; analyzes current trends and research; and develops a philosophical framework related to science education. Prerequisite: Elementary and Early Childhood Education 341 or equivalent, and two years of college science; or consent of instructor. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. No more than 2 units may be given toward an advanced degree except by consent of the dean of the College of Education.
- 451. Evaluation of Educational Programs.** Same as Educational Psychology 451. Origins, assumptions, applications, and development of approaches to educational program evaluation in practice over the past twenty years; unobtrusive measures and non-education evaluation systems; and practice in collecting evaluative data. Prerequisite: Educational Psychology 390, one year of work with children or youth in an institutional setting, or consent of instructor. 1 unit.
- 452. Methods of Child Study.** Studies ways in which teachers can evaluate child behavior and development with emphasis on classroom application; instruction and practice in the use and interpretation of observations, anecdotal records, rating scales, interviews,

achievement tests, intelligence tests, questionnaires, and sociometric and projective techniques. Prerequisite: Educational Psychology 312 or consent of instructor. 1 unit.

- 460. Research and Trends of the Language Arts Curriculum.** Investigates research, trends, issues, and innovative practices for teachers and educators on the teaching of the language arts in the elementary school; identifies and develops procedures for organizing and implementing new knowledge and research into the elementary school curriculum. Prerequisite: Elementary and Early Childhood Education 360 or equivalent. 1 unit.
- 461. Theory and Practice in Children's Composition.** Studies composition or writing, its beginning and progress throughout the elementary grades; gives particular attention to the relationship between creativity and imagination and the basic skills of punctuation, spelling, and other conventions of writing; and examines research studies on functions of writing, motivation, and purposes for writing during the elementary school years. Prerequisite: Elementary and Early Childhood Education 360 or equivalent. 1 unit.
- 462. Linguistics and the Elementary School Curriculum.** Analyzes linguistics for the elementary school curriculum including dialect diversities, new theories of grammar, lexicography, and variations in oral and written forms of language; gives attention to how teachers apply these principles in the construction of language arts programs. Prerequisite: Elementary and Early Childhood Education 360, or credit in a course in English grammar or linguistics. 1 unit.
- 467. Children's Literature and the Elementary School Curriculum.** Investigates trends and issues related to teaching children's literature in the elementary school; focuses attention upon the organization and planning of a balanced children's literature curriculum (fictional and informational) for grades K-8. Prerequisite: Elementary and Early Childhood Education 367 or Library and Information Science 304; and English 101, 103, 106, 115, or 116, or consent of instructor. 1 unit.
- 468. Contemporary Classics in Children's Literature.** Critically examines children's books that have received major national and international awards and prizes and the requirements for that distinction; gives particular attention to the most recent publications so honored and their implications for use in the elementary classrooms. Prerequisite: Elementary and Early Childhood Education 367 or 467, or Library and Information Science 304; and English 106 or 215, or equivalent; or consent of instructor. 1 unit.
- 470. Issues and Trends in Reading.** The timing of beginning reading, the influence of certain linguists on methodology and terminology in instructional materials, and the influence of research on methodology are dealt with in a way that provides a historical perspective for evaluating the merit of emerging issues and trends. Prerequisite: Elementary and Early Childhood Education 370. 1 unit.
- 471. Field Instruction in Reading Programs.** Directed practice in the area of reading; students are placed in an approved and supervised field position for part of the semester. 1 unit.
- 472. The Organization and Supervision of School Reading Programs.** Studies procedures for planning, improving, and evaluating reading programs on a systemwide basis. Open only to those persons who are preparing to supervise reading programs or with approval of graduate adviser. Prerequisite: Elementary and Early Childhood Education 480. 1 unit.
- 473. Reading Instruction in Nursery School Through Grade Two.** Planning and evaluating reading instruction and materials in nursery school through Grade Two. Prerequisite: Elementary and Early Childhood Education 370 or 371, or equivalent; or consent of instructor. 1 unit.
- 480. Corrective Reading Instruction in the Classroom.** Nature, causes, and diagnosis of reading difficulties; translation of diagnostic information into instructional practice. Prerequisite: Elementary and Early Childhood Education 370 or 371, or equivalent. 1 unit.
- 481. Clinical Diagnosis and Remediation in Reading.** Supervised experience in the reading center; special attention to evaluative and interpretative techniques in cases

of severe reading disabilities based on the analysis of specific reading needs. Prerequisite: Elementary and Early Childhood Education 480; a course in individual mental testing. 1 unit. May be repeated to a maximum of 2 units.

- 482. Clinical Practicum in Corrective Reading.** Diagnostic procedures and individual instruction with small groups of children who have reading difficulties. Prerequisite: Elementary and Early Childhood Education 480. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in elementary and early childhood education. Prerequisite: Admission to doctoral study. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Prerequisite: Admission to doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ENGINEERING

Program Administrator: H. L. Wakeland

Program Office: 207 Engineering Hall, 1308 West Green, Urbana

- 100. Engineering Lecture.** Engineering lecture for freshmen; selected topics each week. Required of freshmen in the College of Engineering. 0 hours.
- 101. Cooperative Engineering Education Seminar.** Discussion seminar which gives an introduction to cooperative engineering education. Topics discussed include duties and responsibilities of the student; duties and responsibilities of the cooperative employer; and techniques for obtaining maximum benefits from the program. Prerequisite: Cooperative student in any engineering curriculum. 0 hours.
- 102. Cooperative Engineering Education Practice.** Off-campus practice of engineering in government or industry. Prerequisite: Cooperative student in any engineering curriculum. 0 hours.
- 110. Engineering Apprenticeship.** Part-time practice of engineering science in an on-campus research laboratory environment; summary report required. Prerequisite: Completion of freshman year or equivalent. 0 hours. May be repeated.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Engineering Lecture.** Required of off-campus transfer students in the College of Engineering. Meets for first three weeks of each semester; selected topics. 0 hours.
- 210. Engineering Internship.** Full-time practice of engineering science in an off-campus industrial or research laboratory environment; summary report required. Prerequisite: Completion of sophomore year or equivalent, or consent of Director of Cooperative Education and Professional Practice. 0 hours. May be repeated.
- 298. Executives in the Technological World.** Offers a series of seminars by executives from industrial and technical organizations; provides students an opportunity to better understand the role of the technological executive as a decision maker in the contemporary world; and discusses current trends, practices, economic conditions, productivity, government regulation, and foreign trade from the viewpoint of a wide range of industries such as transportation, steel, energy, and electronics. Prerequisite: Junior or senior standing in engineering, or consent of instructor. 1 hour.
- 299. Engineering Study Abroad.** Provides campus credit for foreign study and or provides a mechanism for engineering students to maintain continuous enrollment on this campus. If objective is study abroad for credit, a detailed proposal must be submitted by the student for approval by a committee of the department in which the student is studying and the college office prior to such study abroad. Final determination of credit and its application toward the student's degree is made after a review of the student's work abroad by the above committee and the college office. Prerequisite: Completion

of sophomore year in engineering; approval of student's proposed study program by his department and the college office. 0 to 15 hours (summer session, 0 to 7 1/2 hours).

ENGINEERING HONORS

Executive Secretary of Program: H. G. Wenzel

Program Office: 207 Engineering Hall, 1308 West Green, Urbana

- 196. The Engineer and Society.** Prerequisite: Freshman James Scholar. 2 hours.
- 198. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester for freshman James Scholars to enable them to explore at their own level various aspects of technology that are of interest to them. Prerequisite: Honors student in the University. 1 to 4 hours.
- 297. College Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester in special interdisciplinary subjects of current interest for James Scholars in engineering. Prerequisite: James Scholar in engineering or consent of instructor. 1 to 4 hours.

ENGLISH

(Including Business and Technical Writing and Rhetoric and Composition)

Head of Department: R. Wheeler

Department Office: 208 English Building, 608 South Wright, Urbana

Business and Technical Writing

Business and Technical Writing Office: 100 English Building

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 251. Business and Administrative Communication.** Study of communication as a tool of administration and management; practice in writing a wide variety of types and forms of communication; and inclusion of oral and visual communication with the written to provide an integrated approach. For the student whose career will be in administration and management requiring a broad range of communication skills. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 252. Technical Communication.** Advanced writing course dealing with the problems, principles, and techniques of presenting technical information; includes reports, proposals, procedures, manuals, and technical articles. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 271. Sales Writing.** Same as Advertising 288. Direct mail campaigns and company magazine copy. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 272. Report Writing.** Personal direction in a report writing project which can be integrated with research in another course; study of report-writing principles and practices. Classes meet for the first month after which the student and the instructor arrange a conference schedule. Small group meetings are arranged for presentation of proposals, progress reports, and summary reports. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
- 290. Individual Study.** Independent research with a chosen tutor leading to the writing

of a formal report or preparation of some other type of major presentation of information. Enroll in Business and Technical Writing Office, 100 English Building, Urbana. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours.

302. Descriptive English Grammar. Same as English 302. See English 302.

400. Technical and Professional Writing. Grammar, syntax, diction, paragraph development, and logic as they relate to technical and professional exposition; practice in defining problems for scientific investigation, organizing information and outlining, preparing headings and abstracts, drafting and revising papers, and presenting information graphically and orally. Prerequisite: Graduate standing. 3 hours. No graduate credit.

English

101. Introduction to Poetry. Reading and discussion of representative poems of several periods and types. 3 hours.

102. Introduction to the Drama. Reading and discussion of representative plays of several periods and types. 3 hours.

103. Introduction to Fiction. Reading and discussion of representative fiction of several periods and types. 3 hours.

104. Introduction to Film. Understanding of narrative films through the viewing and discussion of a representative body of film classics drawn from the entire range of world cinema; emphasizes the basic elements of cinematic expression, and concerns major movements, periods, and genres. 3 hours.

106. Literature and Experience. Understanding of the relationship between literature and human experience through the study of significant, recurrent themes. 3 hours. May be repeated once as topics vary.

107. Law in Literature. The portrayal of law and the legal system in literature with particular emphasis on the impact of that system on society and the relationship between private morality and public law; includes guest speakers from the legal profession. 3 hours.

113. The Idea of Comedy. A selective introduction to the theory and practice of comedy; examines a number of influential theories of comedy and a variety of comic forms including poetry, novels, essays, plays, and short stories. 3 hours.

114. The Bible as Literature. Same as Religious Studies 101. See Religious Studies 101.

115. Masterpieces of English Literature. Study of selected major writings. 3 hours.

116. Masterpieces of American Literature. Study of selected major writings. 3 hours.

118. Introduction to Shakespeare. Representative readings of Shakespeare's drama and poetry in the context of his age, with emphasis on major plays; selections vary from section to section. Does not fulfill Shakespeare requirement for the English concentration. 3 hours.

119. The Literature of Fantasy. Same as Comparative Literature 119. Surveys masterworks in the romance tradition from Shakespeare's time to the present; as distinct from science fiction, the materials feature magic and the supernatural rather than technology; and includes stage romance, fairy tale, horror tale, and fantasy novel. Individual works are set in their historical and literary contexts. 3 hours.

120. Science Fiction. A literary and historical study of science fiction from Mary Shelley to Ursula K. LeGuin with particular emphasis on the achievement of science fiction as a literary form in the romance tradition. 3 hours.

180. Drama in Production. Study, discussion, and production of a dramatic text. 3 hours. May be repeated once as topic varies.

191. Freshman Honors Tutorial. Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.

198. Freshman Honors Seminar. Introduction to the study of literature, with emphasis

on individual work in fundamental problems of literary analysis; works studied are usually a combination either of short poems and short stories or of novels and plays. Prerequisite: James Scholar standing or other designation as a superior student. 4 hours. May be repeated once as topics vary.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

202. Medieval Literature and Culture. Same as Comparative Literature 253. British and continental authors (including Chaucer) read in modern English. Prerequisite: Sophomore standing or consent of instructor. 3 hours.

204. Renaissance Literature and Culture. Same as Comparative Literature 255. Readings in English and continental literary masterpieces with attention to the significant cultural influences of the period. 3 hours.

206. Literature and Culture of the Enlightenment. Same as Comparative Literature 257. Readings in English and continental literature of the eighteenth century, with attention to significant cultural influences. 3 hours.

209. English Literature from the Beginning to 1798. Historical and critical study of selected works of English literature to 1798 in chronological sequence. 3 hours.

210. English Literature from 1798 to Present. Historical and critical study of selected works of English literature after 1798 in chronological sequence. 3 hours.

211. Introduction to Modern African Literature. Same as African Studies 210 and Comparative Literature 210. See African Studies 210.

215. Practical Criticism. Introduction to applied literary criticism. Prerequisite: English 101. 3 hours.

240. The English Romantic Poets. Blake, Wordsworth, Scott, Coleridge, Byron, Shelley, and Keats. 3 hours.

241. The Beginnings of Modern Poetry. American and British poets including Frost, Robinson, Sandburg, Lindsay, Hardy, Hopkins, Housman, Yeats, Lawrence, the Imagists, and the early Pound and Eliot. 3 hours.

242. Poetry Since 1940. 3 hours.

243. Development of the Modern Drama. Same as Comparative Literature 265. Ibsen to O'Neill. 3 hours.

244. Development of the Modern Drama. Same as Comparative Literature 266. Pirandello to the present. 3 hours.

245. The Short Story. Same as Comparative Literature 267. Historical and critical study of the short story (American and European) from the early nineteenth century to World War I; major emphasis on such authors as Hawthorne, James, Crane, Gogol, Chekhov, Maupassant, Flaubert, Joyce, and Mansfield. 3 hours.

246. The Short Story. Same as Comparative Literature 268. Historical and critical study of the short story (American and European) from World War I to the present; major emphasis on such authors as Anderson, Hemingway, Faulkner, Porter, Mann, Kafka, Maugham, Lawrence, Salinger, and Camus. 3 hours.

247. The British Novel. Critical study of representative British novels from different literary periods. 3 hours.

248. Modern British and American Fiction in Relation to Continental Fiction. Same as Comparative Literature 269. An examination of important thematic and structural relationships—influences, parallels, and variations—among selected major works of the nineteenth and twentieth centuries; readings chosen from works of Bronte, Hardy, Lawrence, Woolf, James, Faulkner, Bellow, Oates, Dostoevsky, Tolstoy, Stendhal, Flaubert, Camus, Kafka, Mann, Hesse, Moravia, and Pavese. All works read in English. 3 hours.

249. The American Novel. Study of major and representative novels from the beginnings to the present. 3 hours.

255. Survey of American Literature, I. American literature and its cultural backgrounds to 1900. 3 hours.

256. Survey of American Literature, II. American literature and its cultural backgrounds in the twentieth century. 3 hours.

259. Afro-American Literature, I. Same as Afro-American Studies 259. Historical and

critical study of Afro-American literature in its social and cultural context from the beginning to 1915. 3 hours.

- 260. Afro-American Literature, II.** Same as Afro-American Studies 260. Historical and critical study of Afro-American literature in its social and cultural context since 1915. 3 hours.
- 273. Intermediate Film Studies: Directors, Genres, Themes.** Critical study of narrative films, with viewing and discussion of a major film each week; in-depth study of selected directors, genres, and themes; emphasis on aspects of film aesthetics, criticism, and history. Prerequisite: English 104 or a college-level course in literature or film. 3 hours.
- 274. Literature and Society.** Major literary works presented within the context of social issues of their time. 3 hours.
- 275. Literature and Psychology.** Psychological and psychoanalytical theories as they bear on the interpretation of literature. 3 hours.
- 280. Women Writers.** Same as Women's Studies 280. Study of British and American women authors. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
- 281. Women in the Literary Imagination.** A study of the way various writers, both men and women, have portrayed woman's image, social role, and psychology in English or American literature. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
- 283. Jewish Sacred Literature.** Same as Comparative Literature and Religious Studies 283. See Religious Studies 283.
- 284. Modern Jewish Literature.** Same as Comparative Literature and Religious Studies 284. Surveys imaginative literature by Jewish authors from the Enlightenment to the present; fiction, poetry, drama, and autobiography written in English or translated from other languages. 3 hours.
- 285. Third World Literature in English; the Post-Colonial Period.** Introduction to great works of modern African, Asian, and Caribbean fiction, drama, and poetry within their historical contexts. Emphasis on the emergence of new traditions of literature written in English in the Third World. 3 hours.
- 290. Individual Study.** Study of selected topics. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours. Students may register in this course more than once in the same term.
- 291. Honors Individual Study.** Study of selected topics. Restricted to English and English education concentrators with a 4.25 average who are working towards the degree with Distinction in English or in English education. Enrollment in appropriate honors office necessary. Prerequisite: Consent of English honors or English education honors adviser. 1 to 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Independent research with a chosen tutor leading to the writing of a thesis. Restricted to English or English education majors with a 4.25 average who have satisfied all other requirements towards the degree with distinction; enrollment in the English Honors Office necessary. 3 hours. (Counts for advanced hours in LAS.)
- 296. Honors Seminar, I: Themes, Movements, and Forms in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
- 297. Honors Seminar, II: Periods in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
- 298. Honors Seminar, III: Major British and American Authors.** Each seminar considers one or two major authors. Prerequisite: James Scholar status in any department; for English Department concentrators, a 4.25 grade-point average or consent of director

of honors program. Enrollment through the English Honors Office necessary. 3 hours. May be repeated as topic varies.

301. **Introduction to the Study of the English Language.** Language theories and modes of language study applied to English. 3 hours or 1 unit.
302. **Descriptive English Grammar.** Same as Business and Technical Writing 302. 3 hours or 1 unit.
303. **Historical Introduction to the English Language.** 3 hours or 1 unit.
311. **Chaucer.** A selection read in Middle English. Prerequisite: One year of college literature, or consent of instructor. 1 unit.
315. **Poetry and Prose of the English Renaissance, 1500-1600.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
316. **The Drama of Shakespeare's Contemporaries.** Tudor and Stuart drama. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
318. **Shakespeare, I.** Earlier tragedies, comedies, and history plays. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
319. **Shakespeare, II.** Mature tragedies, dark comedies, and late romances. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
321. **Poetry and Prose from the Metaphysicals to 1660.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
323. **Milton.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
326. **The Age of Dryden, Pope, and Swift.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
327. **The Age of Johnson.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
328. **English Drama of the Restoration and Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
329. **Restoration and Eighteenth-Century Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
331. **English Romantic Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
334. **Victorian Poetry and Nonfiction Prose.** Study of such major poets as Tennyson, Browning, Arnold, and Hardy; and of prose writers including Carlyle, Mill, Arnold, Pater, and Huxley. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
335. **Nineteenth-Century British Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
341. **British Literature in the Twentieth Century to 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
342. **British Literature in the Twentieth Century Since 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
343. **The Plays of Bernard Shaw.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
347. **Literature of the American Renaissance.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
350. **American Literature from the Civil War to the First World War.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
351. **American Literature from the First World War to the Present.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
355. **Major Authors.** Intensive study of the work of one or two major authors. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
361. **Topics in English and American Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
362. **Topics in Modern Fiction.** Topics including theme, genre, and literary movements, predominantly in English nineteenth- and twentieth-century fiction, with occasional consideration of continental fiction in English translation; topics may vary from se-

- mester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
- 365. Comedy.** Same as Comparative Literature 365. History and theory of stage comedy. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 366. Topics in Modern Drama.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 367. The International Folk Tale.** Same as Comparative Literature 359. Origin, nature, and distribution of the folk tale. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 368. The Ballad and Folksong in the United States.** English-language traditional songs and ballads, transplanted and native. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 370. Modern African Fiction.** Same as African Studies, Comparative Literature, and French 310. See African Studies 310.
- 373. Special Topics in Film Studies.** Extended investigation of major subjects and issues in narrative film; topics vary and typically include studies of author/directors, genres, historical movements, critical approaches, and themes. Prerequisite: One college-level film studies course and one additional college-level course in film studies or literature; or consent of instructor. 3 hours or 1 unit.
- 375. Topics in the Relation of Other Disciplines to the Study of Literature.** See Time-table for current topics. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
- 381. Theory and Practice of Written Composition.** History and theory of written composition; basic rhetorical principles; and guidance and criticism of student writing. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 383. Literary Criticism from 1800 to the Present.** Same as Comparative Literature 305. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 385. Literature for the High School.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
- 387. Topics in Folklore.** Same as Comparative Literature, German, Slavic and Speech Communication 387. Presents selected topics in folklore studies that deal with a particular theme, ethnic group, region, genre, or interpretive approach; topics vary. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary to a maximum of 6 hours or 2 units.
- 400. Introduction to Research and Critical Techniques.** Introductory course in methods and techniques in research and literary criticism. 1 unit.
- 404. Seminar in the English Language.** Study of English linguistics. 1 unit.
- 407. Old English.** Introduction to the language before 1000 A.D. 1 unit.
- 408. Beowulf.** Prerequisite: English 407 or consent of instructor. 1 unit.
- 411. Chaucer: Troilus and Criseyde and the Minor Poems.** 1 unit.
- 412. Chaucer: The Canterbury Tales.** 1 unit.
- 414. Seminar in Medieval Literature.** Prerequisite: A college course devoted entirely to an aspect of medieval studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 419. Seminar in Shakespeare.** Prerequisite: A college course devoted entirely to an aspect of Shakespeare's work, or consent of instructor. 1 unit. May be repeated as topic varies.
- 420. Seminar in Sixteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 424. Seminar in Seventeenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 427. Seminar in Restoration and Eighteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of eighteenth-century studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 433. Seminar in Romantic Literature.** Same as Comparative Literature 452. Prerequisite:

A college course devoted entirely to an aspect of Romantic studies, or consent of instructor. 1 unit. May be repeated as topic varies.

- 437. **Seminar in Victorian Literature.** Prerequisite: A college course devoted entirely to an aspect of Victorian studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 443. **Seminar in Modern British Literature.** Prerequisite: One college course devoted entirely to an aspect of modern British studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 447. **Seminar in Earlier American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 453. **Seminar in Later American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
- 463. **Seminar in Literary Themes and Movements.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 464. **Seminar in Literary Modes and Genres.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 469. **Seminar in the Stage History of Classic English Plays.** Same as Speech Communication 469 and Theatre 405. Analysis and reconstruction of past productions of classic plays, with special reference to Shakespeare. Prerequisite: One year of work in dramatic literature or theatre history, or consent of instructor. 1 unit.
- 478. **Seminar in the Relation of Other Disciplines to the Study of Literature.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 481. **Seminar in Literary Theory and Criticism.** Prerequisite: A college course devoted entirely to criticism, or consent of instructor. 1 unit. May be repeated as topic varies.
- 491. **Research in Special Topics.** Independent study under the guidance of a member of the graduate faculty. 1 unit. May be repeated to a maximum of 2 units.
- 492. **Master's Comprehensive Examination Tutorial.** Reading for the Master's Comprehensive Examination under the guidance of the candidate's graduate adviser. 6 or 12 hours. May be taken once for 12 hours or twice for 6 hours each. No graduate credit.
- 493. **Professional Seminar in the Teaching of College English.** Prerequisite: Graduate standing in the Department of English or consent of instructor. 0 or 1 unit. May be repeated by Ph.D. candidates as the topic varies but without credit after two units have been earned in this course. Students needing the proseminar for their programs will be given priority enrollment.
- 499. **Thesis Research.** Guidance in writing theses for doctoral degrees. Prerequisite: Doctoral candidate standing. 0 to 4 units.

Rhetoric and Composition

- 102. **Introduction to Composition.** Instruction in basic formats of expository writing; provides preparatory semester of composition for students with special needs; to be taken prior to Special Options Rhetoric 105. Does not fulfill campus rhetoric requirement. Prerequisite: Concurrent registration in Rhetoric 103; placement by the English Department based on ACT-English scores, reading test when pertinent, and writing samples. 3 hours.
- 103. **Writing Laboratory.** Intensive tutoring in basic writing skills to be scheduled at the Writing Laboratory. Open only to students in the EOP Rhetoric Program or to those in the special option sections. Prerequisite: Concurrent registration in Rhetoric 102, 104 or 105; or written consent from the EOP Rhetoric Program Office. 1 hour. May be repeated to a total of 2 hours.
- 104. **EOP Rhetoric.** An introductory writing course designed for EOP students. Concen-

- trates on exposition and must be taken concurrently with Rhetoric 103, a 1-hour course offered at the Writing Laboratory. To be taken prior to EOP Rhetoric 105. Does not fulfill campus rhetoric requirement. 3 hours.
- 105. Principles of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. This course fulfills the campus rhetoric requirement. 4 hours.
- 108. Forms of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. Students are admitted on the basis of ACT verbal scores or equivalent. Students will type and revise their work at the computer. This course fulfills the campus rhetoric requirement. 4 hours.
- 133. Principles of Composition.** Practice in exposition, with emphasis on organization, paragraphing, and sentence structure. For the student whose career will require competence in writing clear, precise prose as an adjunct to another professional activity. Credit is not given for Rhetoric 133 and Rhetoric 143. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
- 143. Intermediate Expository Writing.** Practice in expository types, with emphasis on style and critical analysis. Recommended for rhetoric majors. Credit is not given for Rhetoric 143 and Rhetoric 133. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
- 144. Introductory Narrative Writing.** Practice in the writing of narrative prose, with primary emphasis on short fiction. Prerequisite: Fulfillment of campus rhetoric requirement. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 146 or 306. 3 hours.
- 146. Introductory Poetry Writing.** Practice in the writing of poetry; experimentation with a number of fixed forms and free verse, but emphasis mainly on the student's freedom to develop a personal style. Prerequisite: Fulfillment of campus rhetoric requirement. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 144, 204, or 304. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Communications Workshop.** Independent writing projects and examination of literature as the cultural basis of the student's specialized fields. 3 hours.
- 204. Intermediate Narrative Writing.** Practice in the writing of fiction, with emphasis on the short story. Prerequisite: Rhetoric 144 or equivalent. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 306 or 146. 3 hours.
- 227. Advanced Expository Writing.** Types of nonfiction prose, including the essay, criticism, biography, and historical writing. Prerequisite: Rhetoric 133 or 143, or equivalent, or consent of instructor. 3 hours.
- 302. Advanced Writing Topics.** Practice in various literary genres and in their combinations for mature students who have some writing experience and a background of data and impressions which they wish to develop in writing of near-professional quality. Individual conferences at hours to be arranged. Prerequisite: Rhetoric 133 or 143, or equivalent; or consent of instructor. 3 hours or 1 unit.
- 304. Advanced Narrative Writing.** Continued practice in the writing of fiction, with emphasis on the longer story. Prerequisite: Rhetoric 204 or equivalent. Student must petition Director of Creative Writing to take this course concurrently with Rhetoric 306 or 146. 3 hours or 1 unit.
- 306. Advanced Poetry Writing.** Practice of the writing of poetry aided by intensive study of examples. Prerequisite: Rhetoric 146 or equivalent. Student must petition Director of Creative Writing to take this course concurrently with Rhetoric 304. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 355. Creative Writing Tutorial.** Personal direction in a writing project: fiction (novel or short stories), poetry, criticism, narrative, etc. Frequency of conference to be determined by the type of project. Prerequisite: Rhetoric 227, 304, or 306 and consent of the Director of Creative Writing. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units. Undergraduate Rhetoric majors with a 4.25 average who are working towards the degree with Distinction or High Distinction in Rhetoric may, with the consent of

the Director of Creative Writing and the English honors advisor, take this course for honors credit.

ENGLISH AS A SECOND LANGUAGE

Director of Division of English as an International Language: B. B. Kachru

Division Office: 3070 Foreign Languages Building, 707 South Mathews, Urbana

- 109. English as a Second Language.** Intensive course in basic English structure for international students who are inadequately prepared for either English as a Second Language 111 or 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois English as a Second Language Placement Test. 0 hours.
- 110. English as a Second Language.** Study of the sounds and intonation patterns of American English and the relation of sound to spelling; designed to improve the international student's ability to speak and understand English at normal conversational speed. May also be taken with English as a Second Language 111 and 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois English as a Second Language Placement Test. 0 hours.
- 111. English as a Second Language.** Continuation of English as a Second Language 109. Rapid and intensive review of basic English structure and a study of more complicated sentence patterns with practice in simple oral and written composition. Designed for international students inadequately prepared for English as a Second Language 114. Prerequisite: English as a Second Language 111, recommendation from Illinois English as a Second Language Placement Test. 0 hours.
- 113. English Structure and Paragraph Development.** Examines basic English structure and paragraph development for undergraduate international students. Recommendation from Illinois English as a Second Language Placement Test determines placement in course and in section for specified credit. Prerequisite: Recommendation from Illinois English as a Second Language Placement Test. 3 or 6 hours. Students should consult their college concerning use of credit from this course toward graduation.
- 114. English as a Second Language.** Composition for undergraduate international students. Prerequisite: English as a Second Language 113 or recommendation from Illinois English as a Second Language Placement Test. 3 hours.
- 115. Research Paper Writing Skills for ESL Students.** Composition for undergraduate international students. Prerequisite: English as a Second Language 114 or equivalent, recommendation from Illinois English as a Second Language Placement Test. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 301. Topics in Applied TESL/TEFL Theory.** Implications of TESL/TEFL theory and research for classroom practice: preparation of teaching and testing materials; evaluation of materials on the basis of ESL/EFL teaching experiences; adaptation to needs of different learner ages, language, and achievement backgrounds; and new teaching formats. Prerequisite: Consent of instructor. 2 to 4 hours, or $1\frac{1}{2}$ to 1 unit. May be repeated as topic varies to a maximum of 8 hours or 2 units.
- 302. Descriptive English Grammar for ESL Teachers.** Adapts modern English grammar to the needs of the ESL teacher, emphasizing the development of analytical skills that can be applied to syntactic and lexical analysis. 3 hours or $\frac{3}{4}$ unit.
- 305. Introduction to Applied Linguistics.** Same as Linguistics 305. See Linguistics 305.
- 335. Neurolinguistics and Second Language Learning.** Same as Linguistics 335. Introduces theoretical, methodological and applied research on the relationship between neurolinguistics and second language acquisition with special emphasis on the "bilingual brain." Prerequisite: Linguistics 200, 225, 300, or 400; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 350. Introduction to Sociolinguistics.** Same as Linguistics 350. See Linguistics 350.

- 356. Impact of Cultural Differences in TESL.** Examines people as cultural beings; studies the effect of cultural differences on communication, both in the ESL classroom and in the community; and presents various methods of incorporating relevant elements of American culture into the ESL classroom. 3 hours or $\frac{3}{4}$ unit.
- 360. Principles of Language Testing.** Same as French, German, and Spanish 360. Studies theoretical and practical aspects of language testing; examines purposes and types of language tests in relation to theories of language use and language teaching goals; discusses testing practices and procedures related to language teaching and language research; and includes the planning, writing, and administration of tests, basic descriptive statistics, and test analysis. A project is required. Prerequisite: English as a Second Language 389. 3 hours or $\frac{3}{4}$ unit.
- 371. Teaching Composition in the ESL Classroom.** Applies select principles of linguistics, rhetoric, crosscultural communication, and second language acquisition to developmental instruction in ESI writing; required projects: article reviews, instructional materials analysis and preparation, and ESL class observation. Prerequisite: English as a Second Language 301. 3 hours or $\frac{3}{4}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, French, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 386. Reading in a Second Language.** Same as Linguistics 385. Treats current research and reading theory with a view toward developing maximally efficient materials designed to teach reading in a second language; analyzes and evaluates teaching practices, however, places primary emphasis on materials development. Project is required. Prerequisite: English as a Second Language 302 and an introductory course in linguistics. 3 hours or $\frac{3}{4}$ unit.
- 388. English Phonology and Morphology for ESL Teachers.** Same as Linguistics 388. Application of linguistics to language learning with special emphasis on learning the sound system of English. Prerequisite: Two years of a foreign language or equivalent; consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 389. Theoretical Foundations of TESL Methodology.** Same as Linguistics 389. Applied linguistics in teaching and learning English as a second language with special emphasis on the applications of some principles of psycholinguistics, sociolinguistics, and ethnolinguistics along with the related disciplines of education, psychology, and anthropology to structured teaching and learning situations. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 400. Verbal Communication in English as a Second Language for Graduate Foreign Students, I.** Language laboratory course concentrating on the typical writing problems that an international graduate or research student encounters in an American university. Prerequisite: Graduate standing and English as a Second Language 111, or consent of instructor. 0 to 4 hours. No graduate credit.
- 401. Verbal Communication in English as a Second Language for Graduate Foreign Students, II.** Language laboratory course dealing with individual, immediate, and specialized speaking and writing problems, with particular attention to orienting international graduate or research students to the techniques of the American university in thesis and other specialized writing, and in the oral presentation of such material. Prerequisite: Graduate standing and English as a Second Language 400, or consent of instructor. 0 to 4 hours. No graduate credit.
- 402. Introduction to General Linguistics.** Same as Anthropology and Linguistics 400. See Linguistics 400.
- 406. Oral Communication for International Teaching Assistants.** Focuses on use of English at the discourse level, with videotaping and critique of student presentation and development of teaching strategies related to university classroom and laboratory contexts. Prerequisite: Consent of instructor. 0 units.
- 410. Generative Phonology in English Teaching.** Generative phonological analyses of English and the teaching of English pronunciation; reevaluation of teaching goals, content, presentation, and methodology; required projects involve research into English

phonology leading to the development and evaluation of lesson materials for ESL classes. Prerequisite: English as a Second Language 301 and English as a Second Language 388. 1 unit.

- 412. Pedagogical Grammar.** Same as Linguistics 413. Surveys English grammar and texts for teaching grammar in ESL, with special emphasis on the development of skills in explanation of grammatical phenomena in ESL classes. Prerequisite: English as a Second Language 302 or equivalent. $\frac{3}{4}$ unit.
- 419. Contrastive Linguistics.** Same as Linguistics 419. See Linguistics 419.
- 460. Research Methods in Language Learning.** Seminar focusing on the formulation of language learning and teaching issues as research questions. Specific topics include: types of research problems; research designs, methods, and strategies; and the analysis, interpretation, and reporting of research findings. Discusses illustrative research and evaluation studies. Students participate in seminar presentations and develop a research proposal. Prerequisite: English as a Second Language 360 or consent of instructor, and English as a Second Language 389. $\frac{3}{4}$ unit.
- 463. College Teaching of Foreign Languages.** Same as French, Russian, German, and Spanish 463. See French 463.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, German, Russian, and Spanish 481. See French 481.
- 487. Seminar in the Teaching of English as a Second Language.** Discussion of and research into various topics of current interest to persons involved in teaching English as a second language; emphasis on new approaches to problems facing the field and the development of understanding methods; study of materials leading to possible solutions. Prerequisite: English as a Second Language 388 or 302, or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated as the topic varies.
- 491. Research in Special Topics.** Independent study under guidance of a member of the graduate faculty. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. Prerequisite: Consent of thesis supervisor. 0 to 2 units. May be repeated to a maximum of 2 units.

ENTOMOLOGY

Head of Department: S. Friedman

Department Office: 320 Morrill Hall, 505 South Goodwin, Urbana

- 118. Insects, Man, and Environment.** Nontechnical course which considers basic aspects of entomology and ecology, especially as they relate to problems in the use of pesticides and environmental pollution. 3 hours.
- 120. Introduction to Applied Entomology.** Same as Forestry 120. Lectures, laboratory, and field practice in the recognition and management of important insect pests of agricultural, forest, and urban ecosystems: classification, structure, and physiology; life histories and behavior involved with injury; methods of control. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Special Problems.** For students ready to undertake a special investigation to be completed as an undergraduate study or as the beginning of a thesis problem for an advanced degree. It also may be used to prepare a thesis for scholastic honors. Prerequisite: Consent of instructor. 2 to 5 hours.
- 301. Introduction to Entomology.** Integrated studies of the principal morphological, physiological, and ecological relationships among insects. Tutorials, field experience, and/or insect collections will be required for 4 or 5 hours, or 1 unit credit. Prerequisite: Biology 111 and Chemistry 131. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.
- 302. Classification and Evolutionary History of Insects.** Analytical survey of the classification and evolution of the orders and principal families of insects, with practical

- experience in the identification of insects at these taxonomic levels; field trips required. Prerequisite: Entomology 301 or consent of instructor. 4 hours or 1 unit.
- 304. Genomic Analysis of Insects.** A comprehensive and integrated presentation of insect genomic analysis from the molecular level to that of the population; concepts are applied to certain aspects of insect population regulation. Prerequisite: Biology 210 and 371 and Biochemistry 350, or equivalents; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 310. Insect Physiology.** Study of the principal physiological and biochemical functions of insects. Prerequisite: Entomology 301 or equivalent, organic chemistry, and consent of instructor. 4 hours or 1 unit.
- 315. Insect Ecology.** Discussion of the practical and theoretical aspects of ecology in relation to insects as individuals, populations, and communities; emphasis on the role of insects in the environment. Prerequisite: Ecology, Ethology, and Evolution 212 or consent of instructor. 3 or 5 hours, or $\frac{3}{4}$ or 1 unit. (Lecture only, 3 hours or $\frac{3}{4}$ unit; with laboratory, 5 hours or 1 unit.)
- 319. Fundamentals of Insect (Pest) Management.** Study of the principles underlying the control of important insect pests of agriculture and of human and animal health; emphasis on integrated pest management involving a systems approach which combines biological, cultural, and chemical suppressive factors into ecologically sound and socially and economically acceptable technology. Prerequisite: Entomology 120, or 301 and 302, or consent of department. 4 hours or 1 unit.
- 320. Insect Pathology.** Examines the general principles of pathology as they apply to insects; includes non-infectious and infectious diseases caused by viruses, bacteria, fungi, protozoa, and nematodes. Studies the epizootiology of naturally occurring insect disease and the use of insect pathogens as microbial control agents. Lecture and laboratory. Prerequisite: Entomology 319 and Microbiology 200 or equivalent. 4 hours or 1 unit.
- 321. Biological Control of Insect Pests.** Same as Agronomy 321. Examines uses of biological methods for the control of insect pests; emphasizes the use of natural enemies in control programs; and discusses life history characteristics of parasitoids and predators, ecological principles of population regulation, and techniques and protocols in implementation of control programs and related topics. Prerequisite: Entomology 315 or 319, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 323. Chemistry and Toxicology of Insecticides.** Comprehensive study of the relation of chemical structure to toxic action of insecticides, their physiological and biochemical modes of action, and their fate and degradation in the total environment; overall emphasis on the environmental toxicology of insecticides. Prerequisite: One year of biology or equivalent in animal science; organic chemistry; or consent of instructor. 4 hours or 1 unit.
- 413. Medical and Veterinary Entomology.** Training in recognition, classification, methods of injury, habits, and control or destruction of insects, mites, and ticks which are predators, parasites, or disseminators of disease among humans and domestic animals. Prerequisite: Entomology 302, or Ecology, Ethology, and Evolution 320; consent of instructor. 1 unit.
- 426. Seminar in Entomology.** Discussions, reviews, and appraisals of special topics in the field of entomology. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 490. Individual Topics.** Individual topics in research and/or reading conducted under the supervision of faculty members in the Department of Entomology; particularly designed for students enrolled in the entomology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their advanced degrees. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units. May be repeated.
- 499. Thesis Research.** Work may be taken in the following subjects: morphology and embryology of insects; applied entomology; systematic entomology; biology and ecology of insects; insect toxicology; and insect physiology. 0 to 4 units.

ENVIRONMENTAL STUDIES

Director of Institute: R. A. Minear

Institute Office: 408 South Goodwin, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 236. Tomorrow's Environment.** Same as Health and Safety Studies 266. Introduction to interdisciplinary methods of analysis of environmental problems in a finite world; examination of the concepts of the limits to growth; development of a working understanding of natural systems and environmental economics; and examination of various management strategies (technical, economic, and social) that can be used to improve environmental quality. Prerequisite: One course in the life sciences and one course in the social sciences, or consent of instructor. 3 hours.
- 241. Introduction to Radiation Protection.** Same as Nuclear Engineering 241. See Nuclear Engineering 241.
- 283. Introductory Ecology for Educators.** Same as Forestry 283. See Forestry 283.
- 299. Individual Studies of Environmental Topics.** Individual studies of environmental problems and their solutions. Studies are accomplished under the immediate supervision of faculty of the Institute for Environmental Studies. Prerequisite: Consent of instructor. 0 to 4 hours.
- 317. Introduction to Natural Resources Economics.** Same as Agricultural Economics and Forestry 317. See Agricultural Economics 317.
- 319. Environment and Plant Ecosystems.** Same as Agronomy and Forestry 319. See Agronomy 319.
- 331. Toxic Substances in the Environment.** Explores toxicological, public health, environmental, industrial, economic, and legal aspects of the use and release of toxic substances in the environment; emphasizes biochemical toxicology and epidemiological aspects of environmental pollution; and features case histories of environmental toxicants. Prerequisite: One year of college chemistry or consent of instructor. 2 hours or $1\frac{1}{2}$ unit.
- 332. Genetic Toxicology.** Same as Agronomy 332 and Biology 332. Introduces the field of genetic toxicology; includes the study of physical and chemical induced mutagenesis, survey of genetic indicator organisms and genetic assays, distribution of environmental mutagens and their biochemistry, analysis of case histories of environmental mutagens and risk assessment. Prerequisite: Biology 210 or Agronomy 110; Chemistry 102; Biochemistry 350, or 352 and 353, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 341. Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Geography 341, and Urban and Regional Planning 375. See Civil Engineering 341.
- 344. Social Impact Assessment.** Same as Leisure Studies 344 and Rural Sociology 344. Social Impact Assessment and Social Soundness Analysis are methodologies that identify the human and social consequences of man-made alterations in the natural and physical environment; teaches the SIA and SSA methods within the context of planned change based on environmental and technological assessment of project development in both first and third world countries. Prerequisite: Rural Sociology 100 or Sociology 101; Rural Sociology 277 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 346. Energy, Environment, and Society.** Same as Rural Sociology 346. Examines historical and modern impacts of environmental alteration and pollution and resource limitations on human populations in the context of various social change theories; explores the environmental movement, population explosion, the "limits to growth" debate, and the impacts of environmental change on food production, land, and water. Prerequisite: Rural Sociology 100 or Sociology 100; Rural Sociology 277 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 348. Atmospheric Chemistry.** Same as Civil Engineering 348. See Civil Engineering 348.
- 349. Basic Toxicology.** Same as Veterinary Biosciences 349. Emphasizes the physiology and biochemistry of intoxication; discusses the types of cellular response to toxic com-

pounds and the role of species variation in the economic use of toxins as pesticides and therapeutic agents. Prerequisite: Biochemistry 350 or 352, or consent of instructor. 3 hours or $3/4$ unit.

- 351. Organic Compounds in the Aquatic Environment.** Surveys the natural and anthropogenic constituents of water and their physical, chemical, and biological transformations; emphasizes adsorption, evaporation, photochemical reactions, hydrolysis, and microbial metabolism; discusses oxidative processes in detail. Prerequisite: Chemistry 131 or 136, or consent of instructor. 2 hours or $1/2$ unit.
- 372. Environmental Psychology.** Same as Psychology 372. Survey of theory and research in environmental psychology; topics include environmental perception and cognition, environmental stress, environmental quality assessment, ecological psychology, and historical and theoretical perspectives on the interaction between people and their environments. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours, or $3/4$ to 1 unit.
- 374. General Epidemiology.** Same as Health and Safety Studies, Medical Sciences, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
- 397. Selected Environmental Problems.** Advanced study of problems related to the environment. Each unit of instruction focuses on a coherent problem area centered primarily within the subject matter of one or more interrelated disciplines comprising the Institute and taught by one or more faculty members from these disciplines. Prerequisite: Senior or graduate standing and consent of instructor. 1 to 4 hours, or $1/4$ to 1 unit.
- 414. Neurotoxicology.** Same as Psychology 414 and Veterinary Biosciences 414. See Veterinary Biosciences 414.
- 427. Statistical Techniques in Epidemiological Research.** Same as Health and Safety Studies 427 and Medical Sciences 463. See Health and Safety Studies 427.
- 449. Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Mechanical Engineering 412. See Civil Engineering 449.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Economics, and Forestry 463. See Agricultural Economics 463.
- 464. Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Economics 464. See Economics 464.
- 468. Molecular Toxicology.** Examines the biochemical processes involved in the interaction of toxic compounds and their metabolites with the body; enzyme alteration, membrane integrity, receptor interaction, and the biochemical basis for the primary site of toxicity. Prerequisite: Environmental Studies 349 or consent of instructor. $1/4$ unit.
- 495. Environmental Studies Seminar.** Interdisciplinary seminar on topics of current interest. Students, faculty, and visiting lecturers present seminars based upon their study, research, and/or professional activities in the selected environmental topic area. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated as topic varies.
- 496. Interdisciplinary Toxicology Seminar.** Same as Veterinary Biosciences 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
- 497. Studies of Environmental Topics.** Individual or group research and study of environmental topics. Subjects for individual study, selected by the student, must be approved by the student's adviser and by the Director of the Institute. (Note: This is not a thesis research course.) Group study focuses on environmental problems and their solutions. Prerequisite: Consent of instructor. 0 to 4 units. May be repeated.

- 254. Introduction to Business Financial Management.** Development and study of a decision framework for financial management; an introduction to the analysis of past and future needs; an analysis of the management of short-term assets; an introduction to a decision framework for capital investment management with an analysis of the cost and sources of long-term capital; and integration of the concepts of financial management into a total systems approach to business decision making. Prerequisite: Accountancy 200 or 202; credit or concurrent registration in Economics 172. 3 hours. Credit is not given for both Finance 254 and 257.
- 258. Money, Credit, and Financial Markets.** Surveys the structure and activity of the financial sector of the economy; impact of money on output, employment, and prices; financial asset types and their uses; interest rates; roles played by financial intermediaries; influence of macroeconomic policies on the financial sector. Prerequisite: Economics 301. 3 hours. (Counts for advanced hours in LAS.)
- 260. Economics of Insurance.** Survey course in insurance which serves as a common introductory course to the fire, marine, casualty, surety, and life branches of the insurance business. Prerequisite: Economics 101 or equivalent. 3 hours.
- 262. Life Insurance and Related Financial Services.** Introductory study of the life insurance industry and related financial services, including banks, investment companies, and government financial security programs, personal income, gift, and estate taxation, inflation, risk-adjusted returns, legal rights, and savings-investment alternatives; develops techniques for contingent present value calculations, life insurance cost comparisons, and personal financial analysis; uses computer systems, including PLATO, as tools for financial analysis. Prerequisite: Economics 101 or equivalent. 3 hours.
- 264. Fundamentals of Real Estate.** Surveys real estate finance, appraisal, investment brokerage, and management; gives special attention to the analysis of aggregate real estate and mortgage markets to the individual transactions of which the markets are composed and to the legal and institutional factors which have an impact on these markets. Prerequisite: Economics 101 or equivalent. 3 hours.
- 280. Advanced Financial Management.** Integration of the capital investment, long-run financing working-capital decision processes; use of simulation, cases, and other techniques to study each decision process. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 281. Short-Run Financial Management.** Introduces short-run financial planning and integrates it into the capital investment model; uses cases and simulation to study fund-flow analysis and the management of liquidity, receivables, inventory, payables, and operating leverage. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 294. Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 295. Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 354. Multinational Business Finance.** Development and study of a framework for the financial decisions of multinational business; includes the management of working capital, investment and financing decisions of the firm in an international environment, foreign exchange markets, exchange risk, and international diversification. Prerequisite: Finance 254. 3 hours, or 1/2 to 1 unit.

- 357. Financing Small Business.** Size and nature of small business; significance and limitations of small business; financial structure and problems; financial assistance to small business; and future prospects of small business. Prerequisite: Finance 254 or 257. 3 hours, or $1/2$ or 1 unit.
- 360. Employee Benefit Plans.** Same as Labor and Industrial Relations 360. Analysis of the economic and financial issues involved in designing and administering employee benefit plans; major emphasis on group life, disability income, and medical care plans, and on qualified pensions and profit-sharing plans for regular employees; and some attention to special supplementary plans for the executive employees. Prerequisite: Finance 260, Economics 240, or Business Administration 351, or consent of instructor. 3 hours, or $1/2$ to 1 unit.
- 363. Life Insurance in Estate Planning.** Studies wealth accumulation, conservation, and liquidation; analyzes personal and business financial planning techniques, methods of developing and marketing financial products, and case studies of planning applications. Gives special emphasis to federal and state income, gift and estate taxes; concentrates on the role the life insurance industry plays in financial planning. Prerequisite: Credit or concurrent registration in Finance 262, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 365. Urban Real Estate Valuation.** Examines the terminology, theory, and techniques of real estate appraisal; a modern view of the three approaches to value: market comparison, income, and cost. The first half of the course emphasizes residential property, while the second half emphasizes income property. Prerequisite: Finance 264 or 464, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 366. Real Estate Investment.** An approach to the evaluation of real estate investment opportunities: begins with the identification of the investor's goals and ends with an investment decision; also considers legal, physical, locational, and financial constraints, aggregate real estate and financial markets, tax considerations, and investment criteria. Prerequisite: Finance 264 or 464, and Finance 254; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 367. Urban Economics.** Same as Economics 361. See Economics 361.
- 368. Real Estate Financial Markets.** Discusses theory and institutions of the real estate credit market and the impact of the credit market on the real estate markets; emphasizes creative financing techniques. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 369. Legal Environment of Real Estate.** Overviews the legal environment in which the real estate business functions; stresses terminology, sources, principles, and issues of real estate law. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 370. Risks and Risk Management.** Analysis of the financial problems in the risks of property damage or bodily injury (in business situations), and evaluation of the alternative methods for dealing with such problems. Prerequisite: One of the following: Accountancy 200 or 202, or Finance 254 or 257; Economics 101 or equivalent. 3 hours, or $1/2$ to 1 unit.
- 371. Seminar in Property and Liability Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving property-liability insurance; analysis of legal problems involving insurance coverages, financial aspects, and governmental regulation of the property-liability insurance enterprise, and economic aspects of the insurance industry. 3 hours, or $1/2$ to 1 unit.
- 400. Theory of Financial Decision Making.** Examines theoretical frameworks for financial decision making under certainty and uncertainty, as well as perfect and imperfect capital markets; discusses state preference, mean-variance, and continuous time models; emphasizes the structure of individual utility functions. Prerequisite: Economics 402; Statistics 310; and admission to doctoral program or consent of instructor. 1 unit.
- 420. Macrofinance: Policies, Institutions, and Markets.** Overview of the workings of the financial sector of the macro economy; includes the roles of financial institutions, financial markets, macroeconomic policies, interest rates, and the flows of funds. Prerequisite: Economics 301 or 401, or Business Administration 401. 1 unit.

- 254. Introduction to Business Financial Management.** Development and study of a decision framework for financial management; an introduction to the analysis of past and future needs; an analysis of the management of short-term assets; an introduction to a decision framework for capital investment management with an analysis of the cost and sources of long-term capital; and integration of the concepts of financial management into a total systems approach to business decision making. Prerequisite: Accountancy 200 or 202; credit or concurrent registration in Economics 172. 3 hours. Credit is not given for both Finance 254 and 257.
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- 354. Multinational Business Finance.** Development and study of a framework for the financial decisions of multinational business; includes the management of working capital, investment and financing decisions of the firm in an international environment, foreign exchange markets, exchange risk, and international diversification. Prerequisite: Finance 254. 3 hours, or $1\frac{1}{2}$ to 1 unit.

- 357. Financing Small Business.** Size and nature of small business; significance and limitations of small business; financial structure and problems; financial assistance to small business; and future prospects of small business. Prerequisite: Finance 254 or 257. 3 hours, or $1/2$ or 1 unit.
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- 400. Theory of Financial Decision Making.** Examines theoretical frameworks for financial decision making under certainty and uncertainty, as well as perfect and imperfect capital markets; discusses state preference, mean-variance, and continuous time models; emphasizes the structure of individual utility functions. Prerequisite: Economics 402; Statistics 310; and admission to doctoral program or consent of instructor. 1 unit.
- 420. Macrofinance: Policies, Institutions, and Markets.** Overview of the workings of the financial sector of the macro economy; includes the roles of financial institutions, financial markets, macroeconomic policies, interest rates, and the flows of funds. Prerequisite: Economics 301 or 401, or Business Administration 401. 1 unit.

- 425. Management of Financial Institutions.** Studies the portfolio behavior, policies, risks, and management of a variety of financial institutions including commercial banks, savings institutions, mutual funds, pension funds, and insurance companies; includes flow of funds, regulation, and industry structure. Prerequisite: Finance 254 or Business Administration 451, or equivalent. 1 unit.
- 427. Seminar in Macrofinance and Financial Institutions.** Reports and explores research in areas of commercial bank models and behavior, bank structure and regulation, interest rate theories, financial markets, and the impact of macroeconomic policies and procedures on financial markets and institutions; discusses current research and research procedures. Prerequisite: Finance 400 and Economics 403. 1 unit.
- 444. International Financial Management.** Studies international financial markets to include Euromarkets and foreign exchange markets; studies the financing and investment decisions of multinational organizations to include working capital, capital budgeting cost of capital, and capital structure decisions in an international environment. Prerequisite: Finance 254 or Business Administration 451; or equivalent. 1 unit.
- 452. Long-Term Financial Decision Making.** Same as Business Administration 452. An analytical approach to the theoretical and applied aspects of decision making in business finance; assumes a long-term planning horizon; and emphasizes valuation and cost of capital theories, capital investment decisions, risk analysis, and capital structure and dividend policies. Prerequisite: Finance 254 or Business Administration 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
- 453. Working Capital Management.** Same as Business Administration 453. A study of working capital management processes and of theoretical linkages between working capital and long-run financial management; uses a variety of models to study the theory of working capital management and to analyze relationships among variables in the short-run financial decision-making process; and combines theory and applications to provide insight into the total financial decision-making process. Prerequisite: Finance 254 or Business Administration 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
- 454. Seminar in Corporate Financial Theory.** Theories, paradigms, and models of non-financial corporations; investigates the theoretical foundations and empirical evidence regarding corporate resource allocation, capital structure decisions, and dividend policies; covers in detail contingent claim analysis, signaling theory, and agency theory. Prerequisite: Finance 400 and Economics 471. 1 unit.
- 455. Seminar in Investments.** Investigates portfolio theory, CAPM, OPM, and arbitrage pricing theory theoretically and empirically; uses both mathematical statistics and modern econometric models to empirically analyze investment decisions and portfolio management. Prerequisite: Finance 400 and Economics 471. 1 unit.
- 456. Investment.** Same as Business Administration 456. Introduction to investment analysis, including the functioning of capital markets, changes in markets, and analysis and tests of the efficient markets hypothesis; introduction to portfolio theory; and consideration of valuation theory applied to the aggregate market, alternative industries, and individual firms. Prerequisite: Business Administration 451 or equivalent. 1 unit.
- 457. Security Analysis.** Same as Business Administration 457. A theoretical and empirical analysis of selected financial markets; considers markets for stock options, bonds, warrants, and convertibles, as well as foreign exchange and financial futures; covers the mechanics of participation in these markets in addition to the analytical material. Prerequisite: Finance 456. 1 unit.
- 458. Portfolio Management.** Same as Business Administration 458. Conceptual foundations and implementation of strategies for the selection, evaluation, and revision of portfolios of financial assets; examination of research related to portfolio and capital market theory. Prerequisite: Finance 456. 1 unit.
- 460. Theory of Insurance.** Study of the nature and cost of risk in our economic society, and of the methods of handling it. 1 unit.

- 464. Real Estate and Urban Land Economics.** Discusses the theory and practice of real estate and urban land economics; emphasizes real estate market analysis, finance, appraisal, and investment. Prerequisite: Economics 300, or consent of instructor. 1 unit.
- 469. Problems in Urban Land Economics.** Examines theoretical and and empirical research into selected problems in urban land economics. Prerequisite: Finance 264 and Economics 300; or Finance 464; or consent of instructor. 1 unit.
- 470. Risk Management and Control.** Same as Business Administration 455. Analysis of the risk management problem in the business enterprise with emphasis on methodology for risk analyses; techniques for risk and loss control; models for risk management decision making; and procedures for administering risk management policy relating to nonspeculative (insurable) risk. Prerequisite: Finance 452 and Business Administration 460, or equivalent, or consent of instructor. 1 unit.
- 471. Seminar in Insurance.** Reviews recent contributions to the insurance literature concentrating upon current issues and research methodology; requires students to review selected recent articles on a variety of topics; gives attention to application of finance and economic theory to insurance issues and to empirical techniques for testing hypotheses. Examples of issues include the application of asset pricing models to insurance pricing, portfolio optimization for insurance companies, capital markets and insurance cycles, moral hazard and adverse selection. Prerequisite: Finance 400. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. $\frac{1}{2}$ to 1 unit.
- 499. Thesis Research.** Required for those writing master's and doctoral theses in finance. 0 to 4 units.

FINE AND APPLIED ARTS

Program Administrator: J. H. McKenzie

Program Office: 110 Architecture Building, 608 East Lorado Taft, Urbana

- 185. Kabuki.** Same as Asian Studies 185. Combines academic studies in the Japanese and Asian theatre arts and the actual production of a Japanese classic kabuki play or some other Asian theatre art form; includes all the essential elements of the theatrical arts. 2 hours. May be repeated once with consent of instructor.
- 190. Exploring the Arts.** An introduction to the fine arts through lecture-discussions with a teacher-practitioner in each of the arts and through written critiques of exhibits, concerts, and plays; provides creative experiences by a final individual or small group project. 2 or 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 299. FAA Study Abroad.** Provides campus credit for foreign study and/or travel. A detailed proposal for study abroad must be submitted for approval by the appropriate committee of the department in which the student is studying and the college dean's office prior to such study abroad. Final determination of credit and its application toward the degree is made after a review of the student's work abroad by the above committee and college office. Prerequisite: Junior standing in the department; approval of the student's proposal by the departmental committee and the college office. 0 to 12 hours (summer session, 0 to 6 hours).

FOOD SCIENCE

Head of Department: A. J. Siedler

Department Office: 567 Bevier Hall, 905 South Goodwin, Urbana

- 101. Food in Modern Society.** Emphasizes the importance of food in providing adequate nutrients for modern society; introduction to processing and preservation of foods as well as the historical, geographical, chemical, and microbiological ramifications which exist in the food industry. 3 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students; credit may be given to juniors and seniors with consent of instructor.
- 202. Sensory Evaluation of Foods.** Same as Foods and Nutrition 202. See Foods and Nutrition 202.
- 206. Field Trip.** Inspection of typical food preservation and manufacturing plants. Four-day trip required of all seniors in food science and food industry; see Timetable for current fees. Prerequisite: Junior or senior standing in food science or consent of instructor. 1 hour.
- 213. Food Analysis, I.** Principles and application of the chemical, physical, and instrumental methods used to determine the constituents of foods; special considerations applicable to the analysis of certain foods. Lecture and lab. Prerequisite: Chemistry 131. 4 hours.
- 214. Survey of Food Chemistry.** Chemical composition of foods and the chemistry of the processing of meats, vegetables, fruits, milk, and cereals. Prerequisite: Chemistry 131. 3 hours. Credit is not given for both Food Science 214 and 314.
- 260. Raw Materials for Processing.** Problems involved with procurement, harvesting, handling, and storage of fruits, vegetables, cereal grains, dairy products, red meat, poultry, fish, and eggs for the food-processing industry. Field trips to specialized operations. Prerequisite: One course in biological science and Food Science 101. 4 hours.
- 298. Senior Seminar.** Discussion of specialized topics and literature relating to Food Science. Required of all seniors in the food science or food industry curricula. Prerequisite: Senior standing. 1 hour.
- 300. Special Problems.** Supervised research on special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. Not open to undergraduates who are on probation. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department with consent of the instructor. 1 to 5 hours, or $3/4$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 2 units.
- 301. Food Processing, I.** Principles and applications of food preservation and processing by heat, low temperatures, and mechanical operations; lecture, laboratory, and field trips. Prerequisite: Food Science 213, 260, and 363, or consent of instructor. 5 hours or $1\frac{1}{4}$ unit.
- 302. Food Processing, II.** Principles and applications of food preservation and processing by moisture removal, fermentation, and special operations; lecture, laboratory, and field trips. Prerequisite: Food Science 301 or consent of instructor. 5 hours or $1\frac{1}{4}$ units.
- 311. Food and Industrial Microbiology.** Same as Microbiology 311. See Microbiology 311.
- 314. Food Chemistry and Nutrition, I.** Examines the chemical aspects of major food components: water, carbohydrates, proteins, and lipids; properties of pigments, salts, and food dispersions. Prerequisite: Chemistry 131 and 134. 4 hours or 1 unit. Credit is not given for both Food Science 214 and 314.
- 315. Food Chemistry and Nutrition, II.** Examines metabolism and nutritional aspects of carbohydrates, proteins, lipids, vitamins, minerals, food additives, and toxicants of food; studies chemical changes that occur in these food components during processing and storage and their effects upon nutritional quality. Prerequisite: Food Science 214 or 314, and Chemistry 131 and 134; or equivalent. 4 hours or 1 unit.

- 316. Food Analysis, II.** Emphasizes the application of modern analytical techniques to food component analysis; consists of laboratory exercises, lectures/discussions, and assigned readings. Prerequisite: Chemistry 122 or equivalent; Food Science 314 and 315. 4 hours or 1 unit.
- 324. Biochemical Aspects of Human Nutrition.** Same as Foods and Nutrition 324 and Nutritional Sciences 324. Advanced treatment of human nutrition, with emphasis on the biochemical functions of nutrients essential for humans; integrates, throughout the course, the molecular mechanisms by which individual nutrients interact to allow for homeostasis or create imbalances. Prerequisite: Biochemistry 350 or both Biochemistry 352 and 353, and a course in nutrition. 3 hours or $\frac{3}{4}$ unit.
- 332. Sanitation in Food Processing.** Studies the principles of sanitation with emphasis on practical considerations as they apply to various food-processing industries; control of insects, rodents, and microorganisms; fundamentals of detergency; sanitation of water supplies; waste disposal methods; and government and public health regulations. Field trips to local food-processing plants. Prerequisite: Chemistry 102 and Microbiology 101. 2 hours or $\frac{1}{2}$ unit.
- 335. Food Marketing.** Same as Agricultural Economics 335. See Agricultural Economics 335.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Forestry and Horticulture 340. See Agronomy 340.
- 363. Engineering for Food Processing.** Fundamentals of material and energy balances, thermodynamics, fluid flow, heat transfer, psychrometry, refrigeration, and process control for the food process industry. Prerequisite: Introductory courses in physics and calculus, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 401. Physical Chemistry of Food Processes.** Studies physicochemical processes in foods during food processing; places special emphasis on methodological and experimental aspects of food processes, such as water activity, rheology of foods, food extrusion, protein hydration, gelation, aggregation, and food process analyses. Prerequisite: Food Science 314 or Biochemistry 350. 1 unit.
- 402. Advanced Topics in Food Processing.** Studies selected topics in food processing and engineering; includes extensive treatment of special processing techniques and elucidation of theory with laboratory exercises. Lecture and laboratory. Prerequisite: Food Science 302 or equivalent. $\frac{1}{4}$ to 1 unit. Students may register only once for a given topic.
- 406. State and Metabolism of Lipids.** Advanced study of the state of lipids in animal tissues and in biological fluids, and of the metabolism of lipids in relation to dietary fats and other food constituents. Prerequisite: Biochemistry 350 or consent of instructor. 1 unit.
- 410. Current Topics in Nutritional Research.** Same as Animal Sciences 410 and Nutritional Sciences 410. See Nutritional Sciences 410.
- 411. Chemistry of Nutritional Processes.** Same as Animal Sciences and Nutritional Sciences 411. See Nutritional Sciences 411.
- 421. Seminar.** Discussions on specialized topics and current literature relating to food technology. Required of all graduate students in food science. 0 or $\frac{1}{4}$ unit.
- 450. Membrane Separations Technology.** Examines theory and applications of synthetic semipermeable membranes in reverse osmosis, ultrafiltration, microfiltration, and electrodialysis processes; thermodynamics of bioseparations, membrane chemistry and properties, process engineering, equipment design, fouling of membranes, selected applications. Prerequisite: Food Science 363 or consent of instructor. $\frac{1}{2}$ or $\frac{3}{4}$ unit. (Lecture is $\frac{1}{2}$ unit and lab is $\frac{1}{4}$ unit.)
- 473. Advanced Food Microbiology.** Detailed examination of food and industrial processes dependent on fermentation and other microbial activities. Prerequisite: Organic chemistry, calculus, and Microbiology 311. $\frac{3}{4}$ unit. Offered in alternate years.
- 481. Advanced Special Problems in Food Science.** Supervised individual study on advanced special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. $\frac{1}{4}$ to 2 units (summer session: $\frac{1}{2}$ to 1 unit).

- 491. Chemistry of Lipids in Foods.** Detailed examination of the chemical and physical properties of lipids in foods. Offered in alternate years. Prerequisite: Food Science 314 or consent of instructor. $\frac{3}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

FOODS AND NUTRITION

Chair of Division: B. P. Klein

Division Office: 386 Bevier Hall, 905 South Goodwin, Urbana

- 120. Contemporary Nutrition.** Fundamental principles of human nutrition and their application to the selection of adequate diets; current topics of nutritional importance. 3 hours.
- 130. Food Selection and Preparation.** Elementary study of foods in relation to market selection, preparation methods, and standards; comparative costs and food values; and principles of meal planning. 3 hours.
- 131. Food Management.** Application of food preparation principles and techniques in the preparation of standard food products; principles of food management and their application in the planning and preparation of meals. A laboratory fee is assessed each student. Prerequisite: Foods and Nutrition 130. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Sensory Evaluation of Foods.** Same as Food Science 202. The physiology, psychology, and chemistry of flavor and flavor perception; tactual, visual, and auditory components affecting food acceptability; principles and application of preference and discrimination testing; and interpretation of panel evaluation data. 3 hours.
- 220. Principles of Nutrition.** Nutritive value of foods and metabolism of essential nutrients; application of principles of nutrition to the requirements of normal individuals throughout the life cycle. Prerequisite: Chemistry 102 or 103; Physiology 103. 3 hours.
- 231. Science of Foods.** Fundamental composition and behavior of foods; applies chemistry and other physical sciences to principles of food preparation and preservation. A laboratory fee is assessed. Prerequisite: Chemistry 102 or equivalent; Foods and Nutrition 131. 3 hours.
- 240. Quantity Food Production and Service.** Application of the principles of food preparation and service to institutional and commercial feeding. Prerequisite: Economics 101; Foods and Nutrition 231. 3 or 5 hours.
- 250. Foods and Nutrition Internship.** Supervised learning experience through a cooperative program with a foods and nutrition related agency, business, or industry. Prerequisite: Junior standing and consent of department head; not open to students on probation. 4 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 305. Pediatrics and Nutrition.** Same as Elementary and Early Childhood Education 305 and Human Development and Family Ecology 305. Basic principles of nutrition, health and disease relevant to infants and children in group settings. Presents bio-medical concepts necessary for an understanding of subject matter. Not recommended for students majoring in nutrition or related field of study. Prerequisite: 3 hours of social sciences and 6 hours of natural sciences courses. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Nutritional Aspects of Disease.** Same as Nutritional Sciences 320. Examines nutritional, biochemical, and physiological aspects of disease processes and studies the role of nutrition in prevention, management, and treatment of disease. Prerequisite: Foods and Nutrition 220 or comparable course with a physiology prerequisite; Biochemistry 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 322. Nutrition Through the Life Cycle.** Examines physiological changes that occur during gestation, postnatal growth, and aging and the influence of these changes on nutritional requirements. Prerequisite: Foods and Nutrition 220; senior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 323. Recent Advances in Foods and Nutrition.** New developments in foods and nutrition; readings, lectures, and discussions. Offered every other summer only. Prerequisite: Foods and Nutrition 220 and 231, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 324. Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Nutritional Sciences 324. See Food Science 324.
- 325. Problems in Nutrition Research.** Individualized instruction in experimental nutrition. Prerequisite: Biochemistry 350, Biochemistry 355, and credit or concurrent registration in Foods and Nutrition 324. 1 to 5 hours, or $\frac{1}{4}$ to $1\frac{1}{4}$ units.
- 326. Communications in Foods and Nutrition.** Selection of problems and organization of materials for demonstrations and other presentations in foods and nutrition subject matter. A laboratory fee is assessed. Field trip; see Timetable for approximate cost. Prerequisite: Foods and Nutrition 120 or 220 and 231, or equivalent; senior standing. 4 hours or 1 unit.
- 330. The Experimental Study of Foods.** Principles and techniques of foods research, including consideration of the effects of formula and preparation variations on chemical, physical, and sensory qualities of food. A laboratory fee is assessed. Prerequisite: Foods and Nutrition 231 or equivalent. 4 hours or 1 unit.
- 331. Problems in Foods.** Individual problems in food preparation and preservation. Prerequisite: Foods and Nutrition 330. 3 hours or $\frac{3}{4}$ unit.
- 345. Food Purchasing and Equipment Selection.** Purchasing food and selecting equipment for quantity food service; factors affecting the purchase of food; and the relationship of floor plans and equipment to service. Field trip; see Timetable for approximate cost. Prerequisite: Credit or concurrent registration in Foods and Nutrition 240; Economics 101. 3 hours or $\frac{3}{4}$ unit.
- 350. Institution and Restaurant Management: Organization and Administration.** Organization and administration of food service operations; management problems in various types of food services; personnel, costs, and sanitary control. Field trips; see Timetable for approximate cost. Prerequisite: Foods and Nutrition 120 and 240. 4 hours or 1 unit.
- 355. Specialized Quantity Food Production and Management.** Advanced application of food production and management principles to specific food service demands; emphasis on artistry in preparation, serving, and merchandising high quality food in quantity. Prerequisite: Foods and Nutrition 345 and credit or concurrent registration in Foods and Nutrition 350. 4 hours or 1 unit.
- 422. Seminar in Nutrition.** Discusses and evaluates current literature related to topics in nutrition. Prerequisite: Undergraduate degree in foods and nutrition, or comparable undergraduate degree in biochemistry, microbiology, physiology, or other biological science; consent of instructor. $\frac{1}{2}$ unit.
- 430. Selected Topics in Foods Chemistry.** Advanced studies of recent research in specialized topics in food chemistry. May be repeated to a maximum of $1\frac{1}{2}$ units. Prerequisite: Foods and Nutrition 330 or Food Science 314 or 315. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 432. Seminar in Foods.** Discusses and evaluates current literature related to specialized topics in foods. Prerequisite: Undergraduate degree in foods and nutrition, or comparable background in chemistry, microbiology, physiology, or other biological science; consent of instructor. $\frac{1}{2}$ unit.
- 445. Current Topics in Food Service Systems Research.** Studies recent research related to food service systems; extensive investigation of research data and techniques on special topics each semester. Prerequisite: Graduate standing in foods and nutrition or related fields; Food Science 340; consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 1 unit.
- 493. Advanced Studies in Foods and Nutrition.** Library or experimental research on specific problems of limited scope; cannot be supervised by thesis advisor. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.

- 499. Thesis Research.** Original research designed and conducted under graduate faculty supervisor. 0 to 4 units.

FORESTRY

Head of Department: G. L. Rolfe

Department Office: 110 Mumford Hall, 1301 West Gregory, Urbana

- 101. Introduction to Forestry.** The forest as a renewable natural resource; the aims and scope of forestry; economic and social importance of forests to the nation; the principal forest regions and species; forests for timber supply, for water conservation, for recreation, and for wildlife; the principles of forest management and protection; and the development of public and private forestry in the United States. 3 hours.
- 120. Introduction to Applied Entomology.** Same as Entomology 120. See Entomology 120.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Special Problems.** Supervised research on special problems in forestry. Prerequisite: A minimum grade-point average of 3.75; senior standing; consent of instructor and head of department. Specific approval of the associate dean is required in advance of registration for a second and/or third special problem course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 3 hours.
- 201. Wildland Recreation (Summer Field Studies).** Field study of wildland recreational resources and facilities, user characteristics and preferences, and management techniques within the multiple-use concept. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
- 211. Forest Ecology (Summer Field Studies).** Introduction to forest ecology and the application of ecological principles in silviculture and management practices. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
- 213. Silviculture.** The art and science of controlling forest establishment, composition, and growth to best fulfill the objectives of the owner. Required field trip. Prerequisite: Forestry 211. 3 hours.
- 220. Dendrology.** Taxonomy, geographical distribution, economic importance, and elementary silvics of the important forest trees in the United States and Canada. Prerequisite: Plant Biology 100. 4 hours.
- 221. Forest Measurements (Summer Field Studies).** Introduction to forest measurements, including individual tree and stand measurements, inventory methods, and determination of the growth of trees and stands; topics in surveying and aerial photogrammetry. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
- 231. Wood Utilization, I (Summer Field Studies).** Field and classroom exercises in logging and milling, conversion of raw wood to useful products, visits to plants, and industrial aspects of wood use. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
- 232. Wood Utilization, II.** Principles and methods of harvesting trees; conversion processes and uses of lumber, veneer, plywoods, pulp, paper, particles and chemical derivatives. Harvesting and the environment, recycling, and wood for energy are also discussed. 3 hours.
- 236. Physical Properties of Wood and Wood-Base Materials.** Physical properties of wood materials, emphasizing the influence of anatomy, density, and moisture content; wood-liquid relations; thermal, electrical, and acoustical properties; and study of the theory and practice of wood seasoning for determining dimensional stability. Prereq-

- uisite: One year of college physics and one year of college chemistry, or consent of instructor. 3 hours.
- 256. Surveying Agricultural and Forest Lands.** Same as Agricultural Engineering 256. See Agricultural Engineering 256.
- 260. Forest Land Policy and Administration.** Examines forest land policies and their administration emphasizing the relations among resources, politics, and people; current major problems in forest land policy administration and progress toward their solution. Prerequisite: Economics 101 or consent of instructor. 3 hours.
- 261. Wood Anatomy and Identification.** Study of the structure of wood and the identification of woods by means of anatomical characteristics; the characteristics of wood are related to growth in trees and use as products. 3 hours.
- 273. Adhesives and Laminates.** Bonding and composite theory are related to wood structure and products; adhesives, processing and characteristics of laminated beams, plywood, flakeboard, particleboard and paper are discussed. 3 hours.
- 277. Interpretation of Aerial Photographs.** Same as Geography 277. See Geography 277.
- 281. Introduction to Forest Resource Management (Summer Field Studies).** Field introduction to forest resource management, including wildlife management, watershed management, and forest protection. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
- 283. Introductory Ecology for Educators.** Same as Environmental Studies 283. Intended primarily for education students. Basic ecological concepts and how they may be incorporated into the classroom; includes ecosystem structure and function, communities and population, energy flow and nutrient cycling, and integrating ecology/environmental education into the classroom. Eight-hour field trip required; see Timetable for approximate cost. 3 hours.
- 290. Urban Forestry.** The management of wooded areas in urban and community settings, including how trees improve the urban environment and how they react to urban stresses. Includes laboratory. Prerequisite: Forestry 220, Horticulture 202, or Landscape Architecture 252, or equivalent. 3 hours.
- 301. Forest Recreation.** Same as Leisure Studies 301. The management of forest lands for recreational uses; biological and physical resources; users' behaviors, needs, and desires; and principles involved in managing the forest resource and the users. Prerequisite: Leisure Studies 100, Forestry 201, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 312. Diseases of Urban Trees.** Same as Plant Pathology 312. See Plant Pathology 312.
- 313. Forest Genetics and Tree Improvement.** Introduction to genetic principles contributing to variation in forest tree species and to approaches for managing genetic resources of forest trees; topics include: basic genetic concepts, population and ecological genetics, experimental methods in forest genetics, genetic inputs to forest regeneration, and tree improvement strategies. Overnight weekend field trip required. Prerequisite: Forestry 213 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Diseases of Forest Trees.** Same as Plant Pathology 314. See Plant Pathology 314.
- 315. Forest Soils.** Advanced study of the chemical, physical, and biological properties of forest soils; includes the relationship of forest soils to site productivity, forest fertilization, intensive forest management, and environmental problems. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
- 316. Advanced Forest Ecology.** Emphasizes the relationship between environmental factors and the structure and function of forests, discusses how environmental factors regulate forests, how forests function ecologically, and how to integrate forest ecology into resource management. One day field trip required. Prerequisite: Forestry 211 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Introduction to Natural Resources Economics.** Same as Agricultural Economics and Environmental Studies 317. See Agricultural Economics 317.
- 318. Tropical Forest Ecosystems.** Studies interactions between climate and soils and the structural and functional characteristics of tropical forests, including both natural and managed forest ecosystems. Prerequisite: Forestry 316 or credit in one course in general ecology; or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 319. Environment and Plant Ecosystems.** Same as Agronomy and Environmental Studies 319. Examines relationships between environmental factors and structural characteristics and processes in ecosystems; impact of human activities on the environment and their effect on plant ecosystems. Draws examples from agricultural and forest ecosystems. Prerequisite: One course in biology, and Chemistry 102 or equivalent; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 321. Forest Biometrics.** Introduction to statistical methods used in the management of natural resources; includes applied regression analysis and survey of sampling methods, with computer applications. Prerequisite: Forestry 221. 3 hours or $\frac{3}{4}$ unit.
- 326. Tree Physiology.** The study of tree functions as they relate to tree structure, environment, and cultural practices; emphasizes photosynthesis, carbohydrate metabolism, nitrogen metabolism, water relations, and symbiotic associations of trees. Prerequisite: Plant Biology 100 and Chemistry 102 or 103. 3 hours or $\frac{3}{4}$ unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science and Horticulture 340. See Agronomy 340.
- 345. Statistical Methods.** Same as Agricultural Engineering and Animal Science 345. See Animal Science 345.
- 348. Wildlife and Land Management.** Same as Ecology, Ethology, and Evolution 348. See Ecology, Ethology and Evolution 348.
- 351. Forest Resource Economics.** Applies principles of economics to the establishment, development, and use of forest and related natural resources; major concepts studied include production economics, capital budgeting, forest taxation, financial maturity, and supply, demand, and valuation of major forest products. Prerequisite: Economics 101 and Forestry 321; or consent of instructor. 4 hours or 1 unit.
- 372. Mechanical Properties of Wood and Wood-Base Materials.** Static mechanics, strength properties, and structural designs of wood, plywood, particleboard, and hardboard, emphasizing the standard methods of testing wood and fibrous material, wood beam and column designing, and other factors concerning the strength of wood materials, particularly the derivation of allowable stresses. Prerequisite: Physics 102. 3 hours or $\frac{3}{4}$ unit.
- 377. Aerial Photograph Interpretation and Remote Sensing.** Same as Geography 377. See Geography 377.
- 381. Forest Resource Management.** An integration and synthesis of forestry concepts and quantitative decision making techniques applied to managing forests to meet the objectives of both public and private forest land owners. Prerequisite: Forestry 351 or consent of instructor. 4 hours or 1 unit.
- 400. Forestry Seminar.** Discussions of current research and specialized topics in forestry; a seminar must be given by all students in order to receive credit. Required of all graduate students in forestry. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 401. Special Problems.** Individual studies or investigations in selected branches of forestry. 0 to 1 unit. Not more than 2 units may be offered toward an M.S. degree.
- 414. Discussions in Forest Ecology and Physiology.** Individual and group discussions of developments and techniques in forest ecology and physiology based on classic and current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 415. Linear and Non-Linear Statistical Models for Biologists.** Same as Animal Science 415. See Animal Science 415.
- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 433. See Biology 433.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 434. See Biology 434.
- 450. Advanced Forest Biometry.** Examines and discusses developments and techniques

used in forest inventory, growth models and ecological models. Prerequisite: Forestry 321, Agronomy 440, or consent of instructor. $\frac{1}{2}$ unit. Offered in alternate years.

- 460. Discussions in Forest Policy and Administration.** Individual and group discussions of the major relevant problems in the field of forest resources policy and administration (both public and private) based on current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Economics, and Environmental Studies 463. See Agricultural Economics 463.
- 499. Thesis Research.** Research may be conducted in various phases of forestry; subject must be approved by departmental committee. 0 to 3 units.

FRENCH

Head of Department: P. A. Gaeng

Department Office: 2090 Foreign Languages Building, 707 South Mathews, Urbana

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. Elementary French, I.** Four-skill course leading to proficiency in oral expression, listening comprehension, reading, writing, and cultural understanding. Open only to students with no previous study of French. All students are required to attend language laboratory sessions several times a week, as needed. 4 hours. Credit is not given for both French 101 and 105.
- 102. Elementary French, II.** Continuation of French 101. Introduces cultural and supplementary enrichment materials; requires laboratory sessions as in French 101. Prerequisite: French 101 or one year of high school French. 4 hours. Credit is not given for both French 102 and 105.
- 103. Intermediate French, I.** Continuation of French 102. Introduces students to a full range of structures to complete their initial study of the grammatical system; emphasizes the development of all four skills and cultural understanding through readings and audiovisual enrichment materials. Students planning to major or minor in French should take French 133 in lieu of French 103. Prerequisite: French 102 or equivalent, or a placement score showing high school achievement equivalent to French 102. 4 hours. Credit is not given for both French 103 and 106.
- 104. Intermediate French, II.** Continuation of French 103. Comprehensive grammar review with emphasis on oral expression and the continued development of reading and written skills. Completion satisfies graduation requirement in the College of Liberal Arts and Sciences. Students planning to take advanced French courses should take French 134 in lieu of French 104. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 105. French Active Review, I.** Reviews materials covered in French 101 and 102 in preparation for entrance into French 103 or 133. Open to students with high school French; by placement score or consent of department only. Not open to students with credit in French 101 or 102. Prerequisite: one or two years of high school French and placement score in 101 range. 4 hours.
- 106. French Active Review, II.** Reviews materials covered in French 102 and 103 in preparation for entrance into French 104, 114, 124, or 134. Not open to students with credit in French 101, 102, or 103. Open to students with high school French; by placement score or consent of department only. Prerequisite: Three or four years of high school French with placement at 102 levels. 4 hours.
- 113. Conversational Practice.** Oral practice for the development of elementary conversational skill and the improvement of pronunciation; designed as a supplement to third

and fourth semester French courses. Prerequisite: Concurrent enrollment in third or fourth semester French course, or consent of instructor. 1 hour.

- 114. Conversational French.** Practice in spoken French. May be substituted for French 104 to satisfy the graduation requirement in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 124. Readings in French Literature.** Additional readings in English of authors treated will be assigned according to demonstrated interest. May be substituted for French 104 to satisfy the graduation requirements in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103; placement by virtue of high school units (usually three years). 4 hours.
- 133. Accelerated Intermediate French, I.** Similar to French 103, but accelerated for those interested in pursuing French in advanced courses; includes comprehensive grammar review and readings in literature and culture. Prerequisite: French 102 or two semesters of college French, or a placement score showing high school achievement equivalent to French 102. Normally for students with a "B" average in French or with consent of instructor. 4 hours.
- 134. Accelerated Intermediate French, II.** Continuation of French 133. Comprehensive grammar review and readings in French literature and culture preparatory for continued work at the advanced level; emphasizes all four skills and culture. Prerequisite: French 133, or French 103 with department approval, or three semesters of college French, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Oral French, I.** Training for the development of oral facility; exercises for the improvement of pronunciation and diction; and optional practice in the language laboratory. Prerequisite: French 104, or 103 and 113, or four years of high school French. 3 hours.
- 206. Oral French, II.** Continuation of French 205; optional practice in the language laboratory. Prerequisite: French 205. 3 hours.
- 207. Grammar and Composition.** Training in French syntax, translation from English into written French, and directed composition. Prerequisite: Four years of high school French or equivalent, or French 134 or, with departmental approval, French 104. 3 hours.
- 209. Introduction to French Literature, I.** Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 210. Introduction to French Literature, II.** Continuation of French 209. Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 217. Advanced Oral French.** Intensive practice in oral French to improve fluency, vocabulary, comprehension, pronunciation and syntax; activities include reports, discussion and role-play on topics selected and prepared by class participants; also includes weekly written assignments based on class activities. Prerequisite: French 206 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
- 220. Sixteenth-Century Literature.** General survey of the literature of the French Renaissance. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 223. French Literature of the Seventeenth Century, I.** Major French writers of the preclassical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)

- 224. French Literature of the Seventeenth Century, II.** Major French writers of the classical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 227. French Literature of the Eighteenth Century, I.** Montesquieu, Voltaire, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 228. French Literature of the Eighteenth Century, II.** Diderot, Rousseau, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 230. French Literature of the Nineteenth Century, I: 1800-1850.** Major prerealist and romantic writers. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 231. French Literature of the Nineteenth Century, II: 1850-1900.** The evolution of romanticism and realism into the naturalist and symbolist movements. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 233. French Literature of the Contemporary Period, I.** Modern poetry from Baudelaire to Valéry; prose writers from 1900 to 1940. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 234. French Literature of the Contemporary Period, II.** Continuation of French 233. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 270. Parateaching.** Same as German, Latin, Russian, and Spanish 270. Parateaching prior to the practicum in local schools under the direct supervision of University of Illinois faculty and the teaching staff of participating schools. Prerequisite: Enrollment in a foreign language teaching curriculum or consent of an advisor in a foreign language teaching curriculum. 2 hours. May be repeated.
- 279. Introduction to Foreign Language Education.** Same as German, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
- 280. Teachers Course.** Survey of resources, classroom materials, standard practices, and problems in the teaching of French with practical application to actual classroom situations. Required for teacher training majors in French. This course does not meet during the period teacher-training majors are off campus. Prerequisite: French 205, 206, 207, 209 and 210; or equivalent. 4 hours.
- 287. French Language and Culture Through Literary Analysis, Scriptwriting, and Recording.** Deepened appreciation of French culture and advanced practical language training through reading and discussion of key works of literature and other cultural documents, followed by the writing and recording in French of scripts based on these works. Prerequisite: French 205, 207, and 209, or equivalent, or consent of instructor. 3 hours.
- 288. French and Comparative Cinema, I.** Same as Comparative Literature 288. Selected world cinema trends to approximately 1960, with emphasis on French directors (Clair, Vigo, Renoir, Carne, Clouzot, etc.); aesthetic, sociopolitical, historical, literary, and technical aspects; meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French concentrators, one college-level film studies course or consent of instructor; no prerequisite for French concentrators. 4 hours.
- 289. French and Comparative Cinema, II.** Same as Comparative Literature 289. Continuation of French/Comparative Literature 288. Selected world cinema trends since approximately 1960, with emphasis on French directors (Chabrol, Godard, Truffaut, Resnais, Marker, Rohmer, etc.); meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French concentrators, one college-level film studies course or consent of instructor; no prerequisite for French concentrators. 4 hours.
- 290. Individual Study: Major Tutorial.** A tutorial taken by students in the course of two of their last four semesters of undergraduate study. Students read the works on a departmental reading list with the guidance of a tutor, repeating enrollment for a total of 2 hours credit, normally at the rate of 1 hour per semester. Prerequisite: French 205, 207, 209, and 210, or equivalent; a declared field of concentration in French; junior standing. 1 to 2 hours. (Counts for advanced hours in LAS.)

- 292. Senior Thesis.** For candidates for honors in French and for other seniors. Prerequisite: Senior standing. 2 hours. May be repeated for a maximum of 4 hours credit. (Counts for advanced hours in LAS.)
- 298. Senior Seminar.** Studies in authors, genres, themes, and movements in French literature; conducted entirely in French. Prerequisite: Senior standing. 3 hours. May be repeated for credit. (Counts for advanced hours in LAS.)
- 299. Study Abroad.** Lectures, seminars, and practical work in French language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: French 209 and two of the following: French 205, 206, or 207; 3.75 overall average; 4.0 average in French courses. 0 to 17 hours per semester, to a maximum of 34 hours per academic year.
- 310. Modern African Fiction.** Same as African Studies and Comparative Literature 310 and English 370. See African Studies 310.
- 313. French Phonetics and Diction.** A systematic study of the sounds and sound patterns of French; training in the improvement of French pronunciation with special attention to the problems of teachers. Prerequisite: French 206, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 314. Advanced Grammar and Style.** Advanced theoretical and practical study of present-day French, with free composition and some consideration of stylistics. Prerequisite: French 207 (with a grade of C or better), or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 316. Structure of the French Language.** Same as Linguistics 316. General survey of the linguistic structure of modern standard French, including phonology, morphology, and syntax; emphasis on the differences between its spoken and written forms. Prerequisite: French 313 or equivalent training in phonetics. 3 hours or $\frac{3}{4}$ unit.
- 319. Techniques in Translating.** A practical course in the techniques of translating technical, commercial, scientific, and literary texts from English into French and vice versa. Prerequisite: French 314 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 320. Techniques in Interpreting.** A practical course in the technique of oral translation of spoken material covering a wide range of subject matter in a variety of settings. Prerequisite: French 319 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 335. French Civilization, I.** Survey of French life and French institutions, intended as a background for literary studies and as a preparation for the teaching of French; given in French. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 336. French Civilization, II.** Continuation of French 335. May be taken independently of French 335. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 343. Studies in French.** See Timetable for current topics. Prerequisite: Junior standing. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 355. France Today, I.** Social structures of France today and their manifestation in daily life and culture; study of the workings of various institutions and systems (political, judicial, economic, educational, etc.) for an understanding of current problems, providing background for closer study, in the second semester, of the forces affecting daily life. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 356. France Today, II.** Study of the conditions of daily life in France today, its organization, the major forces and issues affecting it; topics include class structure, youth culture, urban and minority problems, the press, media, and popular culture and the arts. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 360. Principles of Language Testing.** Same as English as Second Language, German, and Spanish 360. See English as an International Language 360.
- 362. Introduction to Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 379. Studies in Francophonie.** Same as Comparative Literature 334. Studies of various genres, periods, and topics of French literature outside of France, with a different geographical emphasis each semester. Regions include black Africa, the Caribbean, Canada, North Africa, the Middle East, and Switzerland. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 12 hours or 4 units.

- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, German, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 385. Commercial and Economic French, I.** Studies French business practices: company structures, selling and buying techniques, banking, import/export and other commercial negotiations, employment, formalities, and conventions of letter-writing; involves both theory and practice. Prerequisite: French 314 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 386. Commercial and Economic French, II.** Emphasizes business correspondence and simulation of business practices in the areas introduced in French 385; also focuses on geographic and economic topics pertaining to France within the European community and Europe in general. Prerequisite: French 385 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 399. Study Abroad.** Lectures, seminars, and practical work in francophone literature and civilization, in a French-speaking country. Prerequisite: French 209 and 210, and two of the following: French 205, 206, and 207; or equivalent. Not open to undergraduates in the Paris program. 0 to 16 hours, or 0 to 4 units.
- 400. Beginning French for Graduate Students.** Basic grammar, vocabulary, and reading practice; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. 4 hours. No graduate credit.
- 401. Reading French for Graduate Students.** Grammar, vocabulary, and general and special reading; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. Prerequisite: French 400, or French 101 and 102, or equivalent. 4 hours. No graduate credit.
- 403. The Study of Culture: Fine Arts, History, and Literature, I.** A study of major artistic, historical, political, and literary aspects of France up to the French Revolution with emphasis on the relationship between literature and other aspects of French culture. 1 unit.
- 404. The Study of Culture: Fine Arts, History, and Literature, II.** Continuation of the approaches and emphases of French 403 from the French Revolution to the present. Prerequisite: French 403 or consent of instructor. 1 unit.
- 405. Techniques in Teaching College and Secondary French.** Examination and discussion of classroom procedures and language laboratory techniques in teaching French at the college and secondary level, associated with demonstration class and supervision of teaching practice. Required of new teaching assistants in the Department of French. $\frac{1}{2}$ unit.
- 425. Studies in Contemporary Critical Problems.** Same as Comparative Literature 425. Introductory course to some aspect of modern French critical theory; normally taught in English and texts may be read in English. 1 unit. May be repeated as topic varies.
- 429. Studies in French Linguistics.** A variable topics course dealing with both synchronic and diachronic aspects of the French language. 1 unit. May be repeated as topic varies.
- 430. Introduction to Research and Textual Criticism.** Proseminar in literary studies: research and methods; approaches to the literary text. Required of all M.A. and Ph.D. candidates. 1 unit.
- 431. Introduction to Old French Language.** Outline of Old French grammar and training in reading Old French (twelfth and thirteenth centuries). 1 unit.
- 432. Studies in Medieval French Literature.** Close study of one or more topics in Old French literature. See Timetable for current topics. Prerequisite: French 431 or consent of instructor. 1 unit.
- 433. Studies in Sixteenth-Century French Literature.** Close study of one or more topics in sixteenth-century French literature; see Timetable for current topics. 1 unit. May be repeated for credit as topic varies.
- 435. Studies in Seventeenth-Century French Literature.** Close study of one or more topics in seventeenth-century French literature; see Timetable for current topics. 1 unit. May be repeated for credit as topic varies.
- 437. Studies in Eighteenth-Century French Literature.** Close study of one or more topics

in eighteenth-century French literature; see Timetable for current topics. 1 unit. May be repeated for credit as topic varies.

439. **Studies in Nineteenth-Century French Literature.** Close study of one or more topics in nineteenth-century French literature; see Timetable for current topics. 1 unit. May be repeated for credit as topic varies.
441. **Studies in Twentieth-Century French Literature, I.** 1 unit.
442. **Studies in Twentieth-Century French Literature, II.** 1 unit.
443. **French Studies.** A flexible course limited only by the concentration of its material in French; may be activated by student request or faculty proposal. 1 unit.
445. **Studies in French Canadian Literature.** Close study of one or more topics in French Canadian literature; see Timetable for current topics. 1 unit. May be repeated as topic varies.
447. **Introduction to Romance Stylistics.** Same as Italian, Portuguese and Spanish 447. See Spanish 447.
452. **Studies in French and Comparative Cinema.** Same as Comparative Literature 472. Historical, aesthetic, social, and technical studies of the French cinema: its development and relation to world cinema and to literature. 1 unit. May be repeated to a maximum of 3 units.
462. **Seminar in Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
463. **College Teaching of Foreign Languages.** Same as English as a Second Language, German, Russian, and Spanish 463. Rationale for curricular objectives for college courses in foreign languages; the teaching and testing of pronunciation, listening comprehension, speaking, reading, writing, cultural understanding, and literary appreciation; the use of technology; and recent experimentation. 1/2 or 1 unit.
470. **Seminar in Old French Literature.** Discussion and research on some specialized topic in Old French literature. See Timetable for current topic. Prerequisite: French 431 or consent of instructor. 1 unit. May be repeated.
471. **Seminar in Sixteenth-Century French Literature.** Discussion and research on some specialized topic in sixteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
472. **Seminar in Seventeenth-Century French Literature.** Discussion and research on some specialized topic in seventeenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
473. **Seminar in Eighteenth-Century French Literature.** Discussion and research on some specialized topic in eighteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
474. **Seminar in Nineteenth-Century French Literature.** Discussion and research on some specialized topic in nineteenth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
478. **Seminar in Twentieth-Century French Literature.** Same as Comparative Literature 478. Discussion and research on some specialized topic in twentieth-century French literature. See Timetable for current topic. 1 unit. May be repeated.
479. **Seminar in French Literature.** Discussion and research on some specialized area in French literature. See Timetable for current topic. 1 unit. May be repeated.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, German, Russian, and Spanish 481. Language teaching problems considered in the light of theoretical and experimental work in language acquisition, verbal learning and memory, motivation, speech perception, reading, error analysis, and language as an aspect of culture and societal relations. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar in Contemporary Criticism, Methods and Theory.** Same as Comparative Literature 490. Deals with a particular individual, school, method or problematic in structuralist or post-structuralist thought; normally taught in English, and texts may be read in French or English, if available. Prerequisite: An introductory course in criticism, or consent of instructor. 1 unit. May be repeated as topic varies.

- 491. Individual Topics.** Prerequisite: Graduate standing with a major or minor in French.
¹/₄ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

GENERAL ENGINEERING

Head of Department: T. F. Conry

Department Office: 117 Transportation Building, 104 South Mathews, Urbana

- 103. Engineering Graphics, I.** Integrated course in engineering graphics for all students in the College of Engineering. Freehand sketching; theory of orthographic projection and the analysis and synthesis of theoretical and practical problems involving the size, shape, and/or relative positions of common geometrical magnitudes such as points, lines, planes, and other surfaces and solids; theory of pictorial projections; basic dimensioning; and basic charts and diagrams. 3 hours. Credit is not given for both General Engineering 103 and General Engineering 105.
- 105. Elements of Drawing.** Theory, techniques, terms, symbols, and conventional practices used in making various types of projection and nonprojection drawings with instruments and freehand. For students in the aircraft maintenance curriculum. Prerequisite: High school plane geometry. 3 hours. Credit is not given for both General Engineering 105 and General Engineering 103.
- 193. Special Problems.** Individual investigations of any phase of general engineering selected by the students and approved by the department. Prerequisite: Consent of instructor. 0 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. History of Engineering.** Survey of the major contributions of the science and art of engineering from prehistory to the present; integrates the impact of engineering with the cultural aspects of the various periods. Prerequisite: Junior standing or consent of instructor. 3 hours.
- 221. Introduction to General Engineering Design.** Fundamental concepts in the classical and computer-based analysis and design of structural and machine components and assemblies; external and internal loads and displacements in statically determinate and indeterminate configurations; kinematics of linkages, gears, and cams; and cam profile design. Prerequisite: Theoretical and Applied Mechanics 212 and 221, and Computer Science 101. 3 hours.
- 222. Analysis of Dynamic Systems.** Introduction to the operational techniques used in describing the behavior of dynamic systems; elements of modeling; equilibrium and linearization; Laplace transformation techniques; system response via the transfer function; block diagrams and computer simulation; matrix operations; system response via state variables; and stability. Prerequisite: Mathematics 345; concurrent registration in Computer Science 101. 3 hours.
- 232. Engineering Design Analysis.** Studies stress/strain conditions, solution techniques, and analysis of various engineering materials and configurations, as applied to the development and application of design and analysis criteria. Prerequisite: General Engineering 221. 4 hours.
- 234. General Engineering Laboratory.** Prepares students for experimental projects, introduces mechanical and electrical instruments; basic measurement techniques; simulation of dynamic systems; applies microcomputers to control problems; measurement errors, relative and absolute; determines mechanical properties of selected materials; transducers and signal conditioning. Prerequisite: General Engineering 221 and 222. 3 hours. Credit is not given for both General Engineering 234 and either Theoretical and Applied Mechanics 223 or Mechanical Engineering 261.
- 241. Component Design.** Studies the design of basic engineering components: structural members, connections, and mechanical elements; applies principles including material

- failure, fatigue, buckling and other instabilities, reliability, and simulation. Prerequisite: General Engineering 222 and 232. 4 hours.
- 242. Project Design.** Design of various engineering devices and systems. Teams of two to four students work toward the development of engineering solutions to problems supplied by industry. A midterm and final report summarize the work of the semester for sponsor and faculty. Prerequisite: Credit or concurrent registration in General Engineering 241 and senior standing. 3 hours.
- 288. Economic Analysis for Engineering Decision Making.** Introduction to economic and operational analysis in the engineering decision-making process; mathematics of capital budgeting, mathematical programming, systems analysis, and the application of probability and simulation to decision making. Prerequisite: Junior standing or consent of instructor. 3 hours. Credit is not given for both Electrical Engineering 288 and General Engineering 288.
- 290. Legal Aspects of Engineering Contracts and Specifications.** Same as Civil Engineering 290. Laws governing various engineering contracts; tort law and professional liability of engineers; workmen's compensation; property law; and business and technical clauses of specifications. Prerequisite: Senior standing in architecture or engineering, or consent of instructor. 3 hours. Credit is not given for both Civil Engineering 290 and General Engineering 292.
- 291. General Engineering Seminar.** Series of lectures and discussions by department faculty and visiting professional engineers on ethics, professional registration, the role of technical societies, and the relation of engineering to such disciplines as economics, sociology, and government. Prerequisite: Senior standing in general engineering. 0 hours.
- 292. Engineering Law.** Nature and development of the legal system; legal relationships, rights and duties, and their importance in the engineering profession; and contracts, torts, agency, business transactions, and liability for defective products. Prerequisite: Senior standing in engineering or architecture, or consent of instructor. 3 hours. Credit is not given for both General Engineering 290 and 292.
- 293. Special Problems.** Individual investigations or studies of any phase of general engineering selected by the students and approved by the department. Prerequisite: Junior standing; consent of instructor. 0 to 4 hours.
- 324. Digital Control of Dynamic Systems.** Examines theory and techniques for control of dynamic processes by digital computer; linear discrete systems, digital filters, sampling signal reconstruction, digital design, state space methods, computers, state estimator, laboratory techniques. Prerequisite: General Engineering 222 or equivalent. 4 hours or 1 unit.
- 334. Introduction to Reliability Engineering.** Same as Industrial Engineering 334. See Industrial Engineering 334.
- 389. Robot Dynamics and Control.** Kinematics, dynamics, and control of robotic manipulators; emphasis on fundamental concepts and analytical methods for analysis and design of robotic systems; laboratory experiments and computer simulation complement the theoretical development. Prerequisite: General Engineering 222, Aeronautical and Astronautical Engineering 258, and Electrical Engineering 386 or Mechanical Engineering 240. 4 hours or 1 unit.
- 392. Legal Problems in Engineering Design.** The law as it affects engineering design; products liability, product safety legislation, and product standards and certification; legal rights and duties of the design professional; and the patent system and protection of inventions. Prerequisite: Senior standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 393. Special Problems.** Studies advanced problems related to general engineering. Prerequisite: Senior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 491. Simulation of Dynamic Systems.** Modeling and simulation of dynamic engineering systems; distinct modeling approaches for engineering devices; analog and digital computer simulation of dynamic systems; design criteria and performance and design measures; and extensive use of case studies and projects. Prerequisite: General Engineering 222 and Industrial Engineering 385, or equivalent. 1 unit.

- 493. Special Problems.** Advanced problems related to general engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated.
- 495. Evaluation and Management of Engineering Design Projects.** Quantitative evaluation and optimization of project plans, using mathematical programming and multiple-criteria decision making; optimal design and sizing of engineering projects; reliability of designs, studied by acyclic network analysis and network simulation; and implementation and control of engineering designs by network analysis. Prerequisite: General Engineering 288 and Industrial Engineering 385, or equivalent. 1 unit.
- 497. Project Design.** Engineering design projects emphasizing advanced engineering analysis, synthesis, optimization, and engineering economics. $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.
- 499. Thesis Research.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.

GENETICS AND DEVELOPMENT

School of Life Sciences, 393 Morrill Hall, 505 South Goodwin, Urbana

- 290. Individual Topics.** Laboratory work or reading in fields selected in consultation with a School of Life Sciences faculty member. Restricted to students in the Genetics and Development option in the Life Sciences concentration. Prerequisite: Fifteen hours of life science courses and consent of School of Life Sciences faculty sponsor. 2 to 5 hours. May be repeated to a maximum of 10 hours.
- 410. Seminar in Genetics, Development, and Evolution.** Student presentations and discussions of selected current topics in genetics, development, and evolution. $\frac{1}{4}$ unit.

GEOGRAPHY

Head of Department: G. J. D. Hewings

Department Office: 220 Davenport Hall, 607 South Mathews, Urbana

- 101. Geography of Developing Countries.** Examines the manner in which climate, landforms, resources, and cultural factors promote and inhibit change in developing countries (i.e., India, Iran, Egypt, Nigeria, China, Kenya, Brazil, Venezuela, Guatemala); makes comparisons between these countries and others in both the developing and the developed world. 3 hours.
- 102. Weather and Climate.** Introduction to the processes responsible for the spatial variation of weather and climate with a survey of world climatic patterns. 4 hours.
- 103. Earth's Physical Systems.** Systems approach to the physical environment, including landform, soil, vegetation, and animal elements, from a human ecological perspective. 4 hours.
- 104. Social and Cultural Geography.** Introduces the basic concepts of social and cultural geography, and the application of these concepts to a variety of topics: mental maps, territoriality, cultural regions, cultural elements and their diffusion, population movement and migration, settlement patterns, environmental hazards, and spatial patterns of social problems. 4 hours.
- 105. Introductory Economic Geography.** Geographic analysis of the distribution of various kinds of economic activity; an examination of the patterns resulting from the human exploitation of the world's resources; and emphasis on the principles governing the location of mineral, manufacturing, and commercial activities. 4 hours.
- 110. Geography of International Conflicts.** Focuses on contemporary cultural conflicts, competition among nations for economic and mineral resources; treats territorial dis-

putes from a cultural and geographic perspective. Case studies vary to illustrate types of contemporary conflicts. 3 hours.

185. Introduction to Social Statistics. Same as Sociology 185. See Sociology 185.

198. Freshman Honors Seminar. Through discussions and research projects, the seminar is designed to provide an in-depth understanding of topics in the field of systematic or regional geography which are selected for group study. Appropriate geographic methodology is emphasized. Prerequisite: James Scholar standing or other designation as a superior student. 3 hours.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

203. Regional Analysis of Landforms. Examines global and regional variations in the morphology of the earth's surface; emphasizes the role that climate plays in producing these variations. Prerequisite: Geography 103 or Geology 101, 107, or 143. 3 hours.

204. Cities of the World. Introduces the form and function of cities around the world; emphasizes cross-cultural comparisons of urban landscapes and living environments as illustrated by case studies of specific cities. 3 hours.

205. Business Location Decision-Making: Theory and Practice. Same as Business Administration 205. Analyzes location decision-making emphasizing industrial and commercial location patterns; identifies important institutional factors and their changing roles over the recent past; and focuses on plant closings, economic disruptions, and problems of structural change. Prerequisite: Geography 105 or Economics 101, or equivalent. 3 hours.

210. Contemporary Social and Environmental Problems. Geographic perspectives on contemporary national and international problems. Topics vary each semester and include such themes as environmental quality, food production, urban problems, and particular social and political conflicts. 3 hours.

214. Conservation of Natural Resources. Survey of distribution of natural resources and major forms of utilization of these resources; emphasizes consequences of utilization systems which deplete or degrade resources and systems which conserve these resources with respect to future needs of human populations. 3 hours.

215. Resource Conflicts. Surveys the physical and economic views of the importance of resources and a determination of the impacts of resource scarcity; treats the subject in a manner particularly suited to the engineer and physical scientist. Discusses case studies of actual resource conflicts. Prerequisite: Mathematics 132 or equivalent. 3 hours.

224. Geographic Patterns of Illinois. A systematic analysis of the environmental and human processes that have shaped the regional landscapes of rural and urban Illinois. 3 hours.

271. Spatial Analysis. An overview of the spatial analysis (nomothetic) approach to geographic research, both physical and human; includes discussion of the scientific method, with explanations and uses of analytic geographic concepts in studying real world problems. Prerequisite: A course in geography. 4 hours.

273. Spring Field Course. Field observation and mapping of human and physical phenomena using basic geographic field techniques; required ten-day field trip during spring semester break. Prerequisite: Geography majors, or nonmajors with consent of instructor. 4 hours.

277. Interpretation of Aerial Photographs. Same as Forestry 277. Principles and techniques in extraction and analysis of information derived from aerial photographs, including black and white, color, and color infrared; applications to problems in the natural and social sciences stressed in the laboratory. A beginning FORTRAN programming course is highly desirable but not required. Prerequisite: Knowledge of trigonometry (Math 114 or equivalent). 3 hours.

284. Population Geography. Problems and issues surrounding the geographic distribution of populations at the world, regional, and local levels; emphasizes problems associated with population growth and decline, recent population redistribution, births and deaths, and elderly and minority populations. 3 hours.

290. Individual Study. Supervised independent study of special topics or regions; required for students graduating with departmental distinction. Prerequisite: Junior standing;

at least one formal course in the topic or region of interest; consent of instructor. 2 to 4 hours. May be repeated once. (Counts for advanced hours in LAS.)

- 291. Honors Individual Study.** Individual study and research projects for students who are working toward the degree with distinction in geography. Prerequisite: Junior standing; consent of honors adviser. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 294. Special Topics in Social Geography.** Introduction to current research in social geography; includes such topics as access to public facilities, geography of crime, innovation diffusion, geography of communications, spatial assimilation of minorities, and geography of social well-being. See Timetable for current topics. 4 hours. May be repeated.
- 303. Advanced Physical Geography: Methodology and Applications of Landform Studies.** Systematic analysis of the basic elements of physical geography and their interaction through time and surface expression, including the modifying effects of humans. Complementary to Geology 301. Prerequisite: Geography 103 or consent of instructor. 4 hours or 1 unit.
- 304. Soil Geomorphology.** Same as Geology 304. Analysis and review of the principles of soils as applied to geomorphology, archaeology, and geography. One weekend and several one-day field trips; student fees reflect actual field expenses. Prerequisite: Geography 103 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 305. Zoogeography.** Introduction to the principles of zoogeography; the central theme explains present distribution of animals, chiefly mammals. Prerequisite: Geography 102 and 103, Geology 102, Biology 104, or consent of instructor. 3 hours or 1 unit.
- 306. Fluvial Geomorphology.** Same as Geology 306. Systematic overview of the forms and processes associated with rivers and drainage basins: topics include basin hydrology, drainage networks, river hydraulics, sediment transport processes, channel morphology, channel change, and human impacts on fluvial systems. Prerequisite: Physics 101, and Geography 103 or Geology 107, or consent of instructor. 4 hours or 1 unit.
- 307. Periglacial Geomorphology.** Same as Geology 307. Examination of periglacial landscapes through analysis of the formative processes and their interaction with the resulting forms. Prerequisite: Geography 303, Geology 301, or consent of instructor. 4 hours or 1 unit.
- 308. Geomorphology of Coasts.** An analysis of the morphology of marine coasts including study of their distributions and of the physical factors that have influenced their development and distribution; analyzes effects of human-induced stress on modern beaches. Prerequisite: Geography 103 or equivalent. 4 hours or 1 unit.
- 314. Regional Problems in Resource Management.** Major problems of resource utilization examined in regions where problems are most acute; emphasizes interrelationships among resource management problems, environmental consequences of resource utilization, and the problems of public policy involved in resource management. 3 hours or $\frac{3}{4}$ unit.
- 315. Physical Climatology.** Surveys the basic concepts of energy balance climatology, with emphasis on the topoclimatic scale; lectures supplemented by calculations and field observations examining the effects of location and surface characteristics on determination of climate. Prerequisite: Mathematics 112, Physics 101, and Geography 102; and Computer Science 103 or equivalent; or consent of instructor. 3 hours or 1 unit.
- 325. Historical Geography of American Landscapes to 1880.** Same as Landscape Architecture 325. Changing patterns of spatial organization in the United States and Canada, circa 1400 A.D. to 1880; focuses on landscape patterns through time (especially the built environment), perception of relic landscapes in the present day, and contemporary preservation of historic areas as historic places. 4 hours or 1 unit.
- 326. Historical Geography of American Landscapes Since 1880.** Same as Landscape Architecture 326. Review of the values and technologies which underlie the structuring of the American built environment during the past century; emphasizes the changing meaning of urban, suburban, small town, rural, and wilderness places in American life and is concerned with the image of place as a basis for historic preservation. 4 hours or 1 unit.

- 327. American Vernacular: The Cultural Landscape.** Same as Landscape Architecture 327. Focuses on vernacular structures in the cultural landscape, especially common houses, barns, and commercial and industrial structures; examines origin and geographical diffusion of vernacular architecture in the United States. 4 hours or 1 unit.
- 331. Geography of Caribbean America.** Surveys the physical environment and the sequent occupancy processes that have shaped contemporary rural and urban population and land use patterns in Mexico, Central America, Panama, and the West Indies. 3 hours or $\frac{3}{4}$ unit.
- 332. Geography of South America.** Surveys the physical environment and the sequent occupancy processes that have shaped contemporary rural and urban population and land use patterns in South America. 3 hours or $\frac{3}{4}$ unit.
- 341. Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Environmental Studies 341, and Urban and Regional Planning 375. See Civil Engineering 341.
- 342. Geography of Europe.** Analysis of the changing social, economic, and political geography of western Europe; special consideration to population changes and labor migrations and to planning problems in the underdeveloped regions and conurbations of the continent. 3 hours or $\frac{3}{4}$ unit.
- 353. Geography of the U.S.S.R.** Physical and cultural regionalism; a survey of natural resources and patterns of human occupancy including industry, agriculture, and transportation. 3 hours or $\frac{3}{4}$ unit.
- 355. Geography of Central and South Africa.** Regional geography of Africa south of the Sahara. 3 hours or $\frac{3}{4}$ unit.
- 361. Geography of Agricultural Land Utilization.** Geographic consideration of the nature of agricultural land utilization from the world, continental, and regional viewpoints; special emphasis on the geographical implications of various types of agricultural land use and upon the interrelationships between areas of different types of land utilization. 3 hours or $\frac{3}{4}$ unit.
- 365. Transportation Systems and Spatial Development.** Descriptors of transportation systems; allocation models; transportation as an industrial activity and public good; and transportation and spatial development, including the role of transportation in developing countries and in urban and regional development and problems involved in measuring the impact of transport investment. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 366. Location of Industry and Other Economic Activities.** Industrial site selection in theory and practice; examines the effect of factors such as materials, markets, labor, transportation, and environmental constraints on industrial location; and evaluates urban commercial patterns and factors affecting the location of commercial activities. 3 hours or $\frac{3}{4}$ unit.
- 367. The Origins and Impact of Energy Scarcity.** Examines the development of the physically based theories of scarcity and a comparison to the historical and most recent economic theories of scarcity of critical resources, especially energy, and their expected application in local, regional, national, and international situations. The course is a more technical extension of Geography 215. Prerequisite: Mathematics 132 or equivalent; Economics 101 or Geography 105. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Introduction to Quantitative Methods in Geography.** Introduction to statistical, numerical, and mathematical techniques used in geographic research; introduction to computer usage in geographic research. Prerequisite: Geography 185, one year of college mathematics, or one course in statistics, or equivalent. 4 hours or 1 unit.
- 371. Recent Trends in Geographic Thought.** Examines trends in geographic thought since 1950; gives attention to developments in positivism, phenomenology, and structuralism with regard to geographic research; introduces students to the research methodologies of the department's faculty. 2 hours or $\frac{1}{2}$ unit.
- 372. Geographical Epidemiology.** Same as Health and Safety Studies 375. See Health and Safety Studies 375.
- 373. Map Compilation and Construction.** Instruction and practice in the basic techniques of map making followed by a consideration of problems involved in the construction

of maps for presentation in a reproduced form (i.e., printed, photographed); the selection of proper source materials for the base and body of the map, the compilation and correlation of these materials, and methods of mechanical and photographic reproduction. 4 hours or 1 unit.

- 374. Thematic Map Design and Production.** Applies modern design principles to making thematic maps for various uses; the production of maps and atlases, emphasizing multicolor reproduction. Prerequisite: Geography 373 or equivalent. 4 hours or 1 unit.
- 375. Computer Cartography.** Introduction to concepts and techniques for computer mapping with spatial or statistical data; universal computer mapping strategies, with applications in the laboratory; cartographic data capture, covering data structures, devices, manipulation, and display; and a synthesis of geographic information systems. Prerequisite: Geography 185 or equivalent. 4 hours or 1 unit.
- 377. Introduction to Remote Sensing.** Same as Forestry 377. Fundamentals of energy-matter interaction mechanisms, and the manifestation of reflected and emitted radiation on photographs and images; introduces characteristics of aerial films and filters, electro-optical scanners, and digital processing are introduced; and emphasizes applications in environmental problems. Prerequisite: Geography 277 or equivalent, Geography 185 (beginning statistics) or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 378. Techniques of Remote Sensing Image Analysis.** Optical and digital information processing of imagery acquired from aircraft and satellite remote sensing platforms; includes systems design, mensuration theory, photographic enhancement techniques, and automatic digital classification for all of the standard sensor systems; and laboratory focusing on the design and implementation of information processing techniques with application limited to a survey of uses. Prerequisite: Geography 370 and 377, or equivalent. 4 hours or 1 unit.
- 380. Urban Form and Function in Pre-Industrial Western Society.** A review of urban landscapes and functions and of the development of city systems in the historical geography of western civilization prior to industrialization. Previous course work in history or historical geography is desirable. 3 hours or $\frac{3}{4}$ unit.
- 382. Siberian Culture History and Ethnology.** Same as Anthropology 382. See Anthropology 382.
- 383. Urban Geography.** Distribution, functions, and internal structures of cities; emphasizes contemporary metropolitan and central city problems. 3 hours or $\frac{3}{4}$ unit.
- 384. Migration and Spatial Interaction.** Theories and models of migration; contemporary migration patterns; information flow and individual movement in geographic space; and individual level and aggregate models of spatial interaction. 3 hours or 1 unit.
- 386. Political Geography.** Territorial behavior of nation-states; boundary conflicts and influences; regional voting patterns in the United States; malapportionment and gerrymandering; voting behavior of American minorities; and metropolitan fragmentation and spatial access to public services. 3 hours or $\frac{3}{4}$ unit.
- 387. Systems of Cities.** Theoretical and empirical issues in the study of macro-urban geography focusing on urban system structure and processes of growth and change within a system of cities. Prerequisite: Geography 105 or 204, or Urban Planning 101, or Sociology 276; or equivalent. 4 hours or 1 unit.
- 391. Research in Geography.** Detailed examination and discussion of the methods of initiating and executing research projects in human or physical geography (taught in separate sections); requires students to write a research proposal of a quality suitable for a graduate thesis. Prerequisite: Geography 371; either graduate standing in geography or senior standing as a geography major and consent of department. 2 hours or $\frac{1}{2}$ unit.
- 403. Physical Systems in Landform Analysis.** Same as Geology 403. A study of the phenomena of the physical landscape in terms of the basic principles of systems theory. Prerequisite: Geography 303 or equivalent, or consent of instructor. 1 unit.
- 404. Critical Analysis of Concepts and Models in Geomorphology.** The interpretation of a landscape and its evolution is dependent on which of the available models the geomorphologist accepts; the course focuses on the importance and ramifications of this choice. Prerequisite: Graduate standing and consent of instructor. 1 unit.

- 405. Seminar in Physical Geography.** Advanced study of one of several topics that vary from semester to semester and include: (a) mathematical models/numerical analysis in physical geography; (b) problems in physical geography; and (c) professional seminar. Prerequisite: Advanced course work in physical geography and consent of instructor. $\frac{1}{2}$ to 1 unit.
- 406. Urban and Regional Analysis.** Same as Urban Planning 406. See Urban Planning 406.
- 429. The Evolution of Agricultural Economies.** Same as Agronomy 429 and Anthropology 429. See Anthropology 429.
- 450. Issues in Regional Development.** Same as Urban Planning 450. Establishment and articulation of regional development goals; includes trade-offs, the role of government in regional development, analytical problems in the evaluation of regional public policy, and comparison and evaluation of regional development programs in a number of countries. Prerequisite: Urban Planning 406. 1 unit.
- 456. Regional Science Methods: Economic and Demographic.** Same as Urban Planning 456. Examines models of regional growth and development, including export base, input-output and econometric, cohort component and spatial interaction; emphasizes socioeconomic impact analysis and forecasting subnational economic and demographic change. Prerequisite: Urban Planning 406 or consent of instructor. 1 unit.
- 457. Seminar in Regional Science.** Same as Urban Planning 457. Discusses advanced topics in regional science; prepares students for dissertation and thesis research, applied study for public agency, or other student research. Prerequisite: Urban Planning 456, Economics 461, or consent of instructor. 1 unit.
- 463. Historical Geography.** History and philosophy of historical research in geography. Research strategies for the analysis of individual and aggregate spatial behavior in the past, derived geographical patterns, changing spatial behaviors and patterns through time, and historical values underlying contemporary geographical decision making. 1 unit.
- 464. Problems in Historical Geography.** Research seminar focused on the interests of participating students and faculty; application of geographic theory to the study of past geography, geographic change in the past, spatial behavior in the past, and/or evidence of spatial behavior in the contemporary scene. Prerequisite: Geography 370 or equivalent; prior preparation in historical geography. 1 unit.
- 470. Advanced Spatial Analysis.** Advanced techniques of spatial analysis, including spatial autocorrelation, trend surface analysis, grouping and regionalization procedures, and point pattern analysis. Prerequisite: Geography 370 or equivalent. 1 unit.
- 473. Problems in Cartography.** Subjects for map presentation are selected in the student's field of specialization or area of interest. Data are collected and maps compiled and carried to completion in final drafted form suitable for publication. Prerequisite: Geography 373 or consent of instructor. 1 unit.
- 478. Advanced Field Geography.** Field experience in some aspect of physical or human geography which normally involves primary data collection in the field through mapping, survey, interview, archival, or other procedures; work culminates in a written report. Prerequisite: Graduate standing in geography. $\frac{1}{2}$ to 2 units.
- 494. Seminar in Social Geography.** Advanced study of a current research topic in social geography. Topic varies from semester to semester; prepares students for dissertation and thesis research through study of advanced literature and the completion of a research paper. Prerequisite: Geography 370 and 371, or equivalent; graduate course work in social geography or in one of the social sciences. 1 unit.
- 495. Advanced Studies in Geography.** Seminar and directed individual investigation of selected problems or regions; designed to develop ability to conduct independent investigation. Scheduled seminars are detailed in each semester's Timetable. All students are required to register each semester in section Z (the departmental colloquium) for 0 units in addition to other 495 work which may be selected. 0 to 2 units.
- 497. Development of Geographic Thought.** Historical survey of the discipline from the Graeco-Roman period to the present. $\frac{1}{2}$ unit.
- 499. Thesis Research.** 0 to 4 units.

GEOLOGY

Head of Department: D. E. Anderson

Department Office: 245 Natural History Building, 1301 West Green, Urbana

- 101. An Introduction to the Study of the Earth.** Primarily intended for nonscience students. Integrates all aspects of geological science into a unified theory of the evolution and continuing dynamic behavior of the earth. 4 hours.
- 102. History of the Earth.** Primarily intended for nonconcentrators in geology. History of the earth from the physical and biological points of view; methods of determining earth history. One-day field trip may be required. 4 hours.
- 105. Geology of Energy.** For nonconcentrators in geology. Geological constraints on the exploitation and utilization of fossil fuels, nuclear fuels, wind and water power, tidal energy and other energy sources; principles of estimating energy resources and their effect on economic and social planning; environmental problems of energy use; and other economic, social and political concerns. 3 hours.
- 107. General Geology, I.** Introductory course for science and science-oriented students. Concerned with the chemical and physical aspects of the earth, development of methods for investigating geologic problems, and a survey of the more significant observations and interpretations. Field trip required for geology concentrators, recommended for others. 4 hours.
- 108. General Geology, II.** Primarily intended for science and science-oriented students. Considers origin of the solar system and earth, origin of life, climatic changes, and other documented and inferred events of major and evolutionary significance during the past 5000 million years as well as predictable future events. Field trip required. Prerequisite: Geology 107 or consent of instructor. 4 hours.
- 111. The Dynamic Earth (Honors).** Study of the geological history and evolution of the earth, the formation of mountains and ocean basins, the making of continents and earth environments and resources. A four day field trip will be open to students. Course in the campus Honors Program. Credit may not be received for both Geology 111 and Geology 101, 107, or 142. 4 hours.
- 115. Regional Field Study.** Field observations in a region of diverse geology. One- to two-week field trip. Credit is given only on completion of a satisfactory written report. Prerequisite: Any one of Geology 101, 102, 107, or 250; or consent of instructor. 2 hours.
- 142. The Dynamic Earth and Society.** Emphasizes the relationship of society to the dynamic evolution of the earth, risks, earth environments, and earth resources. 3 hours.
- 143. History of Life.** A survey of the 3 1/2 billion year history of the evolution of life; basic geological principles that guide the study of this history. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Geology for Engineers.** Physical geology with an emphasis on those aspects of the natural environment which are of importance to the engineer. Prerequisite: Theoretical and Applied Mechanics 150 or 152; sophomore standing in the College of Engineering. 3 hours.
- 290. Individual Study. Research and individual study in geology.** Prerequisite: Geology 108 or equivalent; consent of supervising faculty member. 1 to 4 hours. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
- 291. Individual Honors Study.** Research and individual study in geology for honors credit. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member and of departmental honors advisor. 1 to 4 hours. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
- 292. Senior Thesis.** Research in geology, with thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member. 2 to 8 hours. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Research in geology with honors thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member

and of departmental honors advisor. 2 to 8 hours. A maximum of 10 hours of Geology 291 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)

301. **Geomorphology.** History, origin, and characteristics of land forms produced by fluvial, glacial, wind, and wave erosion or by a combination of these acting upon the major kinds of geologic materials and structures. Lectures, laboratory, and field trips. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
304. **Soil Geomorphology.** Same as Geography 304. See Geography 304.
306. **Fluvial Geomorphology.** Same as Geography 306. See Geography 306.
307. **Periglacial Geomorphology.** Same as Geography 307. See Geography 307.
309. **Sedimentology and Sedimentary Geology.** Introduces the dynamics of sedimentation and the geology of sedimentary basins. Topics include sediment entrainment, flow regime, bedforms, descriptive sedimentology, sedimentary facies, vertical sequences, depositional systems, anoxic sedimentation, cratonic sequences, sea level and seismic stratigraphy, global sedimentary cycles, basin classification, geodynamics of basins, sedimentary tectonics. Prerequisite: Geology 108; credit or concurrent registration in Geology 311 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
310. **Field and Laboratory Procedures in Sedimentology.** Introduction to the field and laboratory study of Holocene sediments and sedimentary rocks, with emphasis on field sampling, sieve-size analysis, peel making of unconsolidated sediments and sedimentary rocks, x-ray radiography, disaggregation of sediments, heavy mineral analysis, mineral identification by staining, pH-Eh determinations, and thin-section preparation. Required field work. Prerequisite: Geology 108 or consent of instructor; concurrent registration in Geology 309. 1 hour or $\frac{1}{4}$ unit.
311. **Structural Geology.** Rock deformation and its results. Lectures, laboratory, and required field trip. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
315. **Field Geology.** Field mapping or study in a selected area of a specific geologic problem; involves preparation of a geologic map and/or report. Prerequisite: Geology 108 or equivalent; consent of instructor. 2 to 8 hours, or $\frac{1}{2}$ to 2 units.
317. **Field Geology in the Rocky Mountains.** Field course conducted in the Rocky Mountains; introduction to field techniques, geologic mapping, and field training in stratigraphy, petrology, structure, and geomorphology. Offered in summer session only. Prerequisite: 8 hours of 300-level credit in geology, including Geology 321 or 332; or consent of instructor. 8 hours or 2 units.
320. **Introduction to Paleontology.** A survey of the principles of paleontology and the major invertebrate groups; includes how fossils are studied, taxonomy, functional morphology, evolution, paleoecology, paleobiogeography, and biostratigraphy. Lectures, laboratory, and required field trip. Prerequisite: Any one of Geology 102 or 108, or Ecology, Ethology, and Evolution 320; or consent of instructor. 4 hours or 1 unit.
321. **Principles of Stratigraphy.** Definition, description, and correlation of stratigraphic units; facies analysis, environmental interpretation, and historical inference; and laboratory work, including analysis of samples from the subsurface, interpretation of geophysical logs, and seismic stratigraphy. Emphasizes practical applications, especially to mineral fuel exploration and exploitation; required field trip. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
325. **Paleobotany.** Same as Plant Biology 325. See Plant Biology 325.
332. **Mineralogy-Petrology.** Introduction to the structure, chemistry, and stability of the major silicate minerals and their occurrence in rocks; required field trip. Prerequisite: Geology 108 or consent of instructor; Chemistry 102 or 108. 4 hours or 1 unit.
335. **Optical Mineralogy.** Study of crystalline matter, especially minerals, by polarized light microscopy and powder x-ray diffractometry. Prerequisite: Geology 332, and at least Physics 101 or 106. 4 hours or 1 unit.
338. **Introduction to Sedimentary Petrography.** Introduction to the microscopic study of sedimentary rocks in thin section with emphasis on their textural properties as a basis for their classification and environmental interpretation. Prerequisite: Geology 335. 4 hours or 1 unit.
350. **Introduction to Geophysics.** Introduction to basic concepts related to the physics of the earth's interior; includes formation and composition, gravity and shape, seismology,

heat flow and internal temperatures, magnetism, rheology, and plate tectonics. Prerequisite: Mathematics 242 and Physics 107. 4 hours or 1 unit.

- 351. Geophysical Prospecting.** Same as Mining Engineering 351. Principles of geophysics and their application to mining processes. Prerequisite: Senior standing in engineering or geology, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 355. Introductory Groundwater Hydrogeology.** An introduction to fluid flow and transport in the subsurface; topics include the geology of groundwater, regional groundwater flow, petroleum migration, formation of economic ores, and water-rock interaction. Prerequisite: Mathematics 120 or 135. 4 hours or 1 unit.
- 357. Glacial Geology.** Consideration of glacial processes, materials and landscapes, stratigraphic analysis of glacial deposits and the mid-continent Pleistocene glacial succession; field trip and required field work. Prerequisite: Geology 107 or consent of instructor. 4 hours or 1 unit.
- 360. Chemistry of the Earth.** Fundamental chemical and physical concepts applied to surficial and internal geologic processes. Topics include origin, distribution, and geochemical behavior of elements; use of stable and radiogenic isotope variations; equilibrium consideration; chemical evolution of the earth and geochemical cycles. Prerequisite: Geology 101 or 107, and Chemistry 102, and Mathematics 132; or consent of instructor. 4 hours or 1 unit.
- 370. Oceanography.** An investigation of the principal factors which control the origin and physiography of ocean basins, the composition and distribution of marine sediments, the composition and dynamics of ocean water. Prerequisite: Geology 101 or 107, and Chemistry 101, and Mathematics 120; or consent of instructor. 4 hours or 1 unit.
- 397. Special Topics in Geology.** Seminar or lectures in subjects not covered by regular course offerings; for advanced undergraduates and graduate students. See Timetable for current offerings. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 401. Physical Geochemistry, I.** Introduction to geochemistry providing the background needed for more advanced courses in geochemistry, petrology, and mineralogy; topics, with geochemical examples, include classical thermodynamics, statistical thermodynamics, reaction kinetics, aqueous geochemistry, solid-state chemistry, and the theory of phase transformations. Prerequisite: Chemistry 101, 102 and Mathematics 242; or equivalent, or consent of instructor. 1 unit.
- 402. Physical Geochemistry, II.** Introduction to geochemistry providing the background needed for more advanced courses in geochemistry, petrology, and mineralogy. Topics, with geochemical examples, includes classical thermodynamics, statistical thermodynamics, reaction kinetics, aqueous geochemistry, solid-state chemistry, and the theory of phase transformations. Prerequisite: Geology 401 or consent of instructor. 1 unit.
- 403. Physical Systems in Landform Analysis.** Same as Geography 403. See Geography 403.
- 415. Advanced Field Geology.** Field mapping or study in a selected region. Requires preparation of a geological map and/or report. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 420. Paleocology.** Interpretation of life habit of fossil organisms from skeletal morphology and associated depositional features; reconstruction of marine ecosystem relationships from the study of assemblages of fossils. Prerequisite: Geology 320 or equivalent. 1 unit.
- 421. Topics in Paleontology.** Selected topics in macro- and micropaleontology. Intensive study of a selected invertebrate or algal group; special problems in the taxonomy, evolution, skeletal diagenesis, ecology, biogeography, and biostratigraphy of selected fossil organisms. Prerequisite: Geology 320, Ecology, Ethology, and Evolution 320, or consent of instructor. 1 unit. May be repeated.
- 422. Advanced Stratigraphic Geology.** Application of stratigraphic principles and techniques to solution of a selected geologic problem or problems. Selected problem may be in the area of regional stratigraphy, historical inference, or applied geology. Prerequisite: Consent of instructor. 1 unit.
- 431. Structural Mineralogy.** Crystal chemistry of minerals and survey of current knowledge

about the structures and properties of selected minerals and mineral groups. Prerequisite: Consent of instructor. 1 unit.

- 432. Sedimentary Geochemistry.** Equilibrium assemblages among the principal organic and inorganic sedimentary solids and their associated liquids during weathering, deposition, and diagenesis; kinetics and mechanism of phase changes; and transport processes during diagenesis. Prerequisite: Geology 360 or equivalent, or consent of instructor; some background in physical chemistry desirable. 1 unit.
- 433. Isotope Geology.** Introduction to the theoretical basis for isotopic fractionation in nature; survey of isotopic variations in natural materials; and application of isotopic variations to problems of geological and environmental significance. Prerequisite: Consent of instructor. 1 unit.
- 434. Theoretical Petrology.** Use of thermodynamic and kinetic arguments in the solution of basic petrological problems. Prerequisite: Consent of instructor. 1 unit.
- 435. Igneous and Metamorphic Petrology.** Application of chemistry and physics to the study of crystalline rocks, with emphasis on the integration of theory with field and laboratory observations; topics selected on the basis of student interest and training. Prerequisite: Geology 336. 1 unit. May be repeated.
- 437. Basin Analysis and Sedimentary Geology.** Examines contemporary aspects of tectonics and sedimentation, cratonic sequences, seismic stratigraphy, geologic history of sea level, isotope chronostratigraphy, anoxic sedimentation, pelagic deposition, transgressive-regressive sequences, rates of sediment accumulation, sediment yield, maturation of organic sediments, global sedimentary cycles, basin classification, basin geodynamics, and examples of basin analysis. Prerequisite: Geology 309, 311, 350, 360 and 477; or equivalent; or consent of instructor. Consent of instructor required for students from other departments. 1 unit.
- 438. Sedimentary Petrography.** Microscopic study of sedimentary rocks in thin section with emphasis on detailed classification and genetic interpretation of carbonates. Prerequisite: Geology 335 or consent of instructor. 1 unit.
- 439. Carbonate Sedimentology.** Study of genesis and diagenesis of carbonate sediments covering: carbonate deposition, coordination of ultrastructural-petrographic properties and elemental-isotopic composition, nature and environments of diagenetic changes, and temporal trends in carbonates. Prerequisite: Geology 320 and 338, or equivalent; or consent of instructor. 1 unit.
- 444. Depositional Models for Petroleum Exploration.** Analysis and integration of stratigraphic, petrographic, and geochemical features of all types of sedimentary rocks into depositional models; application of these models to basin analysis and in particular to exploration for oil and gas reserves. Prerequisite: Geology 338 or 438, or consent of instructor. 1 unit.
- 450. Principles of Engineering Geology.** Study of the effects that lithology, weathering, joints, faults, and ground water have upon engineering projects; the description and origin of geologic factors and their significance in the design, construction, and performance of civil engineering undertakings. Field trip or term paper required. Prerequisite: Geology 250 or equivalent, or consent of instructor. 1 unit.
- 451. Practice of Engineering Geology.** Review of modern geotechnical exploration techniques (borings, downhole logging, surface geophysics, and remote sensing) and study of case histories illustrating the influence of significant geologic features on exploration design, construction, and performance of civil engineering projects. Field trip or term paper required. Prerequisite: Geology 450 and Civil Engineering 383, or consent of instructor. 1 unit.
- 455. Hydrogeology.** Geology of the occurrence, storage, movement, and quality of water in the rocks of the earth's crust. Prerequisite: Consent of instructor. 1 unit.
- 457. Quaternary Geology.** Consideration of the Quaternary Period, its definition, stratigraphic and fossil records, and correlations; introduces climatic considerations. Prerequisite: Geology 357 or consent of instructor. 1 unit.
- 461. Mineralogy of Clays.** Same as Ceramic Engineering 461. Composition of various types of clays; the structure and properties of the clay minerals; and the origin and

mode of occurrence of the clay minerals and clay materials. Field trip required. Prerequisite: Geology 336 or equivalent; consent of instructor. 1 unit.

- 462. Petrology of Clay Minerals.** Same as Ceramic Engineering 462. Origin and occurrence of clay minerals in natural and synthetic systems such as the weathering, sedimentary, burial diagenetic, and hydrothermal environments; quantitative X-ray diffraction analysis of mineral assemblages from each environment; advanced analytical techniques such as nuclear magnetic resonance and transmission electron microscope analysis of clay minerals. Prerequisite: Geology 461. 1 unit.
- 468. Microbeam Analysis.** Covers the theory and practice of scanning electron microscopy (SEM) and quantitative electron microprobe analysis with emphasis on geological applications; laboratory work utilizes both the SEM and an automated microprobe equipped with wave-length dispersive and energy dispersive spectrometers, and also covers specimen preparation. Prerequisite: Consent of instructor and endorsement of research advisor. $\frac{1}{2}$ unit. May be repeated as topics vary; students may register for two different topics in the same semester. Maybe repeated to a maximum of 1 unit.
- 477. Recent Sedimentary Environments.** Review of sedimentary processes, physical sedimentary parameters, and sedimentary mineralogy in fluvial, lake, dune, beach, barrier island, bar, deltaic, tidal flat, lagoonal, bay, marsh, continental shelf, continental margin, submarine canyon, and deep ocean floor environments; sedimentological aspects of predicting occurrences of oil, natural gas, coal, uranium, and metalliferous deposits in ancient analogs of these environments; and sedimentological aspects of land usage, and conservation and preservation of man's environment. Prerequisite: Geology 437 or consent of instructor. 1 unit.
- 480. Mathematical Methods in Geology.** Introduction to and application of the mathematical topics utilized in the geological sciences. Prerequisite: Mathematics 242, or equivalent. 1 unit.
- 488. Advanced Structural Geology.** Analysis of geologic deformation based upon the principles of mechanics and utilizing research data from laboratory and field investigations; methods in structural analysis. Prerequisite: Geology 311 or consent of instructor. 1 unit.
- 489. Geotectonics.** Nature and distribution of major earth structures and geological and geophysical evidence bearing on their origin. Prerequisite: Geology 311 or consent of instructor. 1 unit.
- 493. Advanced Studies in Geology.** Work may be taken in the following fields: (a) general geology; (b) engineering geology; (c) geomorphology and glacial geology; (d) clay mineralogy; (e) ground-water geology; (f) micropaleontology; (g) mineral deposits; (h) mineralogy and crystallography; (i) paleontology; (j) geochemistry; (k) geophysics; (l) petrography and petrology; (m) sedimentology; (n) stratigraphy; (o) oceanography; (p) submarine geology; (q) structural geology and geotectonics; (r) mathematical geology; (s) sedimentary petrography; (t) petroleum geology; (u) coal geology; (v) isotope geology and geochronology; (w) electron beam analysis; (x) vulcanology; (y) environmental geology; and (z) planetology. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** Individual research under supervision of members of the faculty in their respective fields. 0 to 4 units.

GERMANIC LANGUAGES AND LITERATURES

(Including German, Germanic, and Scandinavian)

Head of Department: J. M. McGlathery

Department Office: 3072 Foreign Languages Building, 707 South Mathews, Urbana

German

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. Elementary Course.** Oral practice, reading, and grammar for beginners. 4 hours.
- 102. Elementary Course.** Continuation of German 101. Prerequisite: One semester of college German or equivalent. 4 hours.
- 103. Intermediate Course.** Continuation of German 102. Prerequisite: Two semesters of college German or equivalent. 4 hours.
- 104. Intermediate Course.** Continuation of German 103. Prerequisite: Three semesters of college German or equivalent. 4 hours.
- 113. Intermediate Speaking.** Practice in speaking idiomatic German; emphasis on spontaneous expression. Prerequisite: Two semesters of college German or equivalent. 4 hours.
- 114. Intermediate Speaking.** Continuation of German 113. Prerequisite: Three semesters of college German or equivalent. 4 hours.
- 124. Intermediate Reading.** Practice in reading German, with emphasis on expository prose. Prerequisite: Three semesters of college German or equivalent. 4 hours.
- 153. Practice in Conversation.** Emphasis on learning to converse in German in an everyday manner. Prerequisite: Two semesters of college German or equivalent. 2 hours.
- 161. German Masterpieces in Translation I: The Middle Ages Through Classicism.** Introduces major works of German literature in English translation from the beginnings through the eighteenth century. Texts and lectures in English; not open to students concentrating in German. 3 hours.
- 162. German Masterpieces in Translation II: Romanticism to the Present.** Introduces major works of German literature in English translation from the nineteenth and twentieth centuries. Texts, discussions, and lectures in English; not open to students concentrating in German. 3 hours.
- 189. Living German—German Living.** Practice in speaking German for students living in the German House. Prerequisite: Elementary speaking knowledge of German. 1 hour. May be repeated to a maximum of 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. German Literature in Translation.** Same as Comparative Literature 224. Introduction to German literature for students with no knowledge of German. 3 hours. May be repeated as topics vary.
- 211. Conversation and Writing.** Prerequisite: German 104 or equivalent, or consent of instructor. 3 hours.
- 212. Conversation and Writing.** Continuation of German 211. Prerequisite: German 211 or equivalent, or consent of instructor. 3 hours.
- 215. German for Technology and Management.** German language course to meet the needs of students preparing for a career in the sciences: surveys history and organization of scientific research and technology in Germany; assimilates terminology of specific technical fields. Prerequisite: German 104 or equivalent; or consent of instructor. 3 hours.

- 220. German for Business.** Introduces German business language as used in basic operations in retail/wholesale, export/import, banking transactions. Prerequisite: German 104 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 221. German for Economics.** German language as used in professional contexts involving economic matters: texts and documents relating to forms of enterprises and their financing, to macroeconomic structures of domestic and foreign trade, and to reports on the economies of German-speaking countries. Prerequisite: German 104 or consent of instructor. 3 hours.
- 225. German-Speaking Europe Today.** Examines contemporary civilization and culture in the German-speaking countries of Europe, including reference to historical, political, and economic developments. Not open to German concentrators or German teacher trainees. 3 hours.
- 231. Introduction to German Literature, I.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Eichendorff, Buechner, Wedekind, Schnitzler, T. Mann, Borchert, Frisch, and Boell. Prerequisite: Two years of college German or equivalent. 3 hours.
- 232. Introduction to German Literature, II.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Storm, Keller, Hauptmann, Kaiser, Kafka, Brecht, and Duerrenmatt. Prerequisite: German 231 or equivalent. 3 hours.
- 270. Parateaching.** Same as French, Latin, Russian, and Spanish 270. See French 270.
- 279. Introduction to Foreign Language Education.** Same as French, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
- 280. Teachers' Course.** Introduction into the problems of the teaching of German and a study of textbooks. Prerequisite: Senior standing or consent of instructor. 4 hours.
- 293. Honors Senior Thesis.** Intended primarily for candidates for honors in German, but open to other seniors. Prerequisite: Senior standing; consent of instructor. 2 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
- 296. Special Topics in German Literature.** Same as Comparative Literature 228. Introductory study in such topics as individual authors, selected literary movements or periods, modes of inquiry in literary study, minor genres, subgenres, extraliterary influences, etc. Prerequisite: Reading fluency in German beyond the fourth-semester college level. 3 hours.
- 299. Study Abroad.** Lectures, seminars, and practical work in German language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: German 211 or equivalent; 3.75 overall average; 4.0 average in German courses. 0 to 17 hours. May be repeated to a maximum of 34 hours per academic year.
- 301. Advanced Conversation, Composition, and Syntax.** Intensive study of advanced problems of grammar, syntax, and style. Prerequisite: German 211 and 212, or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 302. Advanced Conversation.** Practice in free conversation with a native speaker. Prerequisite: German 301 or equivalent. 1 hour or 0 units.
- 303. Translation in Theory and Practice.** Theory and practice of translating technical, commercial, scientific, and literary texts from German into English and vice versa. Prerequisite: German 301 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 311. German Literature 750-1450.** Literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 750 to 1450. Prerequisite: German 232 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 312. German Literature 1450-1770.** A literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 1450 to 1770. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 320. History of German Civilization.** Selected topical, historical, and pictorial analysis of Germany's culture and civilization. Prerequisite: German 232 or equivalent. 4 hours or $\frac{3}{4}$ unit.
- 330. Modern German Poetry.** Same as Comparative Literature 323. A poetical and metri-

- cal survey of modern German lyric verse. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 331. The German *Novelle*.** A study of the development of the German *Novelle* as a genre, together with reading and discussion of *Novellen* from Goethe to Grass. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. German Drama.** German drama from the classical to the modern period; selected works of representative playwrights, such as Lessing, Goethe, Schiller, Kleist, Grillparzer, Hebbel, Buechner, Hauptmann, Kaiser, Brecht, Frisch, Weiss, and Mueller. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 335. Literature and Culture of the German Democratic Republic.** History, politics, and literature of the German Democratic Republic. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 341. Martin Luther.** Same as Religious Studies 341. Special attention to Luther as an artist, and to his importance for the development of German language and literature; attention also paid to the historical and intellectual trends of the fifteenth and sixteenth centuries as well as to the significance of Luther in modern psychological and sociological thought. Prerequisite: A reading knowledge of German. 3 hours or $\frac{3}{4}$ unit.
- 342. Goethe.** Introduction to Goethe's life and works. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 343. Goethe's *Faust*.** Intensive study of Goethe's *Faust*, Parts I and II, with an examination of the theme's evolution in literature. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 360. Principles of Language Testing.** Same as English as a Second Language, French, and Spanish 360. See English as an International Language 360.
- 365. Structure of the German Language, I (Phonology and Morphology).** Introductory survey of the phonological and morphological structure of the German language. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 366. Structure of the German Language, II (Syntax).** Introduction to German syntax; theory and practical applications. Prerequisite: German 365 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, Humanities, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 387. Introduction to Myth and Folklore.** Same as Comparative Literature, English, Slavic, and Speech Communication 387. See English 387.
- 390. The German Cinema.** History and criticism of the German film from its beginnings through Expressionism and the New Objectivity of the 1920s, the Third Reich and the period of decline, to the young German film of the 1960s; weekly film screenings, lectures, and discussions. Knowledge of German useful but not required. 3 hours or $\frac{3}{4}$ unit.
- 396. Special Topics in German Studies.** Intensive study of restricted topics in German language, literature and culture. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit. May be repeated as topics vary up to a maximum of 9 hours or 2 $\frac{1}{4}$ units.
- 400. Beginning German for Graduate Students.** Introduction to the reading of German texts in the sciences and the humanities. 4 hours. No graduate credit.
- 401. Readings in German for Graduate Students.** Designed for graduate students preparing for the German reading requirements for the Ph.D. Prerequisite: German 400 or equivalent. 4 hours. No graduate credit.
- 410. Introduction to Graduate Study.** Bibliography and methodology of the study of the Germanic languages and literatures, with particular regard to German literature and Germanic linguistics; introduction to scholarship in general and the German profession in particular, including the modes and methods of scholarly endeavor. 1 unit.
- 415. Middle High German.** Prerequisite: German 365. 1 unit.
- 420. History of the German Language.** The internal and external history of German from prehistoric times to the present. Prerequisite: German 365 or equivalent. 1 unit.

- 430. Old High German.** Grammar and interpretation of the oldest literary documents. Prerequisite: German 365. 1 unit.
- 440. Middle High German Literature.** Prerequisite: German 415 or equivalent. 1 unit.
- 441. German Romanticism.** Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 442. Nineteenth-Century German Realism.** German realism as manifested in the literature between romanticism and naturalism, with emphasis on so-called poetic realism. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 444. The Eighteenth Century before Goethe.** The Enlightenment and the development of the classical ideal; emphasizes the work of Gottsched, Lessing, Wieland, Klopstock, and Herder. Prerequisite: German 312 or equivalent. 1 unit.
- 451. Naturalism, Symbolism, and Expressionism.** Same as Comparative Literature 441. Comparative analysis of German literature from the 1880s to the 1920s within the European context. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 452. German Literature from the Twenties to the Present.** Trends, problems, and personalities in recent German literature, including exile literature and literature of the Third Reich. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
- 460. Seminar in Older German Literature.** Topics range from the earliest known literature to the Enlightenment. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
- 461. Seminar in Modern German Literature.** Same as Comparative Literature 482. Topics range from the Enlightenment to the present. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
- 463. College Teaching of Foreign Languages.** Same as French, Russian, Spanish, and English as a Second Language 463. See French 463.
- 480. Teaching German in College.** Introduction to the problems of teaching German in college. $\frac{1}{2}$ unit.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, Russian, Spanish, and English as a Second Language 481. See French 481.
- 493. Research in Special Topics.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

Germanic

- 367. Introduction to Germanic Linguistics.** Same as Linguistics 367. Comparative and historical survey of the Germanic languages. Prerequisite: Completion of the foreign language requirement in the College of Liberal Arts and Sciences, or equivalent; some knowledge of German desirable. 3 hours or $\frac{3}{4}$ unit.
- 426. Gothic.** Synchronic and diachronic study of the Gothic language and its relationship to other Germanic and Indo-European languages; extensive reading of extant texts. Prerequisite: Germanic 367 or consent of instructor. 1 unit.
- 462. Seminar in Germanic Linguistics.** Varying topics dealing with problems in diachronic and synchronic Germanic linguistics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated as topics vary.
- 465. Comparative Germanic.** Reconstruction of the phonological and morphological systems of Proto-Germanic and their development into the Germanic languages and dialects. Prerequisite: Germanic 426 or consent of instructor. 1 unit.
- 467. Runic Inscriptions.** Detailed analysis of inscriptions in the "older" Germanic futhork, the Anglo-Frisian futhorc, and the Scandinavian "younger" futharks; their relationships and the correlation between phonological and orthographic developments. Prerequisite: Germanic 465 or consent of instructor. 1 unit.

Scandinavian

- 101. Elementary Scandinavian, I.** The first of four semesters leading to a reading knowledge of Danish, Norwegian, or Swedish, and to an oral command of one of these languages; linguistic structure, reading, and oral practice. 4 hours.
- 102. Elementary Scandinavian, II.** Continuation of Scandinavian 101. Oral practice and reading of simple texts. Prerequisite: Scandinavian 101. 4 hours.
- 103. Intermediate Scandinavian, I.** Readings in Danish and Norwegian, or in Swedish; structure of Swedish, or of Danish and Norwegian. Prerequisite: Scandinavian 102 or equivalent. 4 hours.
- 104. Intermediate Scandinavian, II.** Continuation of Scandinavian 103. Readings in classical and modern Danish, Norwegian, and Swedish texts. Prerequisite: Scandinavian 103. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 215. The Scandinavian Novel: Masterpieces in English Translation.** Same as Comparative Literature 215. Works by Jacobsen, Strindberg, Vesaas, Myrdal, and Nobel Prize winners Hamsun, Undset, Lagerkvist, and Johnson; readings and discussion in English. 3 hours.
- 251. Germanic Mythology.** Studies pre-Christian beliefs of the Germanic peoples as reflected primarily in medieval Icelandic prose and poetry (in translation). 3 hours.
- 252. Icelandic Sagas in Translation.** Same as Comparative Literature 252. Studies Old Norse-Icelandic literature: kings' sagas, family sagas, mythical-heroic sagas, and romances. Texts and lectures in English. 3 hours.
- 293. Honors Senior Thesis.** Prerequisite: Senior standing; consent of instructor. 1 to 2 hours. (Counts for advanced hours in LAS.)
- 361. Ibsen in Translation.** Same as Comparative Literature 326. Dramas in English translation; selected works of Ibsen's Scandinavian contemporaries. 3 hours or 1 unit.
- 362. Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Comparative Literature 327. Major dramas and prose works of August Strindberg; selected plays by Kaj Munk, Kjeld Abell, Nordahl Grieg, and Par Lagerkvist. 3 hours or 1 unit.
- 390. The Films of Ingmar Bergman.** Focuses on Bergman's major films of the late 1950s and 1960s; involves reading screenplays and extensive criticism in addition to viewing the films; and includes important artistic influences on Bergman as well as his own significance as a major twentieth-century artist. Knowledge of Swedish unnecessary. 3 hours or $\frac{3}{4}$ unit.
- 396. Special Topics in Scandinavian Studies.** Individual study in selected topics, such as individual authors, literary movements, periods, genres, or themes, and Scandinavian culture. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated.
- 405. Old Norse-Icelandic, I.** Grammar and selected readings. 1 unit. Offered in alternate years.
- 406. Old Norse-Icelandic, II.** Readings: selections from the Elder Edda and the sagas. Prerequisite: Scandinavian 405. 1 unit. Offered in alternate years.

GRAPHIC DESIGN

(See Art and Design)

HEALTH AND SAFETY STUDIES

Head of Department: R. W. Armstrong

Department Office: 121 Huff Hall, 1206 South Fourth, Champaign

- 100. Contemporary Health.** Examines concepts of health and health promotion in contemporary society with emphasis on health and safety of individuals. Topics include: mental health and stress; exercise, nutrition and weight control; disease; sexuality; aging; environmental health; drugs, tobacco, and alcohol; and consumer health. 3 hours.
- 101. Introduction to Public Health.** Introduction to the nation's public health system; includes an overview of historical roots and organizational structure, basic research tools, concepts and scope of varied public health programs, topical treatment of major contemporary health and safety problems. 3 hours.
- 111. Professional Seminar.** Orientation to department; current views and issues in health and safety fields; career opportunities, and other related topics. 0 hours.
- 121. First Aid.** American Red Cross standard course in first aid. 2 hours.
- 140. Health Advocate, I.** Provides an overview of current college student health issues and concerns, knowledge of the University of Illinois health care delivery system and an understanding of medical self care; develops skills in communication and referral techniques enabling students to be advocates for members of their living units. 2 hours.
- 141. Health Advocate, II.** Provides direct experiences in peer education and basic community health program planning including needs assessment and evaluation. Students plan and implement one campus-wide health promotion activity. Includes CPR certification. Prerequisite: Health and Safety Studies 140. 2 hours.
- 143. Drug Use and Abuse.** Introduction to the biological, psychological, pharmacological, and legal aspects of drug use and abuse; surveys community and university resources concerned with drug use and abuse; emphasizes personal and social actions for responsible drug use. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Mental Health.** Introduction to the science of mental health and illness including personality development, the genesis and manifestations of mental illness, and the maintenance of mental health; taught by a psychiatrist with emphasis on the preventive and medical aspects of mental health. 2 hours.
- 204. Foundations of Health Behavior.** Examines the application of the social and behavioral sciences to health and health behavior; analyzes psychological, social psychological, and sociological approaches to health behavior. Topics include the development of health attitudes and behaviors, perceptions of health and illness, methods of changing health behavior and patient-provider interaction. Prerequisite: Health and Safety Studies 100. 3 hours.
- 206. Human Sexuality.** Emphasizes the behavioral aspects of human sexuality. Topics include: birth control; prenatal care, pregnancy and childbirth; sex roles; premarital sex; lifestyles; marriage and divorce. 2 hours.
- 210. Health Program Development.** Presents the elements of program development and planning as they pertain to various health settings including health care facilities, community agencies, and the school community; places special emphasis on student skills in developing example program plans pertinent to the student's area of interest. Prerequisite: Health and Safety Studies 100 and 101. 3 hours.
- 225. Sexuality Program Development.** Examines theory and practice in the planning, implementation, and evaluation of sex education and sexuality programs in various settings; current topics and issues; students complete an individual planning project. Prerequisite: Health and Safety Studies 100 and 210. 2 hours.
- 240. Health Promotion Practicum.** Preparation and presentation of lifestyle workshops to campus community groups. Practica selected from one or more of the following topics: nutrition, fitness, chemical education, sexuality, or stress management. Prerequisite: Junior standing, or consent of instructor. 3 hours.

- 243. Drug Education Planning.** Development of curricula and education program strategies for management of drug use and abuse; evaluation of current school and community responses to drug use and abuse; pharmacological, psychosocial and legal aspects of drugs including tobacco, alcohol, medications, and illicit drugs. Prerequisite: Credit or concurrent registration in Health and Safety Studies 210. 2 hours.
- 266. Tomorrow's Environment.** Same as Environmental Studies 236. See Environmental Studies 236.
- 274. Introduction to Epidemiology.** Provides an overview of the basic concepts, principles, and methods of epidemiology; emphasis on the application of epidemiology to health education, health services administration and planning, health policy, and environmental health. Prerequisite: Health and Safety Studies 100 and 101, or consent of instructor. 2 hours.
- 284. Community Health Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in community health with work experience in actual field situations. Students work for 12 weeks in University-approved health agencies for a minimum of 480 hours. Prerequisite: Senior standing in health and safety studies and consent of instructor. 8 hours.
- 285. Health Planning and Administration Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in health planning and administration with work experience in actual field situations. Students work for 12 weeks in University-approved health agencies for a minimum of 480 hours. Prerequisite: Senior standing in health and safety studies and consent of instructor. 8 hours.
- 290. Honors Seminar.** Same as Kinesiology 290 and Leisure Studies 260. See Kinesiology 290.
- 293. Special Projects.** Special projects in research and independent investigation in any phase of health, physical education, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser and instructor, and approval of the head of department. 2 or 3 hours. May be repeated for a total of 4 or 6 hours.
- 303. Delivery of Health Care: Problems and Perspectives.** Same as Social Work 303. See Social Work 303.
- 310. Public Health Practice.** Theory and practice of public health promotion as they relate to educational approaches in solving community health problems. Prerequisite: Health and Safety Studies 210, or consent of instructor. 4 hours or 1 unit.
- 312. Health and Safety Education in the Elementary School.** Overview of the school health program to acquaint the teacher with modern concepts of health and safety education in the elementary school; consideration of the role of the classroom teacher in understanding and meeting the health needs of children; and focus on the legal requirements for Illinois schools, major health and safety problems of elementary children, the teacher's role in the school health program, and methods and materials in teaching modern health and safety education. Prerequisite: Junior standing. 3 hours or 1/2 unit.
- 313. Curriculum Development in Nutrition Education.** Same as Vocational and Technical Education 353. See Vocational and Technical Education 353.
- 321. Health Data Analysis.** Introduces health data analysis, sources and uses of health data, collection techniques and classification procedures, commonly used health indices, techniques of rate adjustment, graphic presentation of data as it relates to the planning, conducting, and evaluating of public and school health education programs. Prerequisite: Educational Psychology 390 or equivalent. 3 hours or 1 unit.
- 329. Research and Evaluation in Health and Safety Studies.** A study of the research literature, research designs and program evaluation models employed in health and safety studies. Devotes special emphasis to developing student skills in analyzing research, assessing health behavior change and problem identification for thesis research. 2 hours or 1/2 or 1 unit.
- 341. Consumer Health.** A study of consumerism including advertising, purchasing, con-

sumer behavior and activation, medical economics and protection. Prerequisite: Health and Safety Studies 274 and senior or graduate standing. 2 hours, or $\frac{1}{2}$ or 1 unit.

- 356. The Organization of Health Care.** Same as Sociology 339. Examines types and performance of health care organizations (e.g., doctors' offices, clinics, hospitals, and nursing homes), networks of health services, evaluation of health care, and social policy issues relating to organizations in the U.S. health care system. Prerequisite: 6 hours of anthropology, sociology, health and safety studies, or psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. Health Planning.** Analysis of theory, principles and practices of health planning processes. Includes application of health planning as it relates to health systems agencies and the health care delivery system. Prerequisite: Health and Safety Studies 303, or consent of instructor. 2 hours, or $\frac{1}{2}$ or 1 unit.
- 358. Health Administration.** Examines management principles relative to health care institutions; emphasizing goal setting, decision making, system analysis, organizational structure, conflict resolution, and leadership theories. Prerequisite: Senior or graduate standing, or consent of instructor. 3 hours or 1 unit.
- 369. Environmental Health.** Appreciation of the concepts and mechanisms used to reduce or prevent environmental problems that may lead to infectious or environmentally-induced diseases; presents topics from a public health perspective which include water supply management, waste water treatment and disposal, radiation protection, pest control, and solid waste management. Prerequisite: Health and Safety Studies 274 or equivalent. 2 hours, or $\frac{1}{2}$ or 1 unit.
- 374. Principles of Epidemiology.** Same as Environmental Studies, Medical Sciences, and Veterinary Pathobiology 374. The epidemiology and natural history of infectious and noninfectious diseases, including integrated vector control and host resistance, and mental health and public health. Prerequisite: Microbiology 326, Veterinary Pathobiology 332, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 375. Geographical Epidemiology.** Same as Geography 372. Patterns of health and disease in place and time; time-space analysis and mapping; interrelations between health and population, behavior, and environment; sociocultural aspects; investigative examples from mid-latitude continental, oceanic, and tropical settings. Prerequisite: Health and Safety Studies 374, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 384. Community Health Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in community health with work experience in actual field situations. Students work for 12 weeks in a University-approved health agency. Prerequisite: Health and Safety Studies 303, 310, 321, 374 and 410; graduate standing in Community Health or consent of department. 8 hours or 2 units.
- 387. Epidemiology Internship.** Observation, study, and practical work in epidemiology under supervision in professional field situations. Students work for 8 or 12 weeks in a University approved agency or site. Prerequisite: Health and Safety Studies 374 and 375; graduate standing in Epidemiology or consent of department. 4 or 8 hours, or 1 or 2 units.
- 394. Special Topics.** Lecture-discussion course in topics of current interest; see Timetable for specific subjects. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 401. Issues in Health Education.** Analyzes current developments, trends, and controversies in health education from an historical perspective, with emphasis on developing student competencies for issue analysis; assesses the effect of philosophical, scientific, political, and legislative initiatives on professional practice; and examines issues affecting the health educator in various work settings, including occupational health and safety, patient care, public health, school health, and higher education. 2 or 1 unit.
- 407. Health Policy in the United States.** Comprehensive analysis of the policy process in health care in the United States; systematic and critical review of health policy development, implementation, and evaluation; impact of government at all levels and the role of providers, industry, labor, and consumer in health policy. Prerequisite:

Admission to graduate program in Health and Safety Studies, or consent of instructor. 1 unit.

- 410. Problems in Public Health Practice.** Basic facts and principles of public health at the local, state, and national levels, including the relationships between public health departments, voluntary health agencies, and the school health program. $\frac{1}{2}$ or 1 unit.
- 427. Statistical Techniques in Epidemiological Research.** Same as Environmental Studies 427 and Medical Sciences 463. Description and application of quantitative issues and statistical techniques prominent in the analysis of classification data arising from epidemiologic cohort or case-control aetiological studies; studies of preventive public health; and therapeutic clinical interventions. Confounding factors and methods of adjustment including standardization, stratified and matched analyses, and multiple logistic regression modelling are emphasized. Practice using available computing software for implementation is stressed. Prerequisites: Health and Safety Studies 374 and minimum of two statistics courses covering multiple regression and correlation. 1 unit.
- 440. Theories of Health Behavior.** Examines the philosophical and behavioral science foundations of health science; principles of the determinants of human behavior and relationships to health. Students develop a frame of reference for understanding, predicting, and facilitating change in human behavior. Prerequisite: Health and Safety Studies 310 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 441. Intervention Strategies in Health Science.** Advanced seminar for critical review of intervention strategies as studied from theoretical and practical perspectives; recent developments in the medical, surgical, community, school, and environmental arenas. Prerequisite: Health and Safety Studies 310 and 440, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 479. Seminar in Epidemiology.** Discussion of advanced topics in epidemiologic methods and research. Prepares students for thesis or dissertation research through study of selected literature and the completion of a research paper. Prerequisite: Health and Safety Studies 374 or equivalent. 1 unit.
- 490. Seminar for Advanced Students.** Critical evaluation of research studies in health and safety studies, emphasizing research methods and experiment design and analysis; review of statistical techniques in factorial and correlational studies; and student reports of thesis literature reviews and research procedures. Prerequisite: Master's thesis. $\frac{1}{2}$ unit. May be repeated to a maximum of 1 unit.
- 493. Special Projects.** Independent research on special projects. Prerequisite: Educational Psychology 390, Kinesiology 495, and Health and Safety Studies 440 or equivalent. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 2 units.
- 494. Special Topics in Health and Safety Studies.** Lectures on topics of current interest. $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** Preparation of theses in health and safety studies. 0 to 4 units.

HISTORY

Chairperson of Department: W. C. Widenor

Department Office: 309 Gregory Hall, 810 South Wright, Urbana

- 111. Western Civilization from Antiquity to 1660.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society before 1660; includes the Greek and Roman world, the German migrations, the rise of cities and the commercial revolution, medieval art, universities, and heresies, the Renaissance and Reformation, the Puritan Revolution, and the beginnings of the modern world. 4 hours.
- 112. Western Civilization from 1660 to the Present.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society since 1660; includes the rise of modern science, the French and Industrial revolutions, the Romantic movement, the growth of nationalism and socialism,

- imperialism, urban growth, the Russian Revolution, Nazi Germany, the world wars, and the West and the underdeveloped world. 4 hours.
- 131. History of England to 1688.** Survey of the political and constitutional, social and economic, church and cultural, and imperial history of the British people from the beginning of English history through the revolution of 1688. 4 hours.
- 132. History of England, 1688 to the Present.** Survey of the political and constitutional, social and economic, diplomatic and imperial, and cultural history of the British people from 1688 to the present. 4 hours.
- 147. Religion and Science.** Same as **Religious Studies and Sociology 102**. See Religious Studies 102.
- 151. History of the United States to 1877.** Colonial foundations, movement for independence, and early years of the republic. 4 hours. Students may not receive credit for both History 151 and either History 260 and 261.
- 152. History of the United States, 1877 to the Present.** A century of national life and organization. 4 hours. Students may not receive credit for both History 152 and 262.
- 168. Indian Civilization and Society.** Same as Anthropology 168. See Anthropology 168.
- 170. East Asian Civilizations: China, Japan, Korea.** Surveys the three major East Asian civilizations from ancient and classical times, through the period of Western intrusion, political revolution, and modernization, to the contemporary age and the emergence of East Asian superpowers. 3 hours.
- 172. Southeast Asian Civilizations.** Same as Anthropology and Asian Studies 186. See Anthropology 186.
- 173. Islamic History and Civilization in the Near and Middle East to 1700.** Development of Islamic beliefs, institutions, and culture in the nuclear Islamic region (the present area of the Arab countries and Israel, Iran, and Turkey) from Mohammed to the age of European expansion. 4 hours.
- 174. Islamic History and Civilization in the Near and Middle East Since 1700.** Islamic civilization since the age of European expansion; imperialism, Westernization, nationalism, and modernization. Arab countries, Israel, Iran, and Turkey are covered. 4 hours.
- 175. Latin America from Conquest to Independence.** Survey of Latin American history from the discovery of America to 1824. 3 hours. Credit is not given for both History 175 and 275.
- 176. Modern and Contemporary Latin America.** History of the Latin American republics from their independence to the present; emphasis on Argentina, Brazil, Chile, Colombia, Cuba, and Mexico. 3 hours. Credit is not be given for both History 176 and 275.
- 181. The Ancient World.** Ancient empires and Greece. 3 hours.
- 182. The Ancient World.** Rome. 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 198. Freshman Seminar.** Through research, reports, and discussion in a selected field of historical study, the seminar provides an in-depth understanding of the problems of that field and of the methodology of history as a discipline. Prerequisite: James Scholar standing or other designation as a superior student; consent of instructor. 3 to 4 hours. May be repeated to a maximum of 6 hours.
- 199. Undergraduate Open Seminar. 1 to 5 hours.** May be repeated.
- 203. The Age of Localism: The Early Middle Ages.** The failure of imperial Rome and the rise of the Church; the organization of European society on a local basis through manorialism and feudalism. 3 hours.
- 204. The Revival of Europe: The High and Later Middle Ages.** The revival of the economy; the expansion of Europe; and the rise of national states. 3 hours.
- 211. The Contemporary World: Political, Ideological, and International Forces.** Interpretation of the contemporary world covering the legacy of imperialism, militarism, and world politics, the revolt of the masses, the totalitarian state, nationalism, internationalism, and such related topics. 3 hours.

- 212. The Contemporary World: Economic, Social, and Cultural Aspects.** Interpretation of the contemporary world covering the economics of global power, ideological and social forces, the individual and the modern mind, the collective society, the personality in history, and such related topics. 3 hours.
- 213. The Third World in Contemporary History.** Surveys the years from the close of the nineteenth century to the present, specifically the developments in Africa, Asia, Latin America, and the Middle East that led to the emergence of the "Third World." 3 hours.
- 215. History of North and West Africa.** Survey of major themes and events in the history of North and West Africa from prehistoric times and the peopling of Africa through the advent of Islam; North and West African empires and states in the medieval period; the arrival and departure of European colonial powers; and the re-emergence of independent African states. 3 hours.
- 216. History of East and Southern Africa.** Survey of major themes and events from the Bantu migrations and the rise of Aksum through the development of states and empires, Islam, the expansion of trade, European colonial rule, nationalism, and the persistence of white domination in the south. 3 hours.
- 219. Survey of Russian History from Early Times to the Present.** Main themes and problems of Russian history from earliest times to the present. 3 hours.
- 222. Traditional China.** Historical background to the modern age, tracing the Chinese state and empire from the earliest times until 1644 A.D. Basic political, social, and economic patterns; cultural, intellectual, and technological achievements; and China's impact on Asia and the world. 3 hours.
- 224. Chinese Thought from Confucius to Mao.** Same as Religious Studies 224. Examination of China's principal philosophical, religious, and political schools of thought—such as Confucianism, Taoism, Zen Buddhism, and Maoism—as ways of understanding one of the world's major civilizations; the period of the classical philosophers, the glory years of empire, and the troubled era of western contact receive approximately equal attention. 3 hours.
- 230. Modern Business History.** Historical development of business enterprise from the early modern era to the present in broad international perspective; social and cultural values in business activity; business, government, and social responsibility; and theories of entrepreneurial behavior and detailed case studies of great business leaders. Prerequisite: Sophomore standing. 3 hours.
- 237. Contemporary Western Europe.** Same as Economics 237. An interdisciplinary approach to contemporary Western Europe; cultural, historical, economic, political, and social topics; and postwar issues, including economic recovery, position of Western Europe between the United States and the Soviet Union, economic and political integration, and current policy problems. Prerequisite: Sophomore standing. 3 hours.
- 247. Science in Western Civilization, I.** The intellectual and social history of science from antiquity through the Enlightenment; special emphasis on the scientific revolution of the seventeenth century. 3 hours.
- 248. Science in Western Civilization, II.** Topics in the intellectual and social history of modern science, 1789 to the present. 3 hours.
- 249. History of Medicine.** Rise and development of medicine in the West since the sixteenth century; interrelations of physiology, pathology, and social demands with the theory and practice of medicine; patterns of professionalization; social role of the physician; conflict among ideas of medicine as an art, a science, and a social service; and problems of mental illness, medical ethics, and nontraditional forms of practice. Prerequisite: One year of college biology or chemistry, one year of college history, or consent of instructor. 3 hours.
- 253. Afro-American History to 1877.** Same as Afro-American Studies 253. History of Africans in the Americas, surveying the African slave trade, slavery in the European colonies of the Americas, early United States slavery, and the Afro-American in the Civil War and Reconstruction. 3 hours.
- 254. Afro-American History Since 1877.** Same as Afro-American Studies 254. History

- of Afro-Americans in the age of white supremacy; the rise of modern protest organizations; the era of integration; and the black power movement. 3 hours.
- 255. New England, 1620-1789.** The founding of the New England colonies and their development through the period of the American Revolution. 3 hours.
- 260. Colonial Beginnings and Early United States History to 1815.** Social, economic, and political survey of the region and its relation to the evolving Atlantic community. Credit is not given for both History 260 and 151. 3 hours.
- 261. The United States in the Nineteenth Century.** History of the United States from 1815 to 1900. 3 hours. Credit is not given for both History 261 and 151.
- 262. The United States in the Twentieth Century.** One major emphasis on foreign policy, including the emergence of the United States as a great power after 1898; a second emphasis on the Progressive movement and recurrent attempts at the reform of American society; and racial and urban problems and the conservation of natural resources included. 3 hours. Credit is not given for both History 262 and 152.
- 265. Europe and the Romantic Revolution, 1770-1850.** Examines Romanticism as a basic psychological orientation that received its first elaborate cultural development and historical definition in the period indicated; treats various aspects of human activity, such as love, heroism, nature worship, morbidity, social idealism, and nationalism from the standpoint of the Romantic Movement. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 267. History of Korea.** Same as Asian Studies 267. See Asian Studies 267.
- 268. Religious Rebellions and Messianic Movements in History.** Same as Religious Studies 268. Comparative study of revolutionary religious movements from ancient times to the present. 3 hours.
- 272. History of Women in Europe, 1700 to the Present.** Same as Women's Studies 272. Focuses on the history of women in all social classes in Europe from pre-industrial times to the present; covers changes in attitudes towards women, female employment patterns, household roles and family lives, and women's political and social movements. 3 hours.
- 273. The History of American Women: Colonial Period to the Present.** Same as Women's Studies 273. Focuses on the changing legal, political, economic, and social status of women in the United States and the complex factors affecting change; includes a consideration of family life; and combines chronological and topical approaches. 3 hours.
- 274. United States and World Crisis, 1917 to Present.** History of American foreign relations since World War I. 3 hours.
- 281. War, Military Institutions, and Society to 1815.** Land and naval warfare from prehistory to Napoleon; discusses traditional topics such as technology, tactics, and strategy at length and demonstrates how military institutions are integrated with society as a whole. 3 hours.
- 282. War, Military Institutions, and Society Since 1815.** Land and naval warfare since Napoleon; technology, tactics, strategy, administration, and military institutions in themselves and as they relate to western and nonwestern societies; and conventional nuclear warfare. 3 hours.
- 285. Premodern Japanese History.** Same as Asian Studies 285. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the earliest times to the sixteenth century. 3 hours.
- 286. Modern Japanese History.** Same as Asian Studies 286. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the mid-sixteenth century to the mid-twentieth century. 3 hours.
- 289. Comparative Muslim Societies.** Same as Anthropology 289 and Religious Studies 289. See Religious Studies 289.
- 290. Individual Study.** Readings in selected fields in consultation with the instructor. Prerequisite: Junior or senior of high standing; written consent of the honors adviser. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Two-semester research project. Prerequisite: History concen-

- trator with senior standing and 4.5 grade point average; written consent of supervising professor and honors adviser. May be taken by honors students in partial fulfillment of department honors requirements. 3 hours. Must be repeated for a total of 6 hours. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Topics are given on an experimental one-time-only basis. 3 hours.
- 298. Colloquium in History.** Prerequisite: Junior standing; 14 hours in history, or, with consent of instructor, 14 hours in the social sciences and/or humanities. 3 hours. May be repeated as topics vary to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 301. European Working-Class History: 1750 to the Present.** Same as Labor and Industrial Relations 301 and Sociology 301. Comparative study of the rise of the working class in European countries; formation, culture, and daily life; stratification within the working class; workers in organized labor and revolutionary movements. Prerequisite: One year of college history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 302. Evolution of American Cities.** Same as Urban Planning 302. See Urban Planning 302.
- 303. The Near and Middle East in the Twentieth Century.** Great power diplomacy, imperialism, nationalism, and problems of modernization studied through coverage of Arab states and Israel, Turkey, and Iran. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 304. Medieval Civilization.** Same as Religious Studies 304. The architectural, artistic, philosophical, political, and religious components of medieval culture, thought, and patterns of behavior; includes monasticism and society and the individual. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 305. The Age of the Renaissance.** Same as Religious Studies 305. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 306. The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as Religious Studies 306. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 307. Islam and the Near and Middle East from Mohammed to 1258.** Same as Religious Studies 307. The Koran and the Prophet; rule from the Atlantic Ocean to India; Arab and Persian Muslims; caliphate and sultanate; law, theology, mysticism, and heresies; Crusades; trade and commerce; and intellectual and cultural achievements. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 308. The Europeanization of the Near East, 1768-1914.** Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 309. Development of Modern Europe; Absolutism and Colonial Expansion, 1648-1789.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 310. Europe in the Age of the French Revolution and Napoleon.** Comparative survey of Western countries in the age of democratic upheavals; America, England, and Prussia as well as France; the rise of Napoleon and the response of Europe; and the fate of innovation and reform in the immediate aftermath of the Napoleonic Wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 311. European History from 1815 to 1871.** A synthesis of politics, economics, and culture; revolutions, reaction, liberalism, conservatism, socialism, nationalism, romanticism, and realism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 312. European History from 1871 to 1918.** A synthesis of politics, economics, and culture; new state systems, long depression, imperialism, racism, nationalism, imperialism, symbolism, fin de siècle, socialism, and World War I. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 313. European History from 1918 to 1939.** Survey of European society from 1918 to 1939, with emphasis on the impact of World War I, the Russian Revolution, fascism, and the intellectual trends of the twenties and thirties. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 314. European History from 1939 to the Present.** Survey of European society since 1939, with emphasis on the impact of World War II, the cold War, the establishment of the

welfare state, and social developments. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 316. The Industrial Revolution in Europe, 1780-1900.** Comparative analytic study of industrial development in England, France, Germany, and Russia; social, cultural, and demographic consequences of rapid economic change. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 318. European International Affairs, 1815-1914.** The history of European international affairs from the Vienna Congress to the First World War, with the main focus on political developments, but with considerable attention also paid to the influence of domestic politics and social and economic changes on foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 319. European International Affairs, 1914 to the Present.** The history of European international affairs from the First World War to the present day, concentrating on political developments, especially the two world wars, but including the impact of domestic politics, ideological struggle, and socio-economic change upon foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 320. Russia from the Earliest Times to Peter the Great.** Political, economic, cultural, and social development of Russia during the Kievan and Muscovite periods. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. History of Imperial Russia.** Development of Russia as a modern Western state; evolution of political institutions, economic development, growth of the revolutionary movement, with attention paid to the formation of social groups; intelligentsia, peasantry, working class; from 1700 to 1905. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 325. Southern Africa: Race and Power.** Same as African Studies 325 and Political Science 333. See African Studies 325.
- 326. Intellectual and Cultural History of Russia.** Survey of major themes in the development of Russian culture and thought, with emphasis on the nineteenth and twentieth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 327. Revolutionary Russia, 1904-1939.** Russia and its empire from the Russo-Japanese War and the Revolution of 1905 through World War I, the Revolutions of 1917, the early years of the Soviet system, the rise of Stalin, and the Great Purge. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 328. Soviet Russia since 1939.** The multinational Soviet state from the Hitler-Stalin Pact through World War II, the postwar Stalin era, the emergence and dominance of Khrushchev, and the Brezhnev era to the present day. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Southeastern Europe, 1700-1918.** The political, economic, and cultural development of the Rumanians, South Slavs, Greeks, and Albanians; the impact of Ottoman rule; the rise of nationalism and the formation of national states; and the Orthodox Church. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
- 330. Eastern Europe, 1919 to the Present.** The political, economic, and cultural history of Poland, Czechoslovakia, Hungary, Rumania, Yugoslavia, Bulgaria, Greece, and Albania; particular emphasis upon the post-World War II era. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
- 331. Medieval Economic and Social History.** Includes the decline of Roman society, the age of localism, the revival of commerce and urbanism, medieval capitalism, and economic decline and social turmoil. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
- 332. Medieval England.** Economic, intellectual, religious, and social developments as reflected in the art and architecture of medieval England from the time of the German invasions to about the fifteenth century. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 333. England under the Tudors and Stuarts, 1485-1660.** Politics, religion, and society

in the era of the Protestant Reformation and the Civil War. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

334. **Great Britain Under the Later Stuarts and the Hanoverians, 1660-1815.** Principal political, economic, social, religious, and cultural developments in British history from the Restoration to the end of the Napoleonic wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
335. **History and Culture of Venice.** Examines Venice from its origins at the time of the Roman Empire until the present. Includes economic, political, and social history; humanism; philosophy; art; architecture; literature; music; and popular culture. Fully illustrated with slides. 3 hours or 1 unit.
337. **American Working Class History, 1780 to the Present.** Same as Labor and Industrial Relations 337. Focuses on working class formation, culture, ideas, and organization; examines daily experience of work and community life; special emphasis on race, ethnicity, and gender in the process of class formation; labor relations and the changing patterns of working class protest and accommodation. Prerequisite: One year of college level history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
338. **History of Biology.** Same as Biology 338. Development of biological thought from antiquity to the present, emphasizing evolutionary theory and physiology in the nineteenth century and genetics in the twentieth century. Prerequisite: One year of college biology or history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
339. **Scientific Thought, I.** Same as Philosophy 317. See Philosophy 317.
340. **Scientific Thought, II.** Same as Philosophy 318. See Philosophy 318.
341. **Modern Britain: the Victorian Era, 1815-1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
342. **Modern Britain Since 1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
343. **The Turks and the Ottoman Empire, 1100-1566.** Turkish migrations; the Crusades; Genghis Khan and the Mongols; Seljuks of Rum; Ottoman expansion; Islamic mysticism and law; society and economy; and international trade routes in the Black Sea and eastern Mediterranean. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
344. **The Ottoman Empire, 1566-1924.** Economy, society, law, and government; the Ottomans and Mediterranean society; Ottoman culture and Islamic tradition; minorities; trade, diplomacy, and capitulations; "decline" and dismemberment; and traditional and westernizing attempts at revival. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Thought and Society in Modern Europe, 1789-Present.** Same as Sociology 303. Examines the reciprocal relationship between thought and society in Western Europe from the French Revolution to the present. Prerequisite: Sociology 200, or one year of college history; or consent of instructor. 3 hours or 1 unit.
346. **Thought and Society in Early Modern Europe, 1513-1789.** Same as Sociology 304. Examines the reciprocal relationship between thought and society in western Europe from the Italian Renaissance to the French Revolution. Prerequisite: Sociology 200, or one year of college history; or consent of instructor. 3 hours or 1 unit.
347. **History of Roman Law and Legal Tradition.** Examines Roman law and legal tradition in the context of historical, political, and social developments; origins of law in primitive and ancient classical societies; surveys development of precedent, codification, and preservation of Roman law, and the impact of Roman law on western legal traditions. Prerequisite: One year of college history, political science, or classical civilization; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
350. **History of American Immigration to 1880.** The migrations which peopled Colonial America and the United States and their role in the shaping of American society and culture; research opportunities provided. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 351. History of American Immigration Since 1880.** The migrations of the late nineteenth and twentieth centuries and their impact on American society and culture. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 352. Colonial Beginnings of American Life and Institutions.** Study of the seventeenth- and eighteenth-century colonies to 1763. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. The Era of the American Revolution, 1763-89.** Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. Federalists, Jeffersonians, and the Era of Good Feeling.** United States history from 1789 to 1828, with emphasis on the conflict between nationalism and sectional interests. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. America in the Age of Jackson.** Political, social, and cultural study of the United States from the 1820s to the 1850s, including the humanitarian reform movements, manifest destiny, and the Mexican War. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 359. Civil War and Reconstruction.** The United States between 1850 and 1877, with emphasis on the causes of the war, wartime problems of the North and South, and efforts to create a new Union after the war. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 360. History of the United States, 1877-1909.** Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 361. History of the United States, 1909-1932.** Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 362. History of the United States since 1932.** Discusses the New Deal, the Cold War, all the presidents since Roosevelt, the structure of American imperialism, and America's role in world politics. Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 363. Social History of Industrial America to 1918.** The impact of industrialization, immigration, and urbanization on American society to the end of World War I. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 364. Social History of Industrial America Since World War I.** Study of the impact of industrial technology, business enterprise, immigration, and urbanization of American society. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 365. The History of Illinois to 1900.** The development of Illinois, first as a region and then as a state, with emphasis upon its political, economic, social, religious, and cultural growth in the eighteenth and nineteenth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 366. The History of Illinois in the Twentieth Century.** The development of a modern American state in the twentieth century with emphasis upon its political life, economic growth, social and intellectual problems, and contribution to the nation. Includes Chicago's expanding role in the history of Illinois. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 367. The Trans-Mississippi West.** The West in American history since the Louisiana Purchase; western stereotypes, order and violence, racial minorities, the urban sector, natural resources, and environmental policy. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 368. The South in American History.** Same as Afro-American Studies 368. Exploration of the history of the American South identifying and explaining differences between the South and the rest of the nation; examines the correlates of economic change in the realms of politics, social structure, and cultural values. Race relations provides a central theme of the course. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 369. Constitutional Development of the United States to 1865.** Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 370. Constitutional Development of the United States Since 1865.** Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 371. American Intellectual and Cultural History to 1865.** Same as Religious Studies 381. Examines the role of religious, scientific, political, social, educational, and artistic

thought and institutions in shaping a distinctive American culture, emphasizing Puritanism, the Enlightenment, and the Romantic movement. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 372. American Intellectual and Cultural History since 1859.** Same as Religious Studies 382. Treats the leading intellectual and cultural influences in shaping modern and contemporary America, emphasizing the impact of Darwinism and naturalistic thought, science and technology, the American university, divisions in religious thought (Modernism, Fundamentalism, Neo-Orthodoxy), the Counterculture, and the New Conservatism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 373. History of American Foreign Relations to 1917.** 3 hours, or $\frac{1}{2}$ or 1 unit.
- 374. Imperialism, 1870 to the Present.** Deals thematically with controversial issues concerning imperialism in the past century; includes various theories on the origins of imperialism, the diverse character of European empires before 1914, the impact of the world wars on empire, and American and Soviet "imperialism" since World War II. Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 375. Andean Countries of South America, 1532 to the Present.** The history of Colombia, Ecuador, Peru, Bolivia, and Chile; emphasizes common problems and diverse responses, from the conquest in the sixteenth century to the struggles for development in the twentieth. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 377. History of Modern Brazil, 1808 to the Present.** Problems of a neocolonial society; themes include family structure, slavery, imperialism, modernization, and the crisis of traditional institutions. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 378. History of Mexico, 1519 to the Present.** The development of Mexico from the conquest to the postrevolutionary present. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 379. Slavery and Race Relations in Latin America.** Same as Afro-American Studies 379. Selected topics on Indians and Spaniards, whites and blacks, emphasizing Mexico, the Caribbean, and Brazil. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 380. Europe and the 'Scramble for Africa.'** Analysis of the politics and economics of the European partition of Africa with particular reference to Britain, France, and Germany (1870-1900) and African responses to alien rule. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 381. Ancient Greek States.** History of the Greek states from the earliest times to 334 B.C. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 382. Alexander and His Successors.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 383. History of the Roman Republic to 44 B.C.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 384. The Roman Empire.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 385. African Independence and Underdevelopment: 1945 to the Present.** Same as Political Science 332. Historical investigation of African political economies based on selected case studies; includes development of the colonial economy, economic bases of African nationalism, and postindependence underdevelopment and attempts to escape from it. Prerequisite: One year of college history or enrollment in the African Studies program. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 387. History of Central America.** Major themes of Central American history since conquest: the Colonial regime, ethnic diversity, the independence movement, fragmentation in the nineteenth century, export economies and imperialism, 1880-1932, social movements and populism in the twentieth century, revolution and intervention since the 1950's. Prerequisite: One year of college history or consent of the instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 388. India from Colony to Nation.** Mughal Empire and British Raj. Indian national awakening, and struggle for independence under Ghandi and Nehru. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 390. China Under the Ch'ing Dynasty.** The period of Manchu domination in China (1644-1912); emphasis on Chinese reactions to Western influences during the nineteenth century. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 391. History of Blacks in Urban America.** A survey of historic conditions of Afro-Americans in nineteenth and twentieth century cities; an examination of Black life, slave and free, in antebellum cities, migration patterns, the origins of the ghetto, ethnic conflicts, socio-economic patterns of urban Blacks, community institutions, political participation, urban policy issues, and social and demographic effects of urbanization. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 393. Social-Economic History of Modern China.** Disintegration of traditional social and economic systems during the nineteenth and twentieth centuries, and the political effects of that disintegration; examines changes in the agricultural economy, changing rural elites, urbanization, and emergence of new social classes. It is recommended that students take History 390 and 394 before enrollment in History 393. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 394. Twentieth-Century China.** Chinese state and society in revolutionary transition; emphasis on the Nationalist and Communist revolutions and their results. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 397. History of Spain and Portugal.** Iberian history from pre-Roman times to the present with emphasis on the modern period. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 398. The Habsburg Monarchy, 1526-1792.** A history of the Habsburg Monarchy from the union of Austria, Bohemia, and Hungary to the end of the period of reform. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 399. The Habsburg Monarchy, 1792-1918.** Social, cultural, economic, and political development, evolution of the central institutions of the monarchy and the monarchy's place in the European state system; and internal history of the constituent peoples of the monarchy: Germans, Magyars, Czechs, Slovaks, Poles, Slovenes, Croats, Serbs, Ruthenians, and Rumanians. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 411. Seminar in Ancient History: Greece.** 1 unit.
- 413. Seminar in Ancient History: Rome.** 1 unit.
- 415. Seminar in Medieval History.** 1 unit.
- 417. Seminar in European History, 1350-1648.** 1 unit.
- 419. Seminar in European History, 1648 to 1815.** 1 unit.
- 421. Seminar in European History Since 1815.** 1 unit.
- 423. Seminar in English History to 1688.** 1 unit.
- 425. Seminar in English and British Empire History Since 1688.** 1 unit.
- 427. Seminar in Russian History.** 1 unit.
- 448. Seminar in African History.** Prerequisite: History 215, 216, and one upper-level African history course. 1 unit.
- 451. Seminar in Early American History to 1789.** 1 unit.
- 453. Seminar in American History Since 1789.** 1 unit.
- 461. Seminar in Latin American History.** 1 unit.
- 471. Seminar in the History of Science.** 1 unit.
- 472. Seminar in History of Medicine: Selected Topics from Antiquity to the Present.** 1 unit.
- 473. Seminar in Military History.** Prerequisite: Consent of instructor. 1 unit.
- 475. Problems in Ancient History.** 1 unit.
- 476. Problems in Medieval History.** 1 unit.
- 477. Problems in Early Modern European History.** 1 unit.

- 478. Problems in European History since 1815.** 1 unit.
479. Problems in English History before 1688. 1 unit.
480. Problems in English History since 1688. 1 unit.
481. Problems in Russian History. 1 unit.
482. Problems in Military History. Prerequisite: Graduate Standing. 1 unit.
483. Problems in Chinese History. 1 unit.
484. Problems in European History, 1350-1648. 1 unit.
486. Problems in American History to 1830. 1 unit.
487. Problems in American History since 1815. 1 unit.
488. Problems in Latin American History. 1 unit.
489. Problems in African History. 1 unit.
490. History and Social Theory. Introduces recent historical work drawing upon theories and concepts from the social sciences; considers fields of inquiry which include family history, demographic history, labor history, prosopographical and entrepreneurial studies, local and regional studies, and others. 1 unit.
491. Quantitative Techniques for Historians. Focuses on the use of quantitative techniques in historical research, exploring problems in research design, data management and computer techniques, and the evaluation of statistics used by historians. Prerequisite: Sociology 385 or consent of instructor. 1 unit.
492. Problems in Comparative History. Intensive comparative examinations of particular issues in the histories of multiple countries, cultures or periods; emphasizes methodology, the discipline of comparative history, and the nature of historiography in a cross-cultural and interdisciplinary context. Prerequisite: Consent of instructor. 1 unit.
495. Individual Research Project. Directed research in special fields; may be taken in lieu of seminars in fields in which seminars are seldom offered. 1 unit.
496. History of Historiography. Introduction to the great historians from early times to the present. 1 unit.
497. Reading Course. Directed readings in special fields. Primarily, but not exclusively, for students with a master's degree or equivalent, who are preparing for the preliminary examination in history and who need instruction in areas not provided by current course offerings. Prerequisite: Consent of instructor. 1 unit.
498. Problems in the Teaching of College History. Prerequisite: Candidate for Ph.D. degree in history. 1/2 unit.
499. Thesis Research. Individual direction in research and guidance in writing theses for advanced degrees. 0 to 4 units.

HISTORY OF ART

(See Art and Design)

HORTICULTURE

Head of Department: D. B. Dickinson

Department Office: 1201 South Dorner, Urbana

- 100. Introduction to Horticulture.** Basic principles of plant growth and development as they apply to the production, marketing, and utilization of fruits, vegetables, and ornamental plants. 3 hours.
122. Greenhouse Management. Commercial greenhouse construction and operation, including heating, cooling, soils, potting, fertilizers, and watering; lectures, readings, demonstrations, and greenhouse practice. 3 hours.
125. Survey of Landscape Horticulture. Consumer analysis of horticultural elements and non-plant items utilized in the development of residential, commercial, and community

- landscapes; includes analysis of objectives, site, plants, installation, and maintenance; and considers selection and development of specialty gardens and interior landscapes in order to develop analytical skills in evaluating needs, materials, and services available. Not open to students in ornamental horticulture curriculum. 3 hours.
- 131. Introduction to Floral Design.** Introduces the art of arranging flowers, foliage, and accessories according to the principles of design. Lecture and lab; fee required. 2 hours. Credit not given for students in ornamental horticulture.
- 190. Home Vegetable Gardening.** Principles and practices of producing vegetables in the home garden by traditional and organic methods; lecture and laboratory. 3 hours. Credit is not given to horticulture majors. All other students: may not receive credit for both Horticulture 190 or 242.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Identification and Use of Woody Ornamental Plants, I.** Systematic approach to the identification, ornamental characters, culture, propagation, production, and use of woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
- 202. Identification and Use of Woody Ornamental Plants, II.** Systematic approach to the identification, ornamental characters, culture, propagation, production and use of woody ornamental conifers, broadleaf evergreens, vines, ground covers and woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 and Horticulture 201, or consent of instructor. 3 hours.
- 210. Home Grounds Planning and Design.** Practice of developing home grounds emphasizing planting design; analysis of and practical solutions for typical site problems; and evaluating garden structures as elements in home grounds planning and design. Prerequisite: Horticulture 202; limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agriculture occupations for secondary teachers curriculum. 4 hours.
- 211. Home Grounds Development and Construction.** Continuation of Horticulture 210, with emphasis on development of home grounds and construction methods and techniques. Prerequisite: Horticulture 210; limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agriculture occupations for secondary teachers curriculum. 3 hours.
- 212. Landscape Contracting.** Interpretation of the landscape architect's plans and specifications; estimating quantities of materials; and computing costs and procedures for bidding and executing landscape construction. Prerequisite: Horticulture 211. 3 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only.
- 220. Plant and Animal Genetics.** Same as Agronomy 220 and Animal Science 220. See Agronomy 220.
- 221. Plant Propagation.** Examines theory and methods employed in propagation of plants, emphasizing anatomical, physiological, and ecological principles involved in sexual propagation (seeds) and asexual propagation (division, cuttings, budding, grafting, tissue culture, etc.). Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
- 223. Floricultural Crops Production, I.** Commercial production of major cut-flower crops in the greenhouse and field. Prerequisite: Horticulture 122. 3 hours.
- 224. Floricultural Crops Production, II.** Commercial production of pot plants and minor greenhouse and field-grown cut flowers. Prerequisite: Horticulture 223. 3 hours.
- 226. Bedding Plant Production, Use, and Identification.** Examines the commercial production, use, and identification of herbaceous, frost-tender ornamental plants, largely flowering annuals, grown for outdoor bedding purposes. Includes field trip. Prerequisite: Plant Biology 100. 3 hours.
- 227. Indoor Plant Culture, Use and Identification.** Culture, use, and identification of indoor plants in relation to their application in interior situations; discusses the influence of water, fertilizer, soil type, light (natural and artificial), relative humidity, storage and shipping. Students design and maintain an interior plant area; lecture and lab. A field trip is required. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.

- 230. Herbaceous Perennials: Identification and Use.** Identification of herbaceous perennials; cultural requirements and uses in the landscape; discussion of perennial border design for continuous flowering. Prerequisite: Plant Biology 100. 3 hours.
- 231. Floral Design, I.** Applies principles of design to the composition and decorative use of flowers, foliages, and accessories. 3 hours. Registration limited to horticulture majors, students in ornamental horticulture curriculum, or students in agricultural occupations for secondary teachers curriculum only.
- 232. Flower Shop Management and Floral Design, II.** Introduces flower shop management: includes the location, establishment, and financing of a new or existing shop and basic skills in management, pricing, buying, delivery, and display. Covers advanced floral design skills. Prerequisite: Horticulture 231. 3 hours.
- 233. Floriculture for the Home.** Fundamentals of home gardening and the effective use of ornamentals as a part of the home environment; subjects include the selection, culture, and use of garden annuals, biennials, perennials, bulbs, and house plants; garden tools and equipment; soil preparation; plant propagation; principles of design and planting methods; garden maintenance; use of fertilizers; pest control; training and pruning; lawn care; hybridizing; growing structures; and care of cut flowers. Not open to students in the ornamental horticulture curriculum. 3 hours.
- 234. Landscape Plants Production.** Emphasizes woody ornamental plant production, nursery operation, and nursery business management techniques; compares both traditional and computer-aided management tools; examines industry scope and diversity through nursery visits, presentations by nursery operators, and student-directed interviews/presentations throughout the state. Field trip required; see Timetable for approximate cost. 3 hours. Offered in alternate years.
- 236. Turfgrass Management.** Examines principles and practices used in management of turfgrasses in areas of general and specific use; of value to students interested in one or more aspects of turfgrass utilization. Prerequisite: Plant Biology 100. 3 hours.
- 242. Commercial Vegetable Production.** Commercial vegetable production with emphasis on cultural considerations and harvest and handling of selected vegetable crops; integrates principles of plant growth into vegetable production schemes; covers vegetable classification, growing practices and handling in the context of current commercial production systems. Prerequisite: Horticulture 100 and Soils 101. 3 hours.
- 250. Horticulture Internship.** A supervised off-campus learning experience of at least 300 hours in a horticulture related enterprise. Prerequisite: Junior status; good academic standing; major in ornamental horticulture, horticulture, or agricultural science with horticulture emphasis; completion of a 200- or 300-level course appropriate to the internship activities; and consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
- 251. Arboriculture.** Evaluates criteria for ornamental woody plant selection, cultivation, valuation, and maintenance; links the technical skills and practices for commercial arborist to an understanding of woody plant physiology and anatomy; emphasizes marketing and promotion of horticultural expertise. 3 hours. Offered in alternate years.
- 261. Small Fruit and Viticulture Science.** Technological application of biological principles to the culture of strawberry, grape, blueberry, raspberry, blackberry, currant, gooseberry, and miscellaneous small fruits. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours.
- 262. Tree Fruit Science.** Examines biological principles, cultural methods and practices involved in the growth and production of the apple, pear, peach, cherry, plum, apricot, almond, and miscellaneous citrus and nut crops. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours.
- 300. Special Problems.** Supervised research on individual problems in any phase of horticulture; includes anatomy, breeding, physiology, ecology, or general culture of fruit, vegetable, or ornamental plants. Prerequisite: Not open to students on probation; written consent of the instructor and authorized departmental approval required prior to advanced enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade point average of 4.0 and may be taken

in conjunction with other courses in the department subject to approval of the instructor. 1 to 5 hours, or $\frac{1}{2}$ to 2 units.

- 307. International Food Crops.** Survey of the botany, physiology, breeding, production practices, and pest management of the major international food crops. Tropical and subtropical crops are emphasized and aspects of agriculture in developing countries are discussed. Prerequisite: Agronomy 121, Horticulture 100, or Plant Biology 100. 3 hours or $\frac{3}{4}$ units. Offered in alternate years.
- 321. Floricultural Physiology.** Studies the physiology and metabolism of floricultural crops during their development from seeds through flowering. Lectures and discussion. Prerequisite: Agronomy 101, Plant Biology 100, or consent of instructor. 4 hours or 1 unit.
- 322. Plant Nutrition.** Studies the mechanisms of and factors affecting the absorption, transport, distribution, and functions of the essential elements required by higher plants. Lectures and discussions. Prerequisite: Soils 101; Plant Biology 234 or 330. 4 hours or 1 unit. Offered in alternate years.
- 323. Principles of Plant Breeding.** Same as Agronomy 323. See Agronomy 323.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Plant Biology 333. See Plant Biology 333.
- 336. Perennial Grass Ecosystems.** Same as Agronomy 336. Different levels of ecological organization in perennial grass ecosystems. Provides advanced study for students in turfgrass and forage management. Cultural programs are derived from an understanding of interrelationships between different components of the ecosystem, including man and animals. Term paper required. Field trips; see Timetable for approximate cost. Prerequisite: Horticulture 236 or Agronomy 322. 4 hours or 1 unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science, and Forestry 340. See Agronomy 340.
- 345. Growth and Development of Horticultural Crops.** Factors affecting growth, development, and quality of horticultural crops, such as photoperiodism, growth regulators, carbon dioxide levels, etc. Lecture and discussion. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
- 398. Postharvest Physiology of Horticultural Crops.** Physiology, biochemistry, and anatomy of fruits and vegetables during development, maturation, and ripening in situ and in storage. Prerequisite: Plant Biology 100 and Chemistry 102 or 103, or equivalent. 4 hours or 1 unit. Offered in alternate years.
- 424. Plant Biochemistry.** Same as Agronomy and Plant Biology 424. See Agronomy 424.
- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Plant Pathology 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Plant Pathology 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Plant Pathology 433. See Biology 433.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Forestry, and Plant Pathology 434. See Biology 434.
- 447. Horticulture Seminar.** Discussion of current research and literature pertaining to problems of horticulture and related fields. Prerequisite: Graduate standing in horticulture or related fields. $\frac{1}{4}$ unit.
- 488. Plant Pigments.** Same as Plant Biology 488. A comprehensive presentation of the nature, function, distribution, biosynthesis, degradation, separation, and spectroscopic properties of pyrrole, carotenoid, quinone, and anthocyanin pigments. Prerequisite: Plant Biology 330 or consent of instructor. 1 unit. Offered in alternate years.
- 490. Research Methods in Horticulture.** Lectures, discussions, demonstrations, and laboratory exercises dealing with methods and apparatus used in horticultural research. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 1 unit.
- 492. Special Topics in Horticulture.** Readings and discussion in selected phases of horticulture including such topics as genetics, physiology, anatomy, morphology, and ecology of horticultural crops. $\frac{1}{2}$ to 2 units.

- 494. Professional Orientation in Horticulture.** The philosophy and components of graduate education, with development of the principles useful in teaching, research, and extension in horticulture. Prerequisite: Graduate standing in horticulture. $\frac{1}{4}$ unit.
- 499. Thesis Research.** Research on problems in floriculture, ornamentals, plant breeding, pomology, turfgrass, or vegetable crops. Prerequisite: Graduate standing in horticulture. 0 to 4 units (summer session 0 to 2 units)

HUMAN DEVELOPMENT AND FAMILY ECOLOGY

Head of Division: L. Birch

Division Office: 206 Child Development Laboratory, 1105 West Nevada, Urbana

- 105. Introduction to Human Development.** Systematic overview of the psychological, biological, familial, and cultural factors related to human growth and development throughout the life cycle. 3 hours.
- 106. Observation and Assessment of Human Development.** Studies human behavior in laboratory and natural settings, with emphasis on the developing child; includes observation and assessment of cognitive, social affective, and motor development. Prerequisite: Human Development and Family Ecology 105, or consent of instructor. 3 hours.
- 110. Introduction to Family Ecology.** Overview of family development, including courtship, marriage, parenting, the aging family, and family crisis; emphasizes the application of research findings to individual decision-making. 3 hours.
- 143. Biological Bases of Human Behavior.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 143. See Anthropology 143.
- 145. Introduction to Women's Studies in the Social Sciences.** Same as Sociology 145 and Women's Studies 112. See Women's Studies 112.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Development of Curriculum for Infants and Preschoolers.** Introduces development of curriculum for children from birth to age five; integrates child development theory and principles with programming for young children in preschool and childcare settings. Prerequisite: Human Development and Family Ecology 105, or consent of instructor. 3 or 4 hours. Developmental Child Care students only register for 3 hours and do not enroll in the laboratory; all other students must register for 4 hours credit.
- 203. Infancy and Early Development.** Reviews development during the first two years of life, including cognitive, social, and biological aspects of early development; lab involves first-hand observation of infants to supplement and extend lecture material. Prerequisite: Human Development and Family Ecology 105, or Psychology 216; or consent of instructor. 4 hours.
- 204. Motor Development in Childhood.** Same as Kinesiology 262. See Kinesiology 262.
- 205. Children with Special Needs.** Same as Sociology 205. See Sociology 205.
- 210. Comparative Family Organization.** Same as Anthropology 210. A cross-cultural examination of the family in relation to its environment, the family as an environment, and the family structure as it changes over time; evaluates findings in anthropology, sociology, and psychology; examines current issues in American family life. Prerequisite: Junior standing or consent of instructor. 3 hours.
- 211. Social Context of Human Sexuality.** Surveys current research on social aspects of human sexuality from cross-cultural, social, familial, and life-span development perspectives. 3 hours.
- 214. Introduction to Aging.** Same as Psychology 214. A multi-disciplinary introduction to the study of aging; the social, psychological and physiological context of changing roles in later life; public and private policies that affect older people and their families. Prerequisite: Human Development and Family Ecology 105, or 3 hours of social science. 3 hours.

- 215. Courtship and Marriage.** Development of cross-sex and same-sex relationships that lead to marriage or intimate living over the life cycle; the dissolution of such relationships; emphasizes the effects of social and cultural environments on intimate relationships. 3 hours. Students may not receive credit for both Human Development and Family Ecology 215 and Sociology 321.
- 220. Organization and Administration of Child Development Programs.** Examines principles and practices of organization and administration of programs and community services for young children and their families with special focus on leadership; emphasizes daily planning and operation of programs and services, and internal and external factors influencing program management and effectiveness. Prerequisite: Human Development and Family Ecology 202, or consent of instructor. 3 hours.
- 242. Family Violence.** Same as Sociology 242. See Sociology 242.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 301. Issues in Socialization and Development.** Presents and uses theories of socialization to evaluate and analyze current issues and socialization practices; delineates historical and philosophical trends in socialization, and discusses the implications of these trends for generating social policy affecting the developing individual. Prerequisite: Human Development and Family Ecology 202 and 203; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 302. Sex Roles.** Same as Sociology 302 and Women's Studies 302. See Sociology 302.
- 304. Gerontology.** An interdisciplinary approach to the study of aging and the aged from developmental, behavioral, and social perspectives. Prerequisite: Senior standing. 3 hours or 1 unit.
- 305. Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Elementary and Early Childhood Education 305. See Foods and Nutrition 305.
- 310. Contemporary American Family.** Examination of the variety of forms families assume in the United States; families are compared in the areas of kinship, family organization, patterns of interpersonal relationships, socialization, values, and integration with the larger society. Prerequisite: Human Development and Family Ecology 210 or consent of instructor; and 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 315. Critical Transitions in Families.** A life-span development approach to the study of normative changes and non-normative events and their impact on marriage and family relationships; gives attention to variations in the socio-economic contexts of family transitions, and to methods for reducing the negative effects of such transitions. Prerequisite: Six hours of human development and family ecology courses, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 316. Adolescent Development.** Examines paths of experience and individual development within the family, the peer group, and other domains through this socially-defined stage of life. Prerequisite: Six hours of human development and family ecology courses, or equivalent social science courses. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 319. Day Care Practicum.** Same as Psychology 319. See Psychology 319.
- 330. The Family in International Settings.** Examines the impact of technological change on the family in developing nations, compared with the Western World; includes coverage of the effects of various development approaches and projects on family roles, form, and resource access, and the effects of family characteristics on the success of development projects. Prerequisite: Human Development and Family Ecology 210, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 349. Music in Early Childhood.** Same as Music 349. See Music 349.
- 350. Practicum in Human Development and Family Ecology.** A supervised on or off-campus learning experience related to human development or family ecology, supervised in cooperation with an appropriate agency or institution. Prerequisite: Human Development and Family Ecology major; junior standing. Not available to students on probation. 4 to 12 hours, or 1 to 3 units. (Only 1 unit of the course may be applied to the total required for a graduate degree in Human Resources and Family Studies.)

Option 2. At the undergraduate level only 4 hours may be applied to the total HDFE courses required.)

- 354. Growth and Physical Development of Children.** Same as Kinesiology 354. See Kinesiology 354.
- 370. Family Conflict Management.** Examines processes of conflict management in family and community disputes; emphasizes negotiation and mediation as modes of dispute settlement. Prerequisite: Human Development and Family Ecology 210 or 310; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 388. Special Topics in Human Development and Family Ecology.** Prerequisite: Senior standing and consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours, or 2 units.
- 390. Human Development: Theory and Methodology.** Discussion and evaluation of theories of human development and critical examination of current research; examples from current literature illustrating research methods and the differing theoretical orientations shaping research directions in human development. 4 hours or 1 unit.
- 410. Family Interaction.** Observation and qualitative analysis of the family as a system; how family organization emerges, is maintained, and changes through social interaction. Prerequisite: Human Development and Family Ecology 310 or equivalent. 1 unit.
- 418. Seminar in Human Development.** An overview of theories and research in human development; focuses on major issues regarding development, differing conceptualizations of those issues, and relevant research. Prerequisite: Consent of instructor. 1 unit.
- 419. Seminar in Family Research and Theory.** Presents an advanced, multidisciplinary approach to current theories and research in the areas of marriage and the family. Prerequisite: Human Development and Family Ecology 310, or consent of instructor. 1 unit.
- 420. Contemporary Topics in Human Development.** An in-depth analysis of a current issue in human development with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Ecology or a related area, and consent of instructor; courses in statistics and Human Development and Family Ecology 390, or equivalent. 1 unit.
- 421. Contemporary Topics in Family Studies.** An in-depth analysis of a current issue in family studies with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Ecology or a related area, and consent of instructor; courses in statistics and Human Development and Family Ecology 390, or equivalent. 1 unit.
- 457. Sensorimotor Development.** Same as Kinesiology 457. See Kinesiology 457.
- 470. Family Mediation: Theory and Techniques.** Applies mediation theory and techniques to decisions faced by families in conflict, e.g., divorce; emphasizes the development of professional conflict management skills to assist individuals and families in their ability to resolve disputes. Prerequisite: Human Development and Family Ecology 370 or equivalent. 1 unit.
- 493. Advanced Studies in Human Development and Family Ecology.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. For non-thesis students only. $\frac{1}{2}$ or 1 unit.
- 498. Special Problems in Human Development and Family Ecology.** Research or independent study on a special problem that is not part of thesis work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Original research designed and conducted under faculty supervision. 0 to 4 units.

HUMAN RESOURCES AND FAMILY STUDIES, SCHOOL OF

(Please refer to individual alphabetical listings: Family and Consumer Economics, Foods and Nutrition, Human Development and Family Ecology, Human Resources and Family Studies, and Textiles and Interior Design.)

Director of School: S. Y. Nickols

School Office: 260 Bevier Hall, 905 South Goodwin, Urbana

HUMAN RESOURCES AND FAMILY STUDIES

Director of School: S. Y. Nickols

School Office: 260 Bevier Hall, 905 South Goodwin, Urbana

- 100. Contemporary Issues in Human Resources and Family Studies.** Introduces and analyzes contemporary issues and trends in human resources and family studies; examines the integrative nature of Human Resources and Family Studies and life planning theories, models and research; includes orientation to the School of Human Resources and Family Studies. Required of all freshman and transfer students in the School of Human Resources and Family Studies. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Agriculture 268. See Agriculture 268.
- 269. Cooperative Extension: Summer Experience.** Same as Agriculture 269. See Agriculture 269.
- 280. Leadership Development.** Same as Agriculture Communications 280. See Agriculture Communications 280.
- 298. International Experience.** Same as Agriculture 298. See Agriculture 298.
- 369. Educational Programs in Cooperative Extension.** Same as Agriculture 369. See Agriculture 369.

HUMANITIES

Dean of College: W. F. Prokasy

College Office: 294 Lincoln Hall, 702 South Wright, Urbana

- 131. Introduction to Renaissance Civilization.** A study of major historical, intellectual, and artistic achievements of the period; organized around a series of topics, each focusing on a society, movement, or historical event as reflected in literature, art, and the history of ideas. 3 hours.
- 141. Introduction to American Civilization, I.** An introduction to the multidisciplinary study of major aspects, events, and periods of the American experience; includes a series of topics, each focusing on one society, movement, or historical event as reflected in literature, art, history, and politics. 3 hours.
- 142. Introduction to American Civilization, II.** Continuation of Humanities 141. 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 261. Survey of World Cinema, I: The Beginnings through the Coming of Sound.** Survey of the development of equipment, techniques, and themes of the cinema from its origins through the coming of sound; lectures, discussions, and showings of selected films. 3 hours.

- 262. Survey of World Cinema, II: The Thirties to the Present.** Survey of the development of equipment, techniques, and themes of the cinema from the coming of sound to the present; lectures, discussions, and showings of selected films. 3 hours.
- 279. Introduction to Foreign Language Education.** Same as French, German, Latin, Russian, and Spanish 279. Introduction to the theory and methodology of second language teaching, including the history of foreign language education, contemporary practices and perspectives, and current research in second language acquisition. Prerequisite: Sophomore standing and enrollment in a teacher education curriculum, or consent of instructor. 3 hours.
- 285. The Jewish Experience in Film.** Selected topics focusing on various aspects of Judaism and Jewish culture as it has been portrayed in world cinema along with an examination of the contributions of selected Jewish artists to the cinema. Prerequisite: One college course in literature or cinema studies. 3 hours.
- 290. Individual Study.** Supervised reading and research on interdisciplinary humanities topics chosen by the student in consultation with a faculty member. Prerequisite: Consent of humanities advisor (an approved Learning Agreement must be submitted to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 2 to 4 hours. May be repeated to a maximum of 8 hours.
- 292. Senior Thesis.** Individual research for concentrators in humanities leading to the completion of a thesis. Prerequisite: Senior standing, a declared option in humanities field of concentration, and consent of advisor. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 295. Special Topics: Interdisciplinary.** Interdisciplinary topics in the humanities; topics vary, but are normally related to one of the options in the humanities field of concentration. 3 hours. May be repeated as topics vary; students may register for two different topics in the same semester.
- 297. Special Topics: Junior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities field of concentration. Prerequisite: Junior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
- 298. Special Topics: Senior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities field of concentration. Prerequisite: Senior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to the School of Humanities office not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
- 361. Film Theory and Criticism.** Study of major aesthetic and critical theories about film; study of theory and practice of film criticism. Prerequisite: One cinema studies course at the 200 or 300 level and one college course in literature, or consent of instructor. 3 hours or 1 unit.
- 366. Japanese Cinema.** Same as Asian Studies 366. Examines the influence of Japan's traditional aesthetics on its cinema and surveys its major film movements, genres, and directors. Prerequisite: Two college level courses in cinema studies or Asian Studies, or graduate standing. 3 hours or 1 unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Slavic, and Spanish 382, and Linguistics 386. Theory and practice of computer-assisted instruction, with special emphasis on problems and techniques of foreign-language instruction. General principles; survey of existent and probable future CAI systems; and practical experience with lesson design and programming on the PLATO system. Linguistics majors are advised to complete Linguistics 306 before registering for this course. Prerequisite: Two years college language or equivalent, and consent of instructor. 4 hours or 1 unit.
- 395. Special Advanced Topics: Interdisciplinary.** Offers interdisciplinary topics in the humanities; topics vary, but normally relate to the interdisciplinary areas of study

within the humanities concentration or to the special humanities facilities (e.g., the Language Learning Laboratory). Prerequisite: Prerequisites will vary according to topic. See Timetable. 3 hours or 1 unit. May be repeated as topic varies to a maximum of 6 hours or 2 units.

INDUSTRIAL DESIGN

(See Art and Design)

INDUSTRIAL ENGINEERING

(See Mechanical and Industrial Engineering)

INTERIOR DESIGN

(See Textiles and Interior Design)

JOURNALISM

Acting Head of Department: J. W. Carey

Department Office: 120A Gregory Hall, 810 South Wright, Urbana

114. Agricultural Communications Media and Methods. Same as Agricultural Communications 114. See Agricultural Communications 114.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

204. Typography. Studies type lore and design; type dimensions; printer's arithmetic and copyfitting; platemaking; printing processes; shop organization; and terminology. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours. News-editorial majors do not receive credit for this course.

214. Agricultural Communications Strategy. Same as Agricultural Communications 214. See Agricultural Communications 214.

217. History of Communications. Same as Communications 217. Nature and development of communication systems; history of communication media; history of journalism, advertising, and broadcasting; and communications in the modern world. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.

218. Communications and Public Opinion. Same as Communications 218. Theory of public opinion and of communications; relation of communication systems to public opinion, social systems, and the political order. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.

220. Communications and Popular Culture. Same as Communications 220. See Communications 220.

223. Photojournalism. A basic photography course designed to give students a proficiency in picture taking and processing and to acquaint them with picture editing and other illustrative problems. For current fees, see Timetable; cameras provided by the college. Prerequisite: Registration in the College of Communications or consent of instructor. 3 hours.

231. Mass Communication in a Democratic Society. Same as Communications 231. Studies the philosophical bases of the functions and the responsibilities of mass communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.

- 241. Law and Communications.** Same as Communications 241. Historical background of the nature and meaning of the law as it relates to journalism and contemporary problems of freedom of expression. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 251. Social Aspects of Mass Communications.** Same as Communications 251 and Sociology 251. Media structures related to cultural content and functions; problems of life and society as treated in mass-produced communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 291. Special Problems.** Special projects, research, and independent reading in journalism for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of head of department. 1 to 3 hours.
- 293. Journalism Seminar.** Seminar based on summer internship experience; offered only in the fall for students who participated in a spring pre-internship orientation class and then completed an approved summer internship. Prerequisite: Journalism 350; open only to undergraduate journalism majors who have taken a non-credit internship orientation. 0 to 2 hours.
- 326. Magazine Article Writing.** Preparation of feature stories and articles; techniques of marketing, market analysis, and publishing articles written in the course. Prerequisite: Journalism 350; registration in the College of Communications or consent of the college. 3 hours or 1/2 unit.
- 330. Magazine Editing.** Basic principles of editing for consumer, business, trade, and company magazines; communications theory, market analysis, editorial process, design process, production process, and distribution process as they relate to magazine publishing. Prerequisite: Credit or concurrent registration in Journalism 326 or consent of instructor. 3 hours or 1/2 unit.
- 340. News Publication Management.** An introduction to the administration and management of print media news organizations. Prerequisite: Journalism 350 or Advertising 391; and consent of the department. 3 hours or 1/2 unit.
- 350. Reporting, I.** Fundamentals of journalistic writing; reporting news of public affairs. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 360. Graphic Arts.** Rational and aesthetic standards of visual communications; principles and techniques of making visual statements; and uses of visual technology in wedding verbal and nonverbal languages. For current fees, see Timetable. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 362. Broadcast News Production.** Introduces radio and TV news production designed to acquaint students with techniques, principles, and equipment used in the studio and in the field; emphasizes planning, producing, and directing individual news and public affairs programs and news stories, and serving on production teams. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 370. News Editing.** Newspaper editing and headline writing; the makeup and design of newspaper pages. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 372. Broadcast News Writing and Gathering.** Gathering, writing, and editing news for radio and television; critical analysis of broadcast news practices, past and present; ethics of broadcast journalism; audio and visual communication principles as applied to news dissemination; editing and writing to film, tape and graphics. Individual and team projects. Prerequisite: Journalism 350 and 362; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 380. Reporting, II.** The interviewing, analytical, and writing techniques of reporting complex news stories with clarity and depth. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
- 382. Broadcast News Editing.** Principles of editing audio tape, video tape, and scripts with audio-visual materials; editing story units for broadcast; assembling news and

public affairs programs: broadcast news editing ethics, research, and criticism. Prerequisite: Journalism 372; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.

- 390. Advanced Reporting.** Advanced reporting projects in specialized fields; recommended for news-editorial seniors. Prerequisite: Journalism 350 and 380. 3 hours or 1 unit.
- 392. Broadcast Journalism Practicum.** Individual and team produced advanced enterprise projects in specialized fields. Subject matter to be coordinated with Journalism 390. Prerequisite: Journalism 382; enrollment as a major in the Department of Journalism or consent of department. 3 hours or 1 unit.
- 400. Issues in Journalism.** Seminar on issues of contemporary importance in journalism. Prerequisite: Consent of department. $\frac{1}{2}$ unit.
- 468. The Political Economy of Communications.** Same as Communications 468. Analyzes the structure, policy, and behavior of such media of communication as newspapers, magazines, books, postal service, telegraph, telephone, broadcasting, and film; special emphasis on their relationships to political order and the economy. Prerequisite: Consent of College of Communications. 1 unit.
- 470. Communications and Popular Culture.** Same as Communications 470. Problems of cultural analysis related to the media of communications; social implications of communications research. Prerequisite: Consent of College of Communications. 1 unit.
- 471. Proseminar in Communications, I.** Same as Communications 471. General discussion of the mass media of communications, their role as social institutions, and their control and support; content, audience, and effect of the mass media. Prerequisite: Consent of College of Communications. 1 unit.
- 472. Proseminar in Communications, II.** Same as Communications 472. General discussion of the problem of communications, including the individual as a communicating system, symbolic processes, analysis of messages, psycholinguistics, and language as social behavior. Prerequisite: Consent of College of Communications. 1 unit.
- 473. History and Theory of Freedom of the Press.** Same as Communications 473. Development of the Anglo-American press system and the idea of freedom of the press; contemporary mass media and their implications for freedom and democracy. Prerequisite: Consent of College of Communications. 1 unit.
- 474. Communications Systems.** Same as Communications 474. Analyzes the structure and development of communications systems; examination of the role of communication in social change, political movements, and formal organizations. Prerequisite: Consent of College of Communications. 1 unit.
- 480. Journalism Masters' Proseminar.** Introduction to scholarship and research in journalism and mass communication examining theoretical approaches to the meanings, uses, and effects of mass media in society; discussion of media freedom and accountability; humanistic and social scientific contributions to understanding mass communication. Prerequisite: Graduate standing in journalism or consent of instructor. 1 unit.
- 490. Special Topics in Journalism.** Prerequisite: Consent of head of department. $\frac{1}{2}$ or 1 unit.
- 492. Research Methods in Communications.** Same as Communications 492. See Communications 492.
- 499. Thesis Research.** Prerequisite: Graduate standing in journalism. 1 to 2 units.

KINESIOLOGY

Head of Department: K. M. Newell

Department Office: 117 Freer Hall, 906 South Goodwin, Urbana

- 100. Developmental Activities.** Skills and knowledge essential for leisure-time activities which are classified as developmental activities. Prerequisites for each developmental activity are given below. More than one activity (Sections A through H) may be taken in the same term. 1 to 2 hours.

Section A: Conditioning and Weight Control. Activities and understanding which contribute to the development and/or maintenance of physical fitness and a well-proportioned body. 1 to 2 hours. May be repeated once for credit if taken in successive semesters; credit not to exceed a total of 2 hours.

Section B: Personal Defense. Skills and understanding essential for defense against an aggressor, with emphasis on avoiding attack. 1 hour.

Section C: Weight Training. Skills and knowledge essential for use of weights for conditioning the body. 1 hour. May be repeated once for credit if taken in successive semesters.

Section D: Physical Fitness. Activities and understanding which contribute to the development and maintenance of physical fitness according to social and hygienic standards. 1 hour. May be repeated once for credit if taken in successive semesters.

Section H: Hatha Yoga. Introduction to Hatha Yoga, which is concerned with the physical well-being of the entire organism; includes a graduated program of postures (asanas), stretching movements, and muscular relaxation and breathing exercises. 1 hour.

Section I: Outdoor Adventures. Introductory skills and knowledge for development of life time activities in basic backpacking, basic river canoeing, and mountaineering techniques (balance climbing and rappelling). Includes participation in one field trip during the semester. Prerequisite: Kinesiology 106A and 107A; or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 101. Dance Activities.** Skills and knowledge essential for leisure-time activities which are classified as dance activities. Prerequisites for each dance activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour.

Section A: Ballroom Dance, I. Introductory skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, cha-cha, and selected fad dances. 1 hour.

Section B: Ballroom Dance, II. Intermediate skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, and cha-cha as well as tango, samba, and paso doble. Prerequisite: Kinesiology 101A or consent of instructor. 1 hour.

Section C: International Ballroom Dance. Skills and understanding essential for international ballroom dance steps; emphasis on tango, cha-cha, Viennese waltz, samba, rhumba, quickstep, paso doble, mambo, and merengue. Prerequisite: Kinesiology 101B or consent of instructor. 1 hour.

Section D: American Square Dance. Introductory skills and understanding essential for square dancing; opportunities for conducting and calling dances. 1 hour.

Section E: International Folk Dance. Introductory skills, knowledge, and conditioning essential for exploring cultural characteristics via the folk dance idiom. 1 hour.

Section F: Modern Dance, I. Introductory skills, knowledge, and conditioning essential for free and creative dance. 1 hour.

Section G: Modern Dance, II. Intermediate level technique, improvisation, and composition for both men and women; multimedia approaches to dance and dance criticism. Prerequisite: Kinesiology 101F or consent of instructor. 1 hour.

Section H: Afro-American Dance Forms. Beginning skills and knowledge and, under the repeat option, refined and more complex skills and heightened kinesthetic awareness essential for development of cultural characteristics via dance of West African, West Indian, Latin American, and contemporary Black American sources. 1 hour. May be repeated to a maximum of 3 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 102. Individual and Dual Activities.** Skills and knowledge essential for leisure-time activities which are classified as individual and dual activities. Prerequisites for each

individual or dual activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour.

Section A: Tennis, I. Introductory skills, knowledge, and conditioning essential for court play. 1 hour.

Section B: Tennis, II. Intermediate skills, knowledge, and attitudes for effective court play. Prerequisite: Kinesiology 102A or consent of instructor. 1 hour.

Section C: Golf, I. Introductory skills and understanding essential for course play, with emphasis on irons. For current fees, see Timetable. 1 hour.

Section D: Golf, II. Intermediate skills and understanding essential for use of irons and woods; analysis of course play. For current fees, see Timetable. Prerequisite: Kinesiology 102C or consent of instructor. 1 hour.

Section E: Bowling, I. Introductory skills and understanding essential for bowling. For current fees, see Timetable. 1 hour.

Section F: Bowling, II. Intermediate skills and understanding essential for bowling. For current fees, see Timetable. Prerequisite: Kinesiology 102E or consent of instructor. 1 hour.

Section G: Equitation and Horsemanship, I. Fundamentals of riding, including walk, trot, and canter; flatsaddle and bareback riding; use of reins and tack; saddling and unsaddling; and basic grooming. For current fees, see Timetable. 1 hour.

Section H: Equitation and Horsemanship, II. Intermediate riding skills, including individual control of walk, trot, and canter; smooth transfer of gaits; bareback riding in all three gaits; diagonals, figure eights, and serpentine; and tack maintenance. For current fees, see Timetable. Prerequisite: Kinesiology 102G or consent of instructor. 1 hour.

Section I: Foil Fencing. Introductory skills, knowledge, and conditioning essential for foil fencing. 1 hour.

Section J: Target Archery. Introductory skills, knowledge, and conditioning essential for target shooting. 1 hour.

Section K: Track and Field. Introductory skills, knowledge, and conditioning essential for various track and field events. 1 hour. May be repeated once for credit.

Section M: Pocket Billiards. An introduction to the fundamentals of pocket billiards play; grip, stance, bridge, strategy, variation of shots, how to impart English on the cue ball, basic position play, and an 8-ball tournament; and rules of various billiard games. For current fees, see Timetable. 1 hour.

Section N: Basic Marksmanship. Introductory skills, knowledge, and safety measures for basic marksmanship techniques with small bore weapons. 1 hour.

Section O: Competitive Marksmanship. Development of advanced competitive shooting skills; includes match weapons, description use, match procedures and match techniques. Prerequisite: Kinesiology 102N. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

103. Indoor Court Activities. Skills and knowledge essential for leisure-time activities which are classified as indoor court activities. Prerequisites for each indoor court activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.

Section A: Racquetball, I. Introductory skills, knowledge, and strategies essential for racquetball. 1 hour.

Section B: Racquetball, II. Intermediate skills, knowledge, and strategies essential for racquetball. Prerequisite: Kinesiology 103A or consent of instructor. 1 hour.

Section C: Badminton. Introductory skills, knowledge, and conditioning essential for badminton. 1 hour.

Section D: Handball. Introductory skills, knowledge, and conditioning essential for four-wall handball. 1 hour.

Section E: Squash Racquets. Introductory skills, knowledge, and conditioning essential for squash racquets. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 104. Skating Activities.** Skills and knowledge essential for leisure-time activities which are classified as skating activities. Prerequisites for each skating activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.

Section A: Figure Skating, I. Introductory skills, knowledge, and conditioning essential for figure skating. For current fees, see Timetable. 1 hour.

Section B: Figure Skating, II. Intermediate skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the United States Figure Skating Association's preliminary tests. For current fees, see Timetable. Prerequisite: Kinesiology 104A or consent of instructor. 1 hour.

Section C: Figure Skating, III. Advanced skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the first eight tests of the United States Figure Skating Association. For current fees, see Timetable. Prerequisite: Kinesiology 104B or consent of instructor. 1 hour.

Section E: Ice Dance. Introduction to set patterns of ice dance; emphasizes ice dance skills designed to build control in footwork and balance when skating with a partner. For current fees, see Timetable. Prerequisite: Kinesiology 104B or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 106. Swimming Activities.** Skills and knowledge essential for leisure-time activities which are classified as swimming activities. Prerequisites for each swimming activity are given below. More than one activity (Sections A, B) may be taken in the same term if these activities are offered on an 8-week basis. 1 hour.

Section A: Swimming, I. Introductory skills, knowledge, and conditioning essential for swimming. Open only to nonswimmers and those with no deep water experience. 1 hour. May be repeated once for credit.

Section B: Swimming, II. Intermediate skills, knowledge, and conditioning essential for swimming. Open only to swimmers who can execute a minimum of one of the five basic strokes in deep water, perform a standing dive, and tread in deep water. Prerequisite: Kinesiology 106A or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 107. Aquatic Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as aquatic sport activities. Prerequisites for each aquatic sport activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour.

Section A: Canoeing. Introductory skills and knowledge essential for handling a canoe with safety. Prerequisite: Kinesiology 106B or consent of instructor; the ability to jump or dive into deep water while clothed and maintain a survival position for 10 minutes. 1 hour.

Section B: Competitive Swimming. Skills, knowledge, and conditioning essential for strokes, starts, and turns; emphasis on training for competitive participation as well as meet organization. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour.

Section C: Springboard Diving. Introductory skills, knowledge, and conditioning essential for springboard diving. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour. May be repeated once for credit.

Section D: Synchronized Swimming. Introductory skills, knowledge, and conditioning essential for creating aquatic compositions. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.

- 109. Team Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as team sport activities. Prerequisites for each team sport activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour.
- Section A: Volleyball, I.** Introductory skills, knowledge, and conditioning essential for power volleyball. 1 hour.
- Section B: Volleyball, II.** Intermediate skills, knowledge, and conditioning essential for power volleyball. Prerequisite: Kinesiology 109A or consent of instructor. 1 hour.
- Section C: Basketball.** Introductory skills, knowledge, and conditioning essential for basketball. 1 hour.
- Section F: Baseball.** Introductory skills, knowledge, and conditioning for baseball. 1 hour.
- Section H: Soccer.** Introductory skills, knowledge, and conditioning essential for soccer. 1 hour.
- Section I: Rugby Football.** Introductory skills, knowledge, and conditioning essential for offensive and defensive strategies of the game. 1 hour.
- Section J: Field Hockey.** Introductory skills, knowledge, and conditioning essential for field hockey. 1 hour.
- Section K: Lacrosse.** Introductory skills, knowledge, and conditioning essential for lacrosse. 1 hour.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.
- 110. Gymnastic Activities.** Skills and knowledge essential for leisure-time activities which are classified as gymnastic activities. Prerequisites for each gymnastic activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.
- Section A: Apparatus, I.** Introductory skills, knowledge, and conditioning relative to participation on heavy apparatus. 1 hour.
- Section B: Apparatus, II.** Intermediate skills, knowledge, and conditioning relative to participation on heavy apparatus. Prerequisite: Kinesiology 110A or consent of instructor. 1 hour.
- Section C: Tumbling.** Introductory skills, knowledge, and conditioning for tumbling and free exercise. 1 hour. May be repeated once for credit.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the Timetable. Prerequisite: Consent of instructor. 1 hour.
- 120. Injuries in Sport.** Emphasizes injury mechanisms, means of injury prevention, and emergency care applied to various types of sport injuries; laboratory sessions emphasize preventive and therapeutic taping and emergency first aid. 2 hours.
- 121. Survey of Sports Medicine.** Introduction to sports medicine for nonKinesiology majors; includes discussion of training, conditioning, and preparation for sports, injury aspects of sports, and rehabilitation. 3 hours.
- 130. Analysis and Performance of Basic Movement Skills.** Development of an understanding of basic movement skills; emphasizes performance and qualitative analysis of personal movement skills; and studies developmental aspects of typical and atypical movement skills in a variety of settings. 2 hours.
- 131. Movement Skills: Fitness.** Development of and participation in a physical fitness program including physical fitness assessment. 1 hour.
- 132. Movement Skills: Swimming.** Development of an understanding of basic swimming skills; emphasizes performance and qualitative analysis of personal aquatic skills, developmental aspects of aquatic skills, and analysis of atypical movement patterns in an aquatic environment. Prerequisite: Kinesiology 130, and ability to execute a minimum of one of five basic strokes in deep water, perform a standing dive, and tread in deep water. 1 hour.
- 133. Movement Skills: Dance.** Development of an understanding of basic dance steps,

- positions and sequences; emphasizes performance and qualitative analysis of personal dance skills, developmental aspects of dance and rhythm, and analysis of atypical movement patterns in a dance setting. Prerequisite: Kinesiology 130. 1 hour.
134. **Movement Skills: Gymnastics.** Development of an understanding of basic gymnastic movements and sequences; emphasizes performance and qualitative analysis of personal gymnastic skills, developmental aspects of gymnastic skills, and analysis of atypical movement patterns in a gymnastic setting. Prerequisite: Kinesiology 130. 1 hour.
135. **Movement Skills: Field Activities.** Development of an understanding of basic field activity skills; emphasizes performance, as well as an appreciation of commonalities, in specific activities including soccer, speedball, speedaway, field hockey and flag football. Prerequisite: Kinesiology 130. 1 hour.
136. **Movement Skills: Racquet Activities.** Development of an understanding of basic racquet activity skills; emphasizes performance, as well as appreciation of commonalities in specific racquet activities such as tennis, badminton, squash or racquetball. Prerequisite: Kinesiology 130. 1 hour.
140. **Social Scientific Bases of Sport.** Introduction to the social science aspects of human movement including sport; particular emphasis on concepts derived from the social sciences (including psychology) that are appropriate to human movement. 3 hours.
141. **Sports in Greece and Rome.** Same as Classical Civilization 150. See Classical Civilization 150.
142. **Contemporary Issues in Sport.** Examines current issues in sport relative to competition, economics, race, sex, youth, educational institutions, deviant behavior, religion, psychology, and the media. 3 hours.
150. **Bioscientific Foundations of Human Movement.** Integrates anatomical and physiological aspects of human movement; emphasizes how the body moves, physiological responses to exercise stress, physical conditioning and physical fitness. 3 hours.
160. **Physical Education as a Profession.** The nature and scope of physical education as a profession; emphasis on orientation to the profession as well as understanding necessary for selecting an area of specialization within physical education. 2 hours.
161. **Principles of Motor Skill Acquisition.** Studies the basic principles of learning motor skills and their application in physical activities. Prerequisite: Kinesiology 130, or consent of instructor. 3 hours.
166. **Scuba Diving.** Introductory skills, knowledge, and conditioning essential for scuba diving. Includes only the pool and classroom sessions, not the open water dives required for certification; therefore, successful completion of this course does not result in certification. For current fees, see Timetable. Prerequisite: Kinesiology 106B or equivalent with consent of instructor; medical certification required to use scuba apparatus. 2 hours.
168. **Life Saving.** American Red Cross training for the prevention of aquatic mishaps and for life saving. Prerequisite: Ability to swim one-half mile including 20 yards of each of the following: sidestroke, breaststroke, and front crawl. 2 hours.
169. **Water Safety Instructor Training.** American Red Cross Instructor training for the teaching of swimming and life saving. Prerequisite: American Red Cross Swimmer and Advanced Life Saving certificates (current), and consent of instructor. 2 hours.
171. **Introduction to Sports Officiating.** Introduction to the fundamentals of sports officiating; a lecture course designed to foster the development of a sound knowledge of rules and an understanding of the mechanics involved in officiating selected sports. Content focuses upon those sports in season according to student demand and available faculty expertise; specific sports are announced in the Timetable. Each section is offered for eight weeks. 1 hour. May be repeated as specific activity varies.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
220. **Fundamentals of Athletic Training.** Discusses the role of the athletic trainer; legalities, facilities, advanced emergency procedures, and injury prevention; emphasizes the understanding of the process of injury and healing as a basis for prevention and treatment of injuries. Laboratory sessions stress special taping, emergency procedures and equipment. Prerequisite: Physiology 103, Anatomy 234, Kinesiology 120, or consent of instructor. 2 hours.

- 222. Bases for Prescription of Therapeutic Exercises.** Functional anatomy and injury constraints as a bases for prescription of therapeutic exercises for musculoskeletal conditions; laboratory sessions stress clinical evaluation of muscle and joint function and familiarization with therapeutic exercises. Prerequisite: Physiology 103 and Anatomy 234. 3 hours.
- 230. Coaching Strategies: Basketball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching basketball. 2 hours.
- 231. Coaching Strategies: Tackle Football.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tackle football. 2 hours.
- 232. Coaching Strategies: Baseball/Softball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching baseball/softball. 2 hours.
- 233. Coaching Strategies: Track and Field/Cross Country.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching track and field/cross country. 2 hours.
- 234. Coaching Strategies: Volleyball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching volleyball. 2 hours.
- 235. Coaching Strategies: Gymnastics.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching gymnastics. 2 hours.
- 236. Coaching Strategies: Swimming/Diving.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching swimming/diving. 2 hours.
- 237. Coaching Strategies: Tennis/Badminton.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tennis/badminton. 2 hours.
- 238. Coaching Strategies: Soccer.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching soccer. 2 hours.
- 244. Anthropology of Play.** Same as Anthropology 244. The study of human play with emphasis on origin, diffusion, spontaneity, emergence, and diversity; includes functions of play in selected culture groups. Prerequisite: A course in anthropology. 3 hours.
- 247. Introduction to Sport Psychology.** An analysis of the competitive sport process, with study of how personality and situational variables affect motivation, anxiety, and aggression in sport. Attention is given to the psychological skills needed by coaches and athletes for successful and enjoyable sports participation. 3 hours.
- 249. Sport and Modern Society.** Same as Sociology 249. The sociological analysis of sport in modern societies with regard to social class, politics, community, education, and collective behavior. 3 hours.
- 251. Analysis of Physical Fitness Programs.** Introduction to the physiological adaptations of the body during physical conditioning; analysis and development of physical fitness programs for individuals and groups. Prerequisite: Kinesiology 150 or consent of instructor. 2 hours.
- 255. Biomechanical Analysis of Human Movement.** Studies the biological and mechanical principles of human motor performance; analyzes selected movement skills in depth. Prerequisite: Physiology 103, Anatomy 234, Mathematics 111, or consent of instructor. 3 hours.
- 262. Motor Development in Childhood.** Same as Human Development and Family Ecology 204. Studies the selection of specific movement experiences for the elicitation and

maintenance of developmental sequences in children and youths based on physical growth and motor development; observational experiences provided with children in a variety of settings. Prerequisite: Kinesiology 150 or Human Development and Family Ecology 105. 3 hours.

- 263. Physical Education Curriculum.** The identification, selection, and organization of movement knowledges and experiences into curricula for children and youth; emphasizes the decision-making process in curriculum development. Prerequisite: Junior standing. 3 hours.
- 267. Adapted Physical Education.** Organization, administration, and conduct of physical education programs for the most prevalent types of medical conditions found in school settings; emphasis on analyzing motoric needs and prescribing programs of motor activity for special populations, including individuals with mental retardation and learning disabilities. Prerequisite: Kinesiology 150 and 161, or consent of instructor. 3 hours.
- 269. Physical Education for Children.** Theory and practice of physical education in preelementary and elementary schools; for non-kinesiology majors. 3 hours.
- 273. Instructional Strategies in Physical Education.** Analyzes the teaching-learning process, emphasizing the identification of instructional strategies specific to the development of skilled performance in movement activities. Prerequisite: Kinesiology 161. 3 hours.
- 280. Principles of Evaluation and Assessment.** An introduction to the methods and techniques of evaluation and assessment of human performance in physical education and sport. Prerequisite: Kinesiology 160; Mathematics 111 or 112, or equivalent score on the Mathematics Placement Test. 3 hours.
- 285. Supervised Experiences in Kinesiological Research.** Supervised laboratory experiences in physical education research; individual work under the supervision of members of the faculty in their respective fields. The student assists with data collection, processing, and analysis for research in progress. Prerequisite: Kinesiology 160 or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
- 286. Supervised Experience in the Common School.** Supervised practice in observing, assisting, and teaching children in preelementary school, elementary school, junior high school, and senior high school; emphasis on understanding motor behavior, teacher-learner behavior, and interrelatedness with other aspects of the learning environment. Prerequisite: Kinesiology 161 or equivalent. 3 hours. May be repeated to a maximum of 6 hours.
- 287. Supervised Experiences in the Agency Setting.** Supervised practical experience in leadership roles in nonschool agency settings; emphasis on observing, planning, and conducting physical activity programs for children and/or adults in preschool, recreation, or other social agencies. 3 hours. May be repeated for a maximum of 6 hours.
- 288. Supervised Experiences in Athletic Training.** Supervised practicum in the athletic training setting; places emphasis on evaluation of student progress in clinical experiences. Prerequisite: Sophomore standing, and selection into the National Athletic Trainers Association approved athletic training certification program. 1 hour. May be repeated for a maximum of 6 hours.
- 290. Honors Seminar.** Same as Health and Safety Studies 290 and Leisure Studies 260. Lectures and discussion dealing with issues in kinesiology, dance, health education, recreation education, and related fields. Prerequisite: James Scholar standing or grade-point average of 4.0. 2 hours. May be repeated for a maximum of 6 hours.
- 291. Special Problems.** Special projects in research and independent investigation in any phase of health, kinesiology, physical education, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty advisor, instructor, and head of department. 2 or 3 hours. May be repeated for a maximum of 4 to 6 hours.
- 305. Principles of Ergonomics.** Same as Industrial Engineering and Physiology 305. See Industrial Engineering 305.
- 320. Advanced Assessment of Athletic Injuries.** Analyzes injury patterns and mecha-

nisms for the various joints and body segments; emphasizes the nature of the injuries, clinical evaluation and therapeutic principles, on the physiology of the healing process, and functional anatomy. Prerequisite: Kinesiology 220, or consent of instructor. 3 hours or 1 unit.

- 321. Therapeutic Modalities in Athletic Training.** Emphasizes instrumentation and application of therapeutic modalities in laboratory settings: therapeutic heat, electrotherapy, traction, massage, and hydrotherapy. Prerequisite: Credit or concurrent registration in Kinesiology 320, or consent of instructor; Physics 140 is recommended. 2 hours or $1\frac{1}{2}$ unit.
- 322. Neurophysiological Bases of Therapeutic Exercise.** Examines neurological mechanisms underlying exercise performance with application to therapeutic programs. Prerequisite: Physiology 103 or Anatomy 234, or equivalent. 4 hours or 1 unit.
- 341. Games in Culture.** Examines game phenomena as cultural action systems with special emphasis on the biosocial behavior expressed in varying societies; topics include game components, cultural contexts, ecological strategies, enculturation, acculturation, symbolism, change process, and maladaptive behavior. Prerequisite: Kinesiology 244 or consent of instructor. 3 hours or 1 unit.
- 345. Kinesiology Perspective in Higher Education.** Examines the historical development of kinesiology in higher education in the United States since 1861; attention to the evolution of multi-disciplinary areas, issues, and trends. 3 hours or 1 unit.
- 346. Sociology of Sport.** Same as Sociology 346. Sociological analysis of sport as a socio-cultural system which progresses from the micro to the macro level; focuses on theoretical and conceptual issues in sociology of sport. Prerequisite: Kinesiology 249 and 3 additional hours of sociology, or consent of instructor. 3 hours or 1 unit.
- 347. Social Psychology of Sport.** Same as Psychology 349. Outlines the social psychological parameters which influence behavior and performance in sport; emphasizes the impact of social influences upon the individual within the sport context, including such factors as achievement motivation, competition, anxiety, aggression, and personality. Prerequisite: Kinesiology 140; Kinesiology 247 or equivalent; Psychology 100, 103, or 105; Psychology 201; or consent of instructor. 4 hours or 1 unit.
- 352. Physiology of Physical Activity.** Study of the immediate and long-term physiological effects of exercise upon the body; mechanisms of neuromuscular, cardiorespiratory, and metabolic control and adaptation relative to physical activity. Laboratory and lecture. Prerequisite: Kinesiology 150; Physiology 103 and Anatomy 234; or equivalent. 3 hours or 1 unit.
- 354. Growth and Physical Development of Children.** Same as Human Development and Family Ecology 354. A study of the growth and physical development of children through adolescence with emphasis on those systems and body composition changes related to motor performance and exercise stress. Prerequisite: Physiology 103 and Anatomy 234; Kinesiology 280; or equivalent. 3 hours or 1 unit.
- 355. Cinematography in Kinesiology.** Designed to develop an understanding of the mechanics of human motion as related to performance in sport activities through the mode of cinematography. Prerequisite: Kinesiology 255, or consent of instructor. 3 hours or 1 unit.
- 356. Electromyographic Kinesiology.** Focuses upon the biological components of volitional and reflexive movement in humans; theory and technology of electromyography are utilized to describe and quantify the neuromuscular input to the mechanical output. Prerequisite: Physiology 103 and Anatomy 234. 3 hours or 1 unit.
- 357. Motor Learning.** Discussion and analysis of scientific principles related to the learning and performance of motor skills; review of related literature and research in motor learning. Prerequisite: Psychology 100 or consent of instructor. 4 hours or 1 unit.
- 365. Movement Notation.** Same as Dance 349 and Psychology 312. See Psychology 312.
- 385. Clinical Experiences in Sports Medicine.** Clinical experiences in medical supervision of sports programs, in the areas of therapeutic exercises, fitness programming, and cardiac rehabilitation. Prerequisite: Consent of instructor. Prerequisites are determined on an individual basis in accordance with the clinical experiences to be

undertaken. 2 to 8 hours, or $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 hours or 2 units.

- 394. Special Topics in Kinesiology.** Lecture course on topics of current interest; specific topics announced in the Timetable. Prerequisite: To be determined for each subject and indicated in the Timetable. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
- 420. Issues in Sports Medicine.** Addresses current issues in the medical aspects of sports: examples of these issues are epidemiology of injuries and treatment forms, use of sports equipment, questionable sports practices, and preventive techniques. Prerequisite: Kinesiology 352 and 320, or equivalent; or consent of instructor. 1 unit.
- 422. Kinesiotherapy.** Analyzes pathomechanics underlying injury and orthopedic problems; also analyzes rehabilitation methods for orthopedic and neurological dysfunctions. Prerequisite: Kinesiology 322 or consent of instructor. 1 unit.
- 447. Sport Psychology.** Analysis of psychological factors and principles with special reference to motor performance, learning motor skills, perception, and emotion in sports situations; review of literature; and independent projects. Prerequisite: Psychology 100; Educational Psychology 211; consent of instructor. 1 unit.
- 449. Seminar: Sociology of Sport.** Same as Sociology 449. Sociological analysis of sport with emphasis on sociological theory; places stress on problems of comparative analysis, concept formation, and theory construction within the area of the sociology of sport. Prerequisite: Kinesiology 346 and nine hours of sociology or anthropology; or consent of instructor. 1 unit.
- 451. Scientific Basis of Physical Performance.** Contemporary trends in the study of human performance and exercise stress; analysis of the research literature, experimental strategies, and research instrumentation. Lecture-discussion and laboratory. Prerequisite: Kinesiology 352 or 354, or equivalent. 1 unit.
- 452. Neuromuscular Aspects of Human Performance.** In-depth study of the neuromuscular aspects of human activity; focus on selected topics related to growth, physical development, exercise prescriptions, athletic conditioning, and fitness. Prerequisite: Kinesiology 451. 1 unit.
- 453. Circulorespiratory Aspects of Physical Activity.** Aerobic performance responses to short-term, intermittent, and prolonged physical activity; special consideration given to endurance training methods and assessment techniques, ergogenic aids, and problems associated with growth, environmental influences, and competitive sport. Prerequisite: Kinesiology 451 or consent of instructor. 1 unit.
- 455. Experimental Kinesiology.** Mechanical and neuromuscular approach to human movement; analysis and experimental research. Prerequisite: Kinesiology 355 and 356, or consent of instructor. 1 unit.
- 457. Sensorimotor Development.** Same as Human Development and Family Ecology 457. Studies the development of spatially adapted movement behavior in man; emphasis on the nature of sensorimotor systems and development of perception; the role of proprioceptive feedback mechanisms and associated reflexes; and the neurogeometric principles basic to the study of man interpreting and acting on the environment. Prerequisite: Kinesiology 357 or equivalent. 1 unit.
- 461. Administration of Physical Education and Sport.** Analysis of completed research relating to theory and practice of administration in physical education and sport; the development of policy statements and procedures manuals for the various educational levels; and experience in the use of the case plan of instruction as a teaching technique for the development of competence and knowledge relating to human relations and administration in this specialized field. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar.** Lectures, discussions, and critiques on physical education and related subjects by faculty members and visiting professional leaders; presentation and criticism of student theses. 0 credit.
- 493. Independent Study.** Independent research on special projects; offered summers as a special group practicum. $\frac{1}{2}$ or 1 unit.
- 494. Special Topics in Kinesiology.** Lecture course in topics of current interest; specific subject matter announced in the Timetable. $\frac{1}{2}$ or 1 unit. May be repeated.
- 495. Research Methods in Kinesiology.** Review and appraisal of common research pro-

cedures; application of statistical procedures, library methods, evaluation procedures, and experimental methods. 1 unit.

499. Thesis Research. Preparation of theses in kinesiology. 0 to 4 units.

LABOR AND INDUSTRIAL RELATIONS

Director of Institute: W. Franke

Institute Office: 247 Labor and Industrial Relations Building, 504 East Armory, Champaign

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

301. European Working-Class History: 1750 to the Present. Same as History 301 and Sociology 301. See History 301.

315. The Economics of Poverty and Income Maintenance. Same as Economics 315. See Economics 315.

318. Industry and Society. Same as Sociology 318. See Sociology 318.

337. American Working Class History, 1780 to the Present. Same as History 337. See History 337.

341. Economics of Labor Markets. Same as Economics 341. See Economics 341.

345. Economics of Human Resources. Same as Economics 345. See Economics 345.

347. Labor Law, I. Same as Law 357. See Law 357.

355. Industrial Social Psychology. Same as Psychology 355. See Psychology 355.

357. Psychology of Industrial Relations. Same as Psychology 357. See Psychology 357.

360. Employee Benefit Plans. Same as Finance 360. See Finance 360.

409. Organizational Behavior. Same as Business Administration 409. See Business Administration 409.

418. Seminar in Industrial and Economic Sociology. Same as Sociology 418. Industrialization, labor-management relations as group relations, the interrelations of industry and community, technology and controls in industry, problem of social economics and stratification in industry. 1 unit.

420. Formation of Public Policy. Same as Political Science 420. See Political Science 420.

422. Government Regulation. Focuses on government policies affecting collective bargaining and personnel practices; includes an introduction to theories of political science and public policy for an understanding of government regulation in the employment area. Prerequisite: Labor and Industrial Relations 347 or 491, or consent of instructor. 1 unit.

430. Foundations of Industrial-Organizational Psychology. Same as Psychology 430. See Psychology 430.

435. Motivation and Morale in Industry. Same as Psychology 435. See Psychology 435.

440. Labor Economics. Same as Economics 440. See Economics 440.

441. Labor Economics. Same as Economics 441. See Economics 441.

442. Collective Bargaining. Same as Economics 442. Examination of: social values and social science concepts to develop a framework for explaining the basis and shape of collective bargaining as it has been practiced in the United States; government and law, unions, and employers as part of the development of this framework; the environment of collective bargaining with respect to the role of economics and bargaining structure; the negotiating process as the interactive basis for union-management relations; conflict and conflict resolution as part of the negotiating process; wage and other effects of collective bargaining as bargaining outcomes; contemporary changes in union management relations. Case materials and exercises may be used to supplement course materials. Prerequisite: Consent of instructor. 1 unit. Graduate credit is not given for both Economics 343 and Labor and Industrial Relations 442.

443. Problems and Practices of Labor Dispute Settlement. Same as Economics 443 and Law 361. Examination of the use of procedures to resolve employment disputes, especially between unions and employers; comparative analysis of grievance arbitration,

interest arbitration, mediation, fact-finding, and combinations of these procedures; special emphasis given to the role of third party intervention. 3 hours or 1 unit. Hourly credit only applicable to Law 361.

- 444. Problems and Policies in Human Resources.** Same as Economics 444. See Economics 444.
- 445. Investment in Human Resources.** Same as Vocational and Technical Education 445. Activities which influence future monetary and psychic income by improving the resources in people; coverage of investments, including schooling, on-the-job and other training, migration, and the search for information on jobs and incomes; emphasis on human capital concepts, public human resources policy, and problems of special groups. Prerequisite: An introductory course in economics and in quantitative methods, as specified by the department. 1 unit.
- 447. Labor Union Organization and Administration.** Same as Economics 447. Analysis of the structure, history, and government of the modern American trade union movement; survey of the environmental factors, objectives, and action programs with considerable emphasis on economic and internal institutional factors, including the roles of leaders, policy determination and execution, and governmental regulations; considerable emphasis also on the processes of union organizing and employer opposition. Prerequisite: Major in social science or consent of instructor. 1 unit.
- 448. Problems of Personnel Management.** Same as Business Administration 411. See Business Administration 411.
- 451. Labor Law and Public Policy.** Same as Law 360. Analyzes current major policy issues in labor law and administration through the concepts and techniques of the lawyer and the labor relations specialist. Prerequisite: For law students, Law 357 or consent of instructor; for Institute of Labor and Industrial Relations and other graduate students, one semester of labor and industrial relations course work or consent of instructor. 3 hours or 1 unit. Hourly credit only applicable to Law 360.
- 454. Comparative Industrial Relations Systems.** Same as Law 356. Examines the history and structure of industrial relations systems in industrialized market economies; the organization and policies of unions and employers and of their international organizations; the role of national governments and international organizations in establishing industrial relations policies; comparative analysis of such topics as industrial conflict, industrial and economic democracy, and the relations between industrial relations and national economic policy. 3 hours or 1 unit. Hourly credit only applicable to Law 356.
- 455. Labor in Less Developed Countries.** The role and place of LDCs in the world; colonialism, independence, and nation-building; economics, power, and stratification; development of labor markets and labor movements; economic, political, and social consequences of international trade, finance, and investment; international diffusion of technology and ideology; nation-states, multi-national corporations and world community; and UN, ILO, UNCTAD, UNIDO and other international and regional organizations and their impact on labor in LDCs. Prerequisite: Economics 101 or 109, or equivalent. 1 unit.
- 456. Industrial Relations Theory, I.** An integrated analysis of the principles of labor relations through the study of the works of the major theorists and their critics. Prerequisite: Consent of instructor. 1 unit.
- 457. Industrial Relations Theory, II.** Continuation of Labor and Industrial Relations 456. Focuses on contemporary research in industrial relations and related fields. Prerequisite: Labor and Industrial Relations 456. 1 unit.
- 458. Faculty-Student Workshop.** Training and experience for Ph.D. students in the application of social science and industrial relations theory and research methodology to contemporary industrial relations problems through presentation and discussion of faculty and student research. Ph.D. students are required to make presentations and to participate in workshop discussions during the entire period of their campus residency. Prerequisite: Labor and Industrial Relations 456 and 457. 0 to 1 unit.
- 461. Compensation Systems.** Compensation theory and practice. Topics include: the influence pay has on various outcomes such as job choice, motivation and performance;

external and internal labor market analysis; job pricing through use of job analysis and job evaluation; merit and incentive pay systems; pay discrimination; executive compensation; and innovations in compensation practices. Case analyses and computer simulations may be used to supplement course materials. 1 unit.

- 462. Human Resources Planning and Staffing.** Examines conceptual issues, policies, and practices relating to the attraction, selection, and development of human resources in both private and public organizations. 1 unit.
- 490. Individual Topics.** A student in labor and industrial relations may register for this unit with the consent of the curriculum adviser and the adviser under whom the student will perform individual study or research. Such individual work may include special study in a subject matter for which no course is available or an individual research project, including on-the-job research in industry, which is not being undertaken for a thesis. 0 to 2 units.
- 491. Industrial Relations Systems.** A general framework for analysis of employment relationships. Topics include the American system of collective bargaining, intercountry system differences, and alternative theoretical frameworks for the analysis of industrial relations. Prerequisite: Graduate standing. 1 unit.
- 492. Research Methods in Labor and Industrial Relations.** Systematic analysis of theories and procedures of the various social and physical sciences bearing on research in labor and industrial relations; primary emphasis on the process of integrating the approaches and techniques of the various social sciences with respect to the study of problems in labor and industrial relations as met in practice in management, the union, and government service, as well as in teaching and research in the field. Prerequisite: Major in social sciences or consent of instructor. 1 unit.
- 493. Quantitative Methods in Labor and Industrial Relations.** Introduction to statistical concepts and methods in the social sciences and their application to industrial relations problems; familiarizes the student with modern methods of probability sampling, statistical inference, and multivariate analysis, and their application to current research problems in labor and industrial relations. Prerequisite: Any elementary statistics course. 1 unit.
- 494. Tutorial Seminar.** Training and experience for Master's students in carrying out a problem solving project from formulation to written report in a chosen area of labor and industrial relations. Each student selects an individual topic with the approval and guidance of a faculty member. Prerequisite: Completion of no fewer than 6 units of Labor and Industrial Relations course work. 0 or 1 unit.
- 496. The Evolution of Labor-Management Relations in America.** Historical analysis and interpretation of the development of the labor movement and labor-management relations at the plant, industry, and national levels. Prerequisite: Graduate standing in labor and industrial relations or consent of instructor. 1 unit.
- 497. Collective Bargaining in Public Employment.** Same as Social Work 497, Administration, Higher, and Continuing Education 497, and Political Science 469. Development of employee organization, collective bargaining, and public policies in the public sector: federal, state, and local; analysis of contemporary bargaining relations, procedures, problems, and consequences; special emphasis on dispute resolution and on union impacts. 1 unit.
- 498. Analysis of Organizations in Industrial Relations.** Intensive analysis of organizational behavior, with the main focus upon the theory of organizations as social institutions; concepts drawn from the various social sciences and applied to the principal organizations concerned with industrial relations; and examination of the internal dynamics of unions, managements, and government agencies, with special reference to decision-making processes, and their individual relations to the interactions among them. Prerequisite: Consent of instructor. 1 unit.
- 499. Thesis Seminar.** For all students writing theses in labor and industrial relations at the A.M. and Ph.D. levels. 0 to 4 units.

LANDSCAPE ARCHITECTURE

Head of Department: V. J. Bellafore

Department Office: 214 Mumford Hall, 1301 West Gregory, Urbana

- 101. Introduction to Landscape Architecture.** A survey of the practice, profession, and philosophy of landscape architecture. 2 hours.
- 133. Basic Landscape Design.** Introduction to the fundamentals of design, including studies in two- and three-dimensional abstract and applied problems, basic elements and procedures of design, and principles of landscape composition. Prerequisite: Credit or concurrent registration in Landscape Architecture 180, or consent of instructor. 5 hours.
- 134. Site Design.** Principles and practices of site planning; orientation, circulation, and land use definitions and relationships applied to site scale problems; and application of site design process. Field trip required; see Timetable for current fees. Prerequisite: Landscape Architecture 133 or consent of instructor. 5 hours.
- 142. Landform Design and Construction.** Introduction to the fundamentals of the earth's surface as a design element; limitations and uses of landforms; and methods of grading, surface drainage, and land surveying. Prerequisite: Mathematics 114 or 116. 3 hours.
- 150. Landscape Surveys.** Principles and practices of identifying, analyzing, and recording landscape resources. Field trip required; see Timetable for current fees. Prerequisite: Geography 103 or consent of instructor. 3 hours.
- 180. General Drafting and Graphics.** Basic techniques and standards of drafting; lettering, views and projections, dimensioning, and shades and shadows. Prerequisite: Open to landscape architecture majors only. 2 hours.
- 181. Visual Communications, I.** Principles of basic design and techniques in landscape architectural rendering. Prerequisite: Landscape Architecture 180 or consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Senior Honors Course.** Independent guided study and research in a selected area of landscape architecture; for candidates for honors in landscape architecture. Prerequisite: Senior standing in landscape architecture, a university grade-point average of 4.0, and consent of head of department. 1 to 6 hours. May be repeated to a maximum of 9 hours.
- 214. History of Landscape Architecture.** Analysis of the development of landscape architecture as a result of environmental and cultural influences. 3 hours.
- 226. Principles of Park Design.** Introduces theories, principles, and applications of park site and system master planning and design; examines relationships between aesthetic and functional considerations, site features, park users, and administrators. 2 hours.
- 235. Recreation and Community Design.** Development of design solutions at site and master plan scale relative to community urban and recreational problems; emphasizes development of analysis and design techniques. Field trip required; see Timetable for current fees. Prerequisite: Landscape Architecture 134 or consent of instructor. 5 hours.
- 236. Design Workshops, I.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. Students select from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours.
- 243. Site Engineering.** Principles of surveying and design of drainage, circulation, and utility systems. Prerequisite: Landscape Architecture 142 and Mathematics 114 or 116; or consent of instructor. 4 hours.
- 244. Landscape Construction.** Construction methods, materials, and procedures related to the design of landscape structures; development of design details and cost estimating. Prerequisite: Landscape Architecture 243 or consent of instructor. 4 hours.
- 246. Professional Practice.** The landscape architect as a professional practitioner; includes orientation to the concept of professionalism, forms of professional activity, and the skills needed to manage a practice. 1 hour.

- 251. Plant Materials and Design, I.** Ecological principles, study of plant communities, identification of native flora and perennials, and uses of plants in the landscape; introduction to planting design. Field trips required. Prerequisite: Landscape Architecture 150, Plant Biology 102, and Geography 103. 4 hours.
- 252. Plant Materials and Design, II.** Biogeography; identification of native species, evergreens, and exotics; uses of plants in the landscape; and planting design projects. Field trips required. Prerequisite: Landscape Architecture 251. 4 hours.
- 253. Planting Design.** Planting design philosophies; detailed and comprehensive design projects; management practices; technical documents; and plant identification. Field trips required. Prerequisite: Landscape Architecture 252. 4 hours.
- 290. Special Problems.** Supervised independent study, research, or special project in a selected area related to landscape architecture. Prerequisite: Junior or senior standing; consent of instructor and head of department prior to advance enrollment and registration. 1 to 6 hours. May be repeated to a maximum of 9 hours.
- 299. Off-Campus Study.** Provides campus credit for off-campus study. Prerequisite: Junior standing; prior review and approval of the student's written proposal by a faculty committee and the department head. 0 to 15 hours (summer session, 0 to 6 hours). Final determination of appropriate credit is made by a faculty review committee upon completion of the student's work. Maximum credit, 15 hours (summer session, 6 hours), all of which must be earned within one semester.
- 325. Historical Geography of American Landscapes to 1880.** Same as Geography 325. See Geography 325.
- 326. Historical Geography of American Landscapes Since 1880.** Same as Geography 326. See Geography 326.
- 327. American Vernacular: The Cultural Landscape.** Same as Geography 327. See Geography 327.
- 337. Regional Landscape Design.** Introduction to the process of physical planning, emphasizing land use policy and plan formulation; a regional case study is undertaken to develop analytical skills, to introduce the relationship between cultural and natural processes, and to explore the need for responsible political action. Prerequisite: Landscape Architecture 236 or consent of instructor. 5 hours or 1 1/2 unit.
- 338. Design Workshops, II.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. The student selects from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours, or 1 to 1 1/2 unit.
- 341. Land Resource Evaluation.** Same as Urban Planning 341. Examines concepts for the value of land, land resource problems and policy responses, methods for evaluating land resource development and policy alternatives, and case studies of land resource evaluation. Prerequisite: Graduate standing or consent of instructor. 4 hours or 1 unit.
- 350. Land Use Ecology.** Ecological implications of alternative land use patterns; equipment, field techniques, and nomenclature in current use by environmental consultants; and elements of a baseline ecosystem study. Prerequisite: Consent of instructor. 3 or 4 hours, or 3/4 or 1 unit.
- 370. Design-Behavior Interaction.** Critical discussion of notions and theories pertaining to the reciprocal effects of landscape architectural design and human behavior. 3 hours or 3/4 unit.
- 382. Visual Communications, II.** Continuation of Landscape Architecture 181, emphasizing advanced techniques and further exploration of the media of visual communication. 3 hours or 3/4 unit.
- 417. Land and Society: History, Theories, and Problems.** Historical and cross-cultural investigation of the use, shaping, and perception of the land-based environment; case studies, critical problems and issues, and theories of social-environmental interaction. Prerequisite: Consent of instructor. 1 unit.
- 437. Landscape Planning.** Small group design and planning studio emphasizing actual problems and clients; projects require fieldwork, analysis, problem-solving, design, and

- presentation to them. Prerequisite: Landscape Architecture 341 and 350, or consent of instructor. 1 1/2 units.
442. **Spatial Design Methods.** Same as Urban Planning 442. Representations and solution procedures for problems involving the arrangement of land use activities in space; optimizing, approximate, and graphic methods, their applications, effectiveness, and efficiency, and experiments with computerized procedures. Prerequisite: Landscape Architecture 341 or consent of instructor. 1 unit.
450. **Environmental Impact Statements.** Requirements of the National Environmental Policy Act and Guidelines from the Council on Environmental Quality for preparing and writing environmental impact statements; includes interdisciplinary team efforts and impact assessment techniques. Prerequisite: Graduate or law school standing, or consent of instructor. 1 unit.
463. **Methods of Social and Behavioral Research in Designed Environments.** Same as Architecture 463. See Architecture 463.
464. **Conducting Social and Behavioral Research in Designed Environments.** Same as Architecture 464. Each student prepares and conducts research to obtain information about specific relationships between people and the designed environment. Prerequisite: Landscape Architecture 370 or Architecture 323, and Architecture 460, or equivalent; and a course in introductory statistics. 1 unit.
465. **Design Behavior Studio.** Same as Architecture 465. Development of site or project scale design emphasizing the integration of user needs and behavioral factors. Prerequisite: Landscape Architecture 464, or consent of instructor. 1-3 units. May be repeated to a maximum of 3 units.
481. **Urban Design Studio, I.** Same as Architecture 481. See Architecture 481.
482. **Urban Design Studio, II.** Same as Architecture 482. See Architecture 482.
483. **Geology, Hydrology, and Land Use.** Same as Urban Planning 483. See Urban Planning 483.
487. **Seminar.** Preparation, presentation, and discussion of research papers on current and future areas of landscape architectural application. Prerequisite: Consent of instructor. 1 or 2 units.
490. **Special Problems.** Nature and scope of projects to be determined by consultation between student and faculty adviser; open to landscape architecture majors as well as those from other disciplines who wish to engage in interdisciplinary work. Prerequisite: Consent of instructor. 1 or 2 units.
498. **Master's Project.** Major independent or small-group project synthesizing knowledge from previous coursework. Prerequisite: Consent of instructor and program adviser. 0 to 2 units.
499. **Thesis Research.** Prerequisite: Graduate standing in landscape architecture. 0 to 2 units.

LANGUAGES

(For a list of the languages regularly offered, together with the units responsible for offering them, see APPENDIX A.)

LATIN AMERICAN AND CARIBBEAN STUDIES

Director of Center: E. Mayer

Center Office: Room 250, 1208 West California, Urbana

170. **Introduction to Latin America.** An interdisciplinary introduction to the ways of life of Latin American peoples, their origins and current expressions; discusses social, economic, and political problems, and domestic and international policies related to them in the context of other Third World societies. 3 hours.

- 195. Freshman Seminar.** An intensive review of domestic and foreign factors influencing violence and social change in Latin America. Each semester a particular topic is selected. Prerequisite: Freshman James Scholar or other designation as a superior student. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Individual Study.** A major tutorial normally taken in the senior year. Students read the works on a reading list devised in consultation with a faculty tutor and write a term paper. Prerequisite: Latin American Studies 170; a declared field of concentration in Latin American Studies; consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 295. Special Topics.** A topical survey of social, economic, and political factors in Latin American life. Each semester a particular topic is considered. Prerequisite: A basic course in a social science discipline. 2 to 4 hours.
- 345. Tutorials in Native Latin American Languages.** Upon the consent of the Director of the Center for Latin American Studies, tutorials are available in special native Latin American languages not regularly offered by the University. Tutorials at the elementary, intermediate, and advanced levels may be arranged. Students registering for unit credit for the first two semesters must first present satisfactory evidence of knowledge of the language at the elementary level, either in the form of credit earned at another institution or by passing a proficiency examination. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated up to six semesters successively to a maximum of 16 hours or 4 units.

LAW

Dean of College: P. H. Hay

College Office: 209 Law Building, 504 East Pennsylvania, Champaign

- 301. Contracts-Sales, I.** Enforceability of promises including unjust enrichment and reliance, offer and acceptance, mistake, unfairness and overreaching, unconscionability, Statute of Frauds, interpretation of contract language, conditions, and third party beneficiaries. 4 hours or 1 unit.
- 302. Contracts-Sales, II.** Introduction to the Uniform Commercial Code, its interpretation and application; performance of contracts including warranty obligations, breach, remedies for breach, impossibility and frustration of purpose, assignment and delegation, and third party rights in sold goods. Prerequisite: Law 301. 3 hours or 1 unit.
- 303. Torts, I.** A basic course in civil wrongs, including intentional torts (such as assault and battery), negligence, and medical malpractice, and the impact of insurance. 2 hours or $\frac{1}{2}$ unit.
- 304. Torts, II.** A basic course in civil wrongs, including liability of owners and occupiers of land, libel and slander, unfair commercial practices, and products liability. Prerequisite: Law 303. 3 hours or 1 unit.
- 305. Property, I.** With Law 306, the basic first-year course in property law, required of all students. Provides an overview of the law of land, with incidental coverage of personal property; includes the concept of property, acquisition of private property, recognized property interests, gratuitous transfer of property interests, commercial transfers (sale, lease), the use of property, and an introduction to environmental law. 3 hours or 1 unit.
- 306. Property, II.** Continuation of Law 305. 3 hours or 1 unit.
- 307. Criminal Law.** The sources and purposes of the criminal law; the meaning of criminal responsibility; and the characteristics of particular crimes. 3 hours or 1 unit.
- 308. Criminal Procedure.** Problems in the administration of criminal justice with emphasis on right to counsel, arrest, search, interrogation, lineups, and the scope and administration of exclusionary rules. Prerequisite: Law 307. 3 hours or 1 unit.

- 309. Civil Litigation, I.** The role and importance of procedure in litigation, including jurisdiction, pleadings and parties, pretrial motions and discovery, trial practice (except evidence), relationship between judge and jury, the effect of a decision in one case on subsequent litigation between the same or different parties (*res judicata*), verdicts and judgements, and appellate review. 3 hours or 1 unit.
- 310. Civil Litigation, II.** Continuation of Law 309. Prerequisite: Law 309. 3 hours or 1 unit.
- 311. Legal Writing and Research.** Emphasis on development and improvement of skills in legal writing, and training in legal bibliography. Assignments may include brief writing and preparation of legal memoranda and opinions. 2 hours or 1/2 unit.
- 312. Moot Court.** Following Law 311, moot court is required in the second semester of the first year for further development of skills in legal research, analysis, and writing. Each student works in a team on the preparation of an appellate brief on a moot court case and then argues the case in appellate argument fashion before a panel of senior students and faculty. 1 hour. No graduate credit.
- 313. Constitutional Law, I.** Basic principles of American constitutionalism, including the judicial function in constitutional cases; the implementation of the doctrines of federalism and separation of powers; the development and exercise of the powers of Congress and the states in the federal union; and the protection of civil rights and liberties. 4 hours or 1 unit (summer session, 3 hours or 1 unit).
- 314. Administrative Law.** The functions of administrative tribunals in federal, state, and municipal government; the procedure before such administrative tribunals; and judicial relief from administrative decisions. 3 hours or 1 unit.
- 315. Constitutional Law, II.** A detailed study of the history and application of the First Amendment to the Constitution of the United States; focuses on the decisions of the Supreme Court concerning the freedoms of assembly, press, speech, and religion as well as the implied right of association. Prerequisite: Law 313. 3 hours or 1 unit.
- 316. Constitutional Litigation.** A study of the federal statutes that authorize civil suits against public officials and governmental entities responsible for the deprivation of constitutional rights; immunities and defenses; potential remedies; federalism issues. 2 to 3 hours, or 1/2 to 1 unit.
- 317. Advanced Criminal Procedure.** Problems in the administration of criminal justice, with emphasis upon the commencement of formal proceedings (bail, decision to prosecute, grand jury, preliminary hearing, location of prosecution, scope of prosecution, speedy trial); the adversary system (pleas, discovery, jury trials, prejudicial publicity, ethical problems, double jeopardy); and post-conviction review (post-trial motions, appeals, habeas corpus, related post-conviction remedies). Prerequisite: Law 307, 308 and 313. 3 hours or 1 unit.
- 318. Legislation.** Constitutional and statutory issues in legislative procedure, including issues relating to separation of power between Congress and the President; particular legislative-executive issues raised by the Illinois Constitution; and techniques of legislative drafting and the interpretation of statutes. 2 to 3 hours, or 1/2 to 1 unit.
- 319. Environmental Law.** The regulatory aspects of environmental law. Environmental impact assessments; control of air pollution, water pollution, noise, and toxic substances; the roles of federal and state governments; and citizen participation in and judicial review of public decision-making and enforcement procedures. 3 hours or 1 unit.
- 320. Natural Resources.** Legal problems associated with the use of certain land, water, and mineral resources, including energy sources; emphasizes public management and regulation. 2 or 3 hours, or 1/2 or 1 unit.
- 321. Urban Government.** The law governing the structure, powers, and operation of local governments in urban and suburban areas with analysis of political, economic, and social implications. 3 hours or 1 unit.
- 322. Land Use Planning.** Examination of the legal and administrative aspects of land development and regulation in an urban society, including the techniques and problems of planning; the tools of plan effectuation, such as zoning, subdivision regulation,

renewal and redevelopment, and housing programs; and the allocation of decision making among various levels of government. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.

- 324. Law of Corrections and Prisoners' Rights.** An examination of the present system of corrections, including a study of procedural and substantive rights of incarcerated persons; the sentencing process; post-conviction remedies and programs, focusing on probation and parole; and alternatives to the present system. Prerequisite: Law 307 and 308. 3 hours or 1 unit.
- 325. Law, Science, and Medicine.** Explores the legal system's response to challenges of modern science and medicine; topics include regulation of genetic engineering and nuclear power, experimentation on humans and animals, control of communicable diseases, allocation of transplant organs, and the right to die. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 327. Advanced Bankruptcy and Creditors' Rights.** Selected issues in bankruptcy and creditors' rights not covered in Law 339, with emphasis depending on current significance; examination of business reorganizations under Chapter 11 of the Bankruptcy Code, generally including jurisdictional issues and problems related to the filing of the case, the participants in the Chapter 11 process, operating a business under Chapter 11, and formulating and confirming a reorganization plan. Prerequisite: Law 339. 3 hours or 1 unit.
- 328. Organizations, I.** Examines the basic state and federal legal consequences for individuals, organizations, and society of the formation, control, and financing of organizations; includes the agency and employment relationship, unincorporated associations, general partnerships, limited partnerships, close corporations, public corporations, and nonbusiness organizations. 3 hours or 1 unit.
- 329. Organizations, II.** Examines the impact of state and federal regulation and financial theory on the continuing financial policy decisions of business organizations, including distributions (by dividends and share purchases); going concern rights of debt and equity holders; insolvency and reorganization; tender offers; merger; and acquisitions. Prerequisite: Law 328. 2 hours or $\frac{1}{2}$ unit (summer session 3 hours or 1 unit).
- 330. Antitrust Law.** The limitations imposed by the Sherman Act, Clayton Act, and Federal Trade Commission Act on anticompetitive practices by business firms; emphasizes price fixing, monopolization, mergers, exclusive dealing, tying arrangements. 3 hours or 1 unit.
- 331. Business Planning.** Examination of planning situations wherein tax, corporations, corporate finance, securities regulation, and accounting materials are interrelated; organization of close corporations and public companies, corporate distributions and recapitalizations, sale of corporate businesses, corporate acquisitions and mergers, and corporate separations; and problems requiring written opinions and solutions. Prerequisite: Law 348 and 351. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Securities Regulation.** Problems arising under federal securities laws administered by the Securities and Exchange Commission, as well as "blue sky" or state securities laws; emphasis upon statutory and regulatory requirements imposed in connection with corporate financing. Prerequisite: Law 328 and 329. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 333. Advanced Corporate and Securities Law.** A problem method analysis of advanced substantive and procedural aspects of corporate and securities litigation, including advanced aspects and recent developments of SEC Rule 10b-5; problems involving takeovers, litigation possibilities; procedural and other aspects of shareholders' derivative suits; extra-territorial application of the federal securities laws. Prerequisite: Law 328 and 329. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 334. Government Regulation.** The legal and policy implications of government regulation. Course content varies from a survey of laws regulating various industries to a detailed focus on a specific industry. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 335. International Business Transactions.** Doing business abroad: export-import regulations, use of foreign commission merchants, licensing of patents and know-how, investment and exchange problems, establishing a foreign operation (including forms of business organization available abroad), and application of United States and foreign antitrust law to the business operation. 3 hours or 1 unit.

- 336. Regulation of Financial Institutions.** The framework of federal and state regulation of the structure and activities of financial institutions, with emphasis on banks and other depository institutions. Topics include relevant provisions of the National Bank Act, Federal Reserve Act, and Bank Holding Company Act as well as the regulatory policies of the Comptroller of the Currency and Federal Reserve Board. Consideration is given to the issues presented by "deregulation", including developments relating to branch banking, interstate banking, and brokerage and underwriting activities as well as regulation of international banking activities. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 337. Personal Property Security.** Advanced course in secured transactions under Article 9 of the Uniform Commercial Code. Prerequisite: Law 339. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 338. Tax and Financing Aspects of Real Estate Transactions.** Methods of financing land acquisition and residential and commercial development, including publicly owned and subsidized housing. 3 hours or 1 unit.
- 339. Creditors' Rights.** Examines the legal regulation of the relationship among debtors and their creditors and among creditors of a particular debtor; includes: pre- and post-judgment remedies of unsecured creditors; introduction to rights of secured creditors under article 9 of the Uniform Commercial Code; debtors' attempts to defeat creditors, including fraudulent conveyances; study of Bankruptcy Code Chapters 7 (liquidation) and 13 (adjustment of debts of individuals), and introduction to Chapter 11 (reorganizations). 4 hours or 1 unit (summer session, 3 hours or 1 unit).
- 340. Commercial Paper.** A study of problems involved in the use of checks and promissory notes with special emphasis on Articles 3 and 4 of the Uniform Commercial Code, including electronic funds transfers and letters of credit. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 341. Consumer Credit.** Existing patterns and proposed changes in consumer credit law; finance charge regulations, special licensing for merchandisers of consumer credit, disclosure of finance charges, door to door selling, home improvement financing, cutting off defenses, creditor remedies problems including garnishment, wage assignments, and deficiency judgments, and administrative control of creditor practices. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 342. Copyright, Trademark, and Unfair Competition.** The regulation of competitive business behavior at common law and under federal and state statutes; trademarks, copyrights, trade secrets, protection of ideas, commercial disparagement, false advertising, and price discrimination. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 344. Sports Law.** Examines specialized aspects of the sports industry; emphasis given to antitrust, labor, and tax issues as applied to professional sports, and antitrust and constitutional issues that have allowed courts to intervene in intercollegiate athletics. Does not consider recurring legal problems for which general principles of law are applicable. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Patent Law.** Historical development of protection of ideas, inventions, and discoveries; patentability: securing the patent; amendment and correction of patents; and infringement remedies, defenses, and procedures. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 346. Advanced Antitrust Law.** Issues in antitrust law of particular current significance. The precise content varies, but typical areas of inquiry include federal regulatory antitrust exemptions, state action doctrine, patent licensing, extra-territorial application of domestic antitrust laws, and procedural issues in private enforcement. Prerequisite: Law 330. 3 hours or 1 unit.
- 347. International Trade Policy.** An analysis of the regulation of trade between nations by international agreement (e.g., the GATT), by multinational organizations (e.g., the European Communities), and by individual countries; emphasizes U. S. import restraints, export controls, and related laws. 3 hours or 1 unit.
- 348. Income Taxation.** The fundamental course in federal income taxation. Includes materials relating to income taxation of individuals and an introduction to taxation of corporations and shareholders. 3 hours or 1 unit.
- 349. Corporate Taxation.** An in-depth study of federal income tax law related to taxation

of corporations, shareholders, partnerships, and partners. Prerequisite: Law 348. 3 hours or 1 unit.

350. **Partnership Taxation.** Examines in detail the workings of subchapter K of the Internal Revenue Code of 1954, as amended, as well as other partnership tax provisions. Prerequisite: Law 348; Law 328, 329, and 349 are recommended. 2 hours or 1 unit (summer session, 3 hours or 1 unit).
351. **Estate and Gift Taxation.** A comprehensive treatment of federal transfer (estate and gift) taxes. Prerequisite: Law 348. 3 hours or 1 unit.
352. **State and Local Taxation.** A survey which stresses the constitutional and statutory bases of state and local tax systems; considers the fiscal and economic policy aspects of the tax structure, and includes the power and purposes of taxation, the operation and administration of the general property tax, jurisdiction of the states to impose various types of taxes, and special problems relating to the operation of income, sales, and business excise taxes. 2 or 3 hours, or 1 or 1 unit.
354. **Taxation of International Transactions.** Survey of the problems in U.S. taxation of foreign persons and foreign income, with special emphasis upon foreign business transactions of U.S. corporations. Prerequisite: Law 351. 2 or 3 hours, or 1/2 or 1 unit.
356. **Comparative Industrial Relations Systems.** Same as Labor and Industrial Relations 454. See Labor and Industrial Relations 454.
357. **Labor Law, I.** Same as Labor and Industrial Relations 447. A study of the National Labor Relations Act as amended, the preact history of the labor movement, and the judiciary's response thereto, with emphasis on understanding the problems, experiments, and forces leading to the enactment, includes the negotiation and administration of the collective bargaining agreement, especially the grievance arbitration procedure, its operation and place in national labor policy, and explores the relationship of the individual and the union. Prerequisite: Graduate standing or completion of first year of law curriculum. 3 or 4 hours, or 1 unit.
358. **Employment Discrimination.** Problems arising under federal statutory prohibitions of discrimination in employment, with particular emphasis on evidentiary problems and the use of statistical proofs; defining relevant labor pools, using statistical analyses of data, and establishing proof of test validation. 2 hours or 1/2 unit (summer session, 3 hours or 1 unit).
359. **Collective Bargaining and Labor Arbitration.** Enforcement and administration of the collective bargaining agreement, including enforcement of labor contracts under Section 301 of the National Labor Relations Act and enforcement of the labor contract pursuant to its own grievance and arbitration procedure. 2 hours or 1 unit (summer session, 3 hours or 1 unit).
360. **Labor Law and Public Policy.** Same as Labor and Industrial Relations 451. See Labor and Industrial Relations 451.
361. **Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Labor and Industrial Relations 443. See Labor and Industrial Relations 443.
363. **Family Law.** The creation and dissolution of the family, and legal relationships established by marriage, cohabitation and procreation. Covers the law of marriage, divorce, annulment, separation, unmarried cohabitation, illegitimacy, adoption and rights of child custody, parental property on divorce, inheritance, and related rights. Legal rules are placed into the social setting in which they operate, and emphasis is given to family policy as reflected in current developments in family law reform, including constitutional law. 3 hours or 1 unit.
364. **Decedent's Estates and Trusts.** Studies the means of transferring wealth, with primary emphasis on gratuitous transfers; the means available for making gratuitous transfers, including the validity and effect of testamentary instruments and trust deeds, and problems concerning the dispositive provisions of any type of instrument which transfers wealth. 3 hours or 1 unit.
365. **Future Interests.** Studies the validity and effect of gratuitous dispositions of assets in which enjoyment is postponed, restrained, or long continued; classification of future interests; construction, powers of appointment; rule against perpetuities and related

restrictions. Prerequisite: Law 364. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).

- 366. Problems in Estate Planning.** Selected problems in the planning of estates which will serve to integrate the basic materials in property, trusts, wills, and income, estate, and gift taxation. Prerequisite: Law 348, 351, and 364. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 368. Mental Health Law.** Exploration of contemporary psychiatric theory, including diagnostic procedures, the etiology of psychopathology, and problems of treatment and prediction; legal issues and standards at the interface between mentally ill or incapacitated individuals and the institutional systems and processes designed to deal with such persons. 3 hours or 1 unit.
- 369. American Legal History.** Studies selected topics in the development of law and legal institutions in the United States with particular emphasis on the history of the legal profession, legal education, and the role of lawyers and courts in U.S. society. Prerequisite: Some prior study of U.S. history, particularly social and intellectual, is helpful but not required. 3 hours or 1 unit.
- 370. International Human Rights Law.** Studies established and developing legal rules and procedures governing the protection of international human rights, including Marxist and Third World, as well as Western, conceptions of those rights. 3 hours or 1 unit.
- 371. Jurisprudence.** The place of law in society: the nature, goals, and methods of law; and the relation of law and social science. 3 hours or 1 unit.
- 372. Development of Western Legal Institutions.** Explores the development of both public and private law institutions in Western Europe and Great Britain from the period of late Antiquity (the Roman Codifications) to the high Middle Ages. 3 hours or 1 unit.
- 373. Current Legal Problems.** Intensive study of selected current legal problems: based upon recent court decisions, recent legislation, pending law reform proposals, or empirical studies; subject matter varies from semester to semester. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit).
- 374. International Law.** The nature, sources, and subjects of international law and its place in the control of international society; includes an examination of the law of jurisdiction, territory, recognition and succession of states, rights and immunities of states in foreign courts, diplomatic immunities, treaties, protection of citizens abroad, settlement of international disputes, war and neutrality, the United Nations, and the International Court of Justice. 3 hours or 1 unit.
- 375. Comparative Law.** An introduction to legal systems that differ significantly from ours through discussion of specific subjects, including legal education, legal professionals and fees, public law, commercial law, highlights of civil procedure, bases of jurisdiction, the relative roles of cases, statutes, and codes, and international business practices. The two major civil law code systems (French and German) are principal sources with contrasts between English and American common law also noted. 2 hours or $\frac{1}{2}$ unit.
- 376. International Organizations of the United Nations.** Examines the legal and political problems arising from the establishment and operations of international organizations, covering the nature and implications of their legal personality, membership, decision-making processes and powers; emphasizes primarily the United Nations, related specialized agencies, and affiliated regional organizations in regard to the peaceful settlement of international disputes. 3 hours or 1 unit.
- 377. Soviet Law.** Soviet conceptions of the role of law in theory and in practice: highlights of Soviet law, with comparison to the common law and civil law traditions; and study of Soviet court and legislative materials. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 378. Common Market Law.** An intensive study of the European Common Market, particularly of its laws relating to trade barriers, establishment of companies, and antitrust; and United States legislation in the field of international trade. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 379. Roman Law.** Basic public and private doctrines of Roman Law in the juristic period including contract, family law, succession, citizenship and status, delict, and criminal law. 3 hours or 1 unit.
- 381. Evidence.** The law governing the proof of disputed issues of fact; function of the court

and jury; competence and examination of witnesses; standards of relevancy; privileged communications; illegal evidence; hearsay rule; best evidence rule; presumptions; and judicial notice. 3 or 4 hours, or 1 unit.

- 382. Trial Advocacy.** Examination of the problems of advocacy and tactics at the trial level. Students engage in all aspects of actual trial work, including witness preparation, opening and closing statements, direct and cross examination, and jury instructions; culminates in student conduct of a full jury trial in late spring; demonstrations are conducted by staff and visiting judges and practitioners. Prerequisite: Law 381. 2 hours or $\frac{1}{2}$ unit. Full year course; is repeated to a total of 4 hours or 1 unit.
- 383. Fundamentals of Trial Practice.** Explores the theory and reality of trial practice, from developing a theory of the case through submission of jury instructions; topics include fact gathering, jury selection, opening statements, direct and cross-examination, exhibits, expert witnesses, and closing arguments. Prerequisite: Law 381 and concurrent registration in Law 382. 1 hour or $\frac{1}{2}$ unit.
- 384. Economic Analysis of Law.** An introduction to the systematic economic analysis of law, including property, contracts, torts, criminal law, and related topics. 3 hours or 1 unit.
- 385. Conflict of Laws.** The study of problems having relationship with two or more states or nations involving individual litigants or potential litigants; includes such matters as jurisdiction of courts, judgments, torts, workers' compensation, contracts, property, family relationships, trusts and estates, business organizations, and governmental activities. 3 hours or 1 unit.
- 386. Federal Courts.** Examination of the relationship of federal courts to other organs of federal government and to the states, including an analysis of cases dealing with congressional control over jurisdiction, federal review of state court decisions (including the relationship between state and federal substantive and procedural law), and application of law to fact; the scope of the federal question of jurisdiction in federal courts; abstention; federal injunctions of state criminal proceedings; and problems of justiciability, advisory opinions, and mootness. 3 hours or 1 unit.
- 387. Advanced Torts.** Substantive theories of products liability; negligence, breach of warranty, strict liability, and tortious misrepresentation; procedural and remedial problems with, and defenses to, each substantive theory. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 388. Complex Litigation.** Legal and practical issues in "complex" cases: problems of joinder in multi-party cases, consolidation of cases brought independently (including the activities of the Judicial Panel of Multidistrict Litigation), class actions, discovery issues including the assertion and waiver of evidentiary privileges and use of computers, consequences of active judicial "management" of litigation at the pretrial stage, settlement of complex cases, and res judicata problems. 3 hours or 1 unit.
- 390. Law of Professional Responsibility.** A problem course analyzing ethical issues that arise in the practice of law and considering the approaches to such issues taken by the American Bar Association's Code of Professional Responsibility, Model Rules of Professional Conduct, and Code of Judicial Conduct. 1 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 391. Accounting Issues for Lawyers.** Examination of accounting principles as they affect the work of practicing lawyers, focusing particularly on accounting issues in corporate and securities law; includes an introduction to the mechanics of bookkeeping and proceeds to the interpretation of financial statements and the understanding of accounting conventions on income determination, inflation adjustments, and business acquisitions. Students with more than six hours of college accounting credit may not elect this course. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 392. Lawyer as Negotiator.** Examines the negotiation process generally engaged in by legal practitioners; discusses specific negotiation situations of concern to lawyers, and considers the impact of social psychology upon the negotiation process. Reading materials include topics such as labor bargaining, personal injury settlements, nonverbal communication, visible manifestation of anxiety, and stress reaction; students engage in mock negotiations and write a paper on a related topic. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 393. Legal Drafting and Law Office Practice.** A practical course on the drafting of legal

documents; a study of the organization and management of a law office. 2 hours. No graduate credit.

- 394. Legal Problems.** Preparation of comments on current legal developments for publication in the *University of Illinois Law Review* or the *Illinois Bar Journal*. 1 hour. May be repeated for a maximum of four hours. No graduate credit.
- 395. Moot Court Board.** Preparation of an appellate brief; presentation of an appellate oral argument; participation in intramural, state, national, or international moot court competition. 1 hour. No graduate credit. May be repeated to a maximum of 4 hours.
- 396. Remedies.** A survey of legal and equitable remedies for the protection of personal and property rights. Procedural and substantive aspects of injunctions; restitution of unjust enrichment in the context of the receipt of unsolicited benefits, benefits derived from the commission of tortious acts, and the mistaken acquisition of benefits; alternative remedies arising from bargain transactions; and remedies for violations of civil rights. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 397. Clinical Training.** Student field work in the offices of the Land of Lincoln Legal Assistance Foundation in Champaign and Danville, Champaign Human Relations Commission, local City Attorneys, State of Illinois Department of Mental Health, Champaign County State's Attorney, Champaign County Public Defender, Student Legal Service, and other public agencies. Students engage in legal and investigative work under the supervision of agency attorneys or other administrative personnel; this work may include conducting client interviews, doing legal research, preparing legal documents, and in some cases engaging in the trial of actual cases. 1 to 4 hours. May be repeated to a maximum of 4 hours. No graduate credit.
- 398. Seminar.** Subjects vary from year to year; specific subject matter will be announced in the Timetable. 2 hours or $\frac{1}{2}$ unit. May be repeated.
- 399. Research in Special Topics.** Individual research on a special problem selected in consultation with the instructor. 0 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 402. Introduction to United States Law.** An intensive introduction to the American legal system for graduate law students with prior professional training in non-common law legal systems; stresses the functioning of basic U.S. legal institutions and the techniques of American legal research. 1 unit.
- 499. Thesis Research.** 0 to 3 units.

LEISURE STUDIES

Head of Department: L. R. Allen

Department Office: 104 Huff Hall, 1206 South Fourth, Champaign

- 100. Introduction to Leisure Studies.** Central issues in defining leisure and providing for its realization; historical, philosophical, sociological, psychological, and economic approaches to understanding leisure behavior, its meanings, social contexts, and personal and social resources. 3 hours.
- 110. Foundations for Delivery of Leisure Services.** Introduces the leisure studies major to enabling legislation, fiscal concerns, standards for planning, problems of cities, and the relationship of professional organizations to recreation and park services. 2 hours.
- 130. Introduction to Therapeutic Recreation.** A survey of the history, philosophy, concepts, and trends in therapeutic recreation; overviews types of populations served; describes settings and services; examines role of the therapeutic recreator in clinical and community settings. 2 hours.
- 140. Principles of Outdoor Education and Camping.** Introduces various aspects of outdoor education and organized camping; theoretical perspectives, basic skills, and practice in developing program objectives and evaluations. 3 hours.
- 141. Introduction to Outdoor Recreation.** Philosophy, policy, history, laws, regulations, and trends in the provision of all types of outdoor recreation opportunities; management and planning principles for the various organizational structures involved. 3 hours.

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Leadership in Leisure Delivery Systems.** Introduces the student to the various theories of leadership applicable to situations that exist in the field of leisure studies; provides practice in various leadership settings and techniques for the evaluation of leadership performance. 3 hours.
- 210. Theories and Methods of Supervision.** Concepts, principles, and objectives of supervision; the nature of the supervisory relationship; supervisory functions and processes; identification and application of methods and techniques; and organizational and operational patterns of supervision in recreation and park settings. Prerequisite: Leisure Studies 100 and 110, or consent of instructor. 3 hours.
- 215. Recreation Program Development.** Theory and practice in recreation program development in the various recreation settings, including public, private, and commercial operations; core programming and programming dictated by the needs of the field, setting, or clientele; and program evaluation. Prerequisite: Leisure Studies 100 and 200, or consent of instructor. 3 hours.
- 230. Clinical Aspects of Therapeutic Recreation.** A survey of basic concepts associated with the clinical application of therapeutic recreation services, including an investigation of illness and disabilities, basic medical and psychiatric terminology, adaptive devices and appliances, assistive techniques and record keeping and behavior, observation and recording. Prerequisite: Credit or concurrent registration in Leisure Studies 130. 4 hours.
- 231. Leisure and the Aging.** In-depth study of concepts and theories of aging as related to recreation services; characteristics of the elderly, service delivery systems; activity adaptation; legislation; and issues and trends. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
- 232. Principles of Therapeutic Recreation.** Practices and principles utilized in therapeutic recreation; includes professionalism, legislation, team approaches, activity analysis, client assessment and treatment plans. Prerequisite: Leisure Studies 230. 3 hours.
- 233. Recreation for the Physically Disabled.** In-depth study of aspects of physical disability as related to therapeutic recreation services; includes characteristics and implications of disability, self-help skills, wheelchair activities, coaching techniques, services, accessibility, and legislation. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
- 234. Recreation for the Mentally Ill and Emotionally Disturbed.** In-depth study of mental illness and emotional disturbance as related to therapeutic recreation services; characteristics and classification of mental illness, treatment standards, legislation, treatment approaches, and issues and trends. Prerequisite: Psychology 238 and Leisure Studies 230, or consent of instructor. 3 hours.
- 235. Recreation for the Developmentally Disabled.** In-depth study of developmental disabilities as related to therapeutic recreation services; characteristics of various developmental disabilities, mainstreaming, normalization, activity selection and adaptation, instructional strategies, and behavioral management techniques. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
- 239. Seminar in Therapeutic Recreation.** A seminar for senior therapeutic recreation majors to discuss and explore current issues, trends, and professional concerns in the field of therapeutic recreation. Prerequisite: Senior standing. 1 hour.
- 240. Operation and Maintenance of Parks.** Basic understanding of park operations, facility design, construction, and maintenance practices; staff allocations, job analysis, contract administration, and organizational structures. Prerequisite: Leisure Studies 100, 110, and 141. 3 hours.
- 241. Outdoor Recreation Consortium.** Intensive on-site study of programs and management of large multiple-use recreation areas; includes lectures, problem solving, and interaction with personnel from various responsible agencies. Prerequisite: Leisure Studies 141 and 240; Landscape Architecture 226, or consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
- 250. Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, or related areas selected by the student.

- Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser, instructor, and head of department. 2 to 3 hours. May be repeated to a maximum of 4 or 6 hours.
- 260. Honors Seminar.** Same as Health and Safety Studies 290 and Kinesiology 290. See Kinesiology 290.
- 280. Orientation to Practicum.** Prepares and places students in the Leisure Studies Practicum. Students must document completion of 320 hours of field work. Topics include placement requirements and policies, vitas, interviewing, letters of application, and the role and issues of professional practice. Prerequisite: Junior standing; Leisure Studies 100, 110, 130, and either 200 or 230. 0 hours.
- 284. Leisure Studies Practicum.** Students are assigned to University-approved field training stations in an internship capacity for a minimum of forty hours per week for sixteen weeks. Both the agency and the University provide supervision. Prerequisite: Senior standing; Leisure Studies 280 and 310. 6 or 12 hours. Must be repeated to a maximum of 12 hours credit.
- 290. Research in Leisure Studies.** Examines elementary principles of research methods, design, processing and analysis; use of completed leisure research; development of an ability to conduct, evaluate, and utilize research on leisure behavior. Prerequisite: Junior standing; Leisure Studies 100, or consent of instructor. 3 hours.
- 299. Off-Campus Study.** Provides campus credit for foreign or domestic study completed off-campus. A student's proposal for study must have prior approval of the major department and the college office. Final determination of appropriate credit is made on the student's completion of the work. Prerequisite: Advanced standing and approval of major department and college. 0 to 16 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 32 hours.
- 301. Forest Recreation.** Same as Forestry 301. See Forestry 301.
- 310. Introduction to Administration.** Organization of public and private agency programs, leadership, facilities, and services; introduction to recreation administration. Prerequisite: Leisure Studies 210 and senior standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 315. Play Theories and Their Implications.** Classical and modern theories of play; critical analysis of definitions, concepts, and assumptions and of extant research and research strategies; implications for programming and planning for play. Prerequisite: Leisure Studies 100 and Psychology 100, 103, or 105; or consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 331. Facilitation Techniques and Leisure Education.** Examines knowledge, concepts, and models of leisure education in therapeutic recreation; applies specific instructional and counseling theories and techniques to the development and implementation of leisure education programs with different populations. Prerequisite: Leisure Studies 232 and junior standing, or consent of instructor. 3 hours or 1 unit.
- 332. Program Design and Evaluation in Recreation.** Examines theory and techniques of program design and evaluation utilizing system approaches; includes needs assessment, agency accountability, and comprehensive programming strategies. Prerequisite: Leisure Studies 130 and senior standing, or consent of instructor. 3 hours or 1 unit.
- 340. Outdoor Recreation Management.** Principles, practices, and problems involved in managing outdoor recreation areas; emphasizes management of both natural and cultural resources and visitor use patterns. Prerequisite: Landscape Architecture 226 and Leisure Studies 141; or consent of instructor. Leisure Studies 290 or another research methods course recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 341. Outdoor Recreation Resource Planning.** Studies the outdoor recreational use of lands in the public domain and their planning, concepts, and processes related to planning resource-based systems; multiple-use in planning; planning criteria for outdoor recreation facilities. Prerequisite: Leisure Studies 141, Landscape Architecture 226, and junior standing; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies and Rural Sociology 344. See Environmental Studies 344.
- 381. Management Internship.** Work-study experience in the management aspects of leisure

service delivery systems. Students are assigned to agencies in their special fields of study and are closely supervised by University faculty. Prerequisite: Leisure Studies 284 or graduate standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.

401. **Foundations of Leisure Studies.** Basic philosophical, historical, and scientific foundations and developments in leisure and recreation; analyzes of recreation values as related to other contemporary individual and community needs; and functions and settings of organized recreation, special problem areas, and current issues. Prerequisite: Leisure Studies 100 or equivalent. 1 unit.
402. **Leisure Systems Administration.** Strengthens the graduate student's knowledge of the public administration of recreation programs and services provided by municipal, county, state, and national departments and agencies as related to the general well-being of individuals, families, and communities. Prerequisite: Basic course in the organization of recreation or equivalent. 1 unit.
403. **Advanced Research Methods-Leisure.** Examines methods and techniques of conducting and evaluating leisure research; experimental and survey designs and procedures; data collection, reduction and analysis. Prerequisite: Leisure Studies 100 or equivalent; Leisure Studies 290 or equivalent; a course in introductory statistics. 1 unit.
404. **Seminar in Outdoor Recreation.** Philosophy, principles, and methods employed in outdoor recreation research today; also emphasizes pure versus applied research, utilization, and dissemination of research results. Prerequisite: Leisure Studies 141, 340 and 341, or equivalent; or consent of instructor. 1 unit.
412. **Personnel Administration for the Delivery of Leisure Services.** Examines principles, objectives, techniques, and problems in establishing a systematic approach to the recruitment, selection, and evaluation of personnel in public leisure service agencies with emphasis on innovative methods of personnel assessment and collective bargaining. Prerequisite: Leisure Studies 310 or consent of instructor. 1 unit.
430. **Advanced Seminar in Therapeutic Recreation.** In-depth investigation of contemporary professional issues related to the practice of therapeutic recreation in treatment and community agencies serving special populations. Prerequisite: Leisure Studies 332 or consent of instructor. 1 unit.
445. **Sociology of Leisure.** Same as Sociology 445. Sociological theory and research methods as applied to the study of leisure; includes institutional and community contexts of leisure, leisure roles and socialization, built and natural environments, and the relationships of leisure to family, work, subcultures, and resources. Prerequisite: Leisure Studies 401 or Sociology 386 or 415, or consent of instructor. 1 unit.
465. **Psychology of Leisure.** Applies psychological theory and research methods to the study of leisure behavior and experience including a consideration of basic motivation, individual differences, and social interaction and implications for developmental intervention and human services. Prerequisite: Graduate standing or consent of instructor. 1 unit.
490. **Seminar.** Student presentation of thesis studies, informal discussions, and critical analysis of problems; informal lectures by invited speakers. 0 hours.
493. **Special Problems.** Independent research on special projects. Open only to students majoring in leisure studies. $\frac{1}{2}$ to 2 units.
494. **Special Topics in Leisure Studies.** Lecture courses in topics of current interest; specific subject matter will be announced in the Timetable. Prerequisite: Will be determined for each course offered and will be indicated in the Timetable. $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Preparation of thesis in leisure studies. 0 to 4 units.

LIBERAL ARTS AND SCIENCES

Dean of the College: W. F. Prokasy

College Office: 204 Lincoln Hall, 702 South Wright, Urbana

- 110. Workshop-Tutorial.** Independent study and experimental seminars open to Unit One students and to others; specific offerings vary each semester. Prerequisite: Allen Hall residency or consent of Unit One director. 1 to 4 hours. At the end of the semester, the instructor may increase or decrease credit up to 2 hours, i.e., to a maximum credit of 6 hours. Credit toward college or departmental requirements is contingent upon approval by the appropriate unit. In any given semester, a student may register only for Liberal Arts and Sciences 110 (4 hour limit) or 210. A combined total of 12 hours of Liberal Arts and Sciences 110 and/or 210 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
- 199. Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
- 294. Senior Project.** For students seeking graduation with distinction in IPS. Prerequisite: Consent of instructor and IPS Advisory Committee; open only to students whose field of concentration is IPS and who have a cumulative grade point average of at least 4.25. 1 or 4 hours. May be repeated to a maximum of 4 hours.
- 299. LAS Study Abroad.** Provides credit toward the undergraduate degree for study at accredited foreign institutions or approved overseas programs. Final determination of credit is made on the student's completion of the work. Prerequisite: One year of residence at UIUC; good academic standing; and prior approval of the major department and the College of Liberal Arts and Sciences. 0 to 13 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 30 semester hours per academic year or to a total of 36 semester hours, all of which must be earned within one calendar year.

LIBRARY AND INFORMATION SCIENCE

Dean of Graduate School of Library and Information Science: L. Estabrook

School Office: 410 David Kinley Hall, 1407 West Gregory, Urbana

- 199. Undergraduate Open Seminar.** 1 to 3 hours. May be repeated.
- 300. Foundations of Library and Information Science.** Examines the development of the library and information centers in relation to the society they serve; the library and information science profession; the operation and organization of libraries and information centers; building collections; and the administration of libraries and information centers. Serves as an orientation to library and information science. Prerequisite: Junior standing and consent of School. 4 hours or 1 unit.
- 301. Bibliography.** Covers enumerative bibliography, the practices of compiling lists; analytical bibliography, the design, production, and handling of books as physical objects; and historical bibliography, the history of books and other library materials, from the invention of printing to the present. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours or 1/2 or 1 unit.
- 303. Library Materials for Children.** Selection and use of library materials for children in public libraries and elementary school media centers, according to their needs in their physical, mental, social, and emotional development; deals with the standard selection aids for all types of print and nonprint materials and develops the ability to select and describe children's materials according to their developmental uses. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1/2 or 1 unit. Students may not receive credit for both Library and Information Science 303 and Elementary and Early Childhood Education 304.
- 304. Library Materials for Young Adults.** Evaluation, selection, and use of library materials for young adults in school and public libraries and community organizations.

according to personal and curricular needs; studies selection sources for all formats of materials and explores techniques for utilization of materials. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours, or 1/2 or 1 unit.

- 307. Introduction to Services Relating to Organization of Library Materials.** Emphasizes the role of library catalogs in bibliographic control; introduces the functions, forms, and arrangements of library catalogs in all types of libraries; identifies bibliographic data elements in manual and machine-readable catalog records; and emphasizes the basic principles, concepts, practices, and tools of descriptive and subject cataloging and file structures. Prerequisite: Junior standing and consent of the School. 2 hours or 1/2 unit.
- 308. Audiovisual Services in Libraries.** Designed to acquaint students with the nonprint media responsibilities of libraries; includes the evaluation, selection, and acquisition of software and hardware, the utilization of media in various types of libraries by individuals and groups, in formal and informal programs; and the administration of integrated media collections (films, recorded sound, video, and exhibits). Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1 unit.
- 309. Storytelling.** Fundamental principles of the art of storytelling including techniques of adaptation and presentation; sources of materials; story cycles; methods of learning; practice in storytelling; and planning the story hour for the school and public libraries, for recreational centers, for the radio, and for television. Prerequisite: Junior standing and consent of instructor. 3 hours, or 1/2 or 1 unit.
- 320. Introduction to Information Sources and Services.** Introduces information retrieval techniques and trailers' advisory and online information services; examines representative printed and online sources, and develops questioning, citation skills and search strategies. Prerequisite: Junior standing and consent of the School. 2 hours or 1/2 unit.
- 350. The Theory, Design, and Production of Audiovisual Materials.** Examines the theory and research related to the design and production of audiovisual materials and their application to the design and production of graphic materials, films, sound-slide programs, and television programs; also treats the management of audiovisual production services in libraries. Prerequisite: Junior standing or consent of instructor. 3 hours or 1 unit.
- 360. Practicum.** Supervised field experience of professional-level duties in an approved library or information center. Prerequisite: Completion of 4 units of library and information science courses, including Library and Information Science 300; junior standing or consent of instructor. 3 hours or 1/2 unit. A maximum of 1/2 unit may be applied toward a degree program.
- 405. Library Administration.** Designed to supply knowledge of the internal organization of libraries and of the principles of library administration; emphasis on comparison of the conditions found in the several kinds of libraries and on applications of the general theory of administration. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 406. Media Programs and Service for Children and Young Adults.** The role, problems, and needs of children's and young adults' library services in the school and public library. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 407. Cataloging and Classification, I.** Theory and application of basic principles and concepts of descriptive and subject cataloging; emphasis on interpreting catalog entries and making a catalog responsive to the needs of users; provides beginning-level experience with choice of entries, construction of headings, description of monographs (and, to a lesser extent, of serial publications and nonprint media), filing codes, Dewey and Library of Congress classification systems, and Library of Congress subject headings. Prerequisite: Library and Information Science 307 or consent of instructor. 1 unit.
- 408. Cataloging and Classification, II.** More complex problems in making and evaluating the changing, modern library catalog; practical and administrative problems in cata-

logging serial publications, analytics, ephemeral materials, and microforms; deals with various nonprint media, rare books and manuscripts, foreign language materials, and materials in special subject areas. Prerequisite: Library and Information Science 407. 1 unit.

- 409. Communication Roles and Responsibilities of Libraries.** Considers mass media of communication in terms of their relations with modern library services; reviews media organization, content, and research; considers problems of intellectual freedom as an aspect of communications behavior; and discusses the potential role of electronic devices in library activities now and for the future. $\frac{1}{2}$ or 1 unit.
- 410. Adult Public Services.** The literature, history, and problems of providing library service to the general adult user; investigation of user characteristics and needs, and the effectiveness of various types of adult services. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 411. Reference Service in the Humanities and Social Sciences.** Detailed consideration of the bibliographical and reference materials in various subject fields; training and practice in their use for solving questions arising in reference service. Prerequisite: Library and Information Science 320 or consent of instructor. 1 unit.
- 412. Scientific and Technical Literature and Reference Work.** Aims (a) to acquaint students with typical library materials in science and technology, and (b) to develop proficiency in their selection, evaluation, and use for reference work. Prerequisite: Library and Information Science 320, or consent of instructor. 1 unit.
- 415. Library Automation.** Introduction to various types of equipment for handling information and providing services in libraries; study of applications to library operations; and introduction to systems planning, to automation concepts, and to computer use. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 416. Advanced Library Automation.** The development of computer programs for library processes such as circulation, acquisitions, cataloging, and document retrieval. Includes seminar presentations based on individual research in automation topics. Prerequisite: Library and Information Science 415, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 417. Techniques for Managerial Decision Making in Library and Information Science.** Systematic techniques for achieving rational management decisions; includes problem definition, sampling, decision tables, and critical path analysis. Examples and current issues from the operation of libraries and information centers. Prerequisite: Library and Information Science 300, or consent of instructor. 1 unit.
- 424. Government Publications.** Aims to acquaint students with government publications, their variety, interest, value, acquisition, and bibliographic control, and to develop proficiency in their reference and research use; considers publications of all types and all governments (local, national, international) with special emphasis on U.S. state and federal governments and on the United Nations and its related specialized agencies. Prerequisite: Library and Information Science 411, 412, or consent of instructor. 1 unit.
- 427. Resources of American Research Libraries.** Acquaints students with the distribution and extent of American library resources for advanced study and research; spatial and financial aspects of library resources; methods of surveying library facilities; growth and use of union catalogs and bibliographical centers; interinstitutional agreements for specialization of collections and other forms of library cooperation; and the use of the research collection by the scientist and scholar. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 428. Library Buildings.** Studies the library's physical plant in the light of changing concepts and patterns of library service; analyzes present-day library buildings, (both new and remodeled) and their comparison with each other as well as with buildings of the past; examines the interrelationship of staff collections, users, and physical plant; discussion supplemented by visits to new libraries and conference with their staffs. A two-day field trip is required; see Timetable for estimated cost. Prerequisite: Library and Information Science 405 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 429. Information Storage and Retrieval.** Types of systems for storage and retrieval of documents and references; history of retrieval systems, their characteristics, evaluation,

and factors affecting their performance, with special reference to modern computer-based systems; procedures in the dissemination of scientific and other information; major information centers and services in the U.S. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.

430. Advanced Reference. Enables the student to utilize the varied resources of a large research library; deals with the methods of analyzing and solving bibliographic problems such as arise in scholarly libraries and in connection with research projects. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ or 1 unit.

431. Online Information Systems. Explores the state-of-the-art in online information systems, with particular emphasis on their use as part of reference service in libraries; acquaints students with the characteristics of both bibliographic and nonbibliographic data bases; and trains students in the use of at least one currently available online retrieval system. Prerequisite: Library and Information Science 300 and 320, or consent of instructor. $\frac{1}{2}$ unit.

432. History of Libraries. Same as Communications 432. The origins, development, and evolution of libraries and related institutions, from antiquity to the twentieth century, as a reflection of literacy, recognition of archival responsibility, humanistic achievement, scientific information needs, and service to society. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.

433. Information Needs of Particular Communities. In-depth study of the characteristics and information needs of specialist users of libraries; goals and objectives, policies, and services; reference and bibliographical aids; and effective services that satisfy these special needs. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for a total of 2 units.

434. Library Systems. Development of library systems, with special reference to public libraries as a norm for the development of library services; detailed treatment of library standards, the growth and development of county and regional libraries, and the role of the state library and of federal legislation. Prerequisite: Library and Information Science 405 or consent of instructor. 1 unit.

437. Technical Services Functions. Seminar on the principles, problems, trends, and issues of acquiring, identifying, recording, and conserving/preserving materials in all types of libraries and information centers; includes the special problems of serials management; emphasizes service aspects. Prerequisite: Library and Information Science 300 and 407, or consent of instructor; concurrent registration in Library and Information Science 407 is acceptable with consent of instructor. 1 unit.

438. Administration and Use of Archival Materials. Administration of archives and historical manuscripts; emphasizes the processing and research use of archival materials. Prerequisite: Consent of instructor. 1 unit.

440. Advanced Bibliography. Discusses the major reference bibliographies, including general works, subject lists in various fields, regional historical and current national bibliographies, and published library catalogs; surveys the nature of bibliographical access to the output of the world's press, descriptive bibliography, and rare-book librarianship. Prerequisite: Library and Information Science 301 or consent of instructor. $\frac{1}{2}$ or 1 unit.

441. History of Children's Literature. Interpretation of children's literature from the earliest times, including the impact of changing social and cultural patterns on books for children; attention to early printers and publishers of children's books and to magazines for children. 1 unit.

443. Contemporary Book Publishing. Surveys twentieth-century book publishing, placing it in an economic, social, and literary context; emphasizes economic structure, the relationship of author and publisher, promotion, distribution, and the influence of the industry on librarianship. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.

444. Measurement and Evaluation of Library Services. Methods and criteria for evaluating various facets of library service, including the collection, the catalog, document delivery capabilities, reference service, technical processes, and information retrieval

operations; deals with cost-effectiveness considerations. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.

450. **Advanced Problems in Librarianship.** Directed and supervised investigation of selected problems in library resources, reference service, research libraries, reading, public libraries, or school libraries. Prerequisite: Library and Information Science 300, or consent of instructor. $\frac{1}{4}$ to 2 units.
451. **Independent Study.** Permits the intermediate or advanced student opportunity to undertake the study of a topic not otherwise offered in the curriculum or to pursue a topic beyond or in greater depth than is possible within the context of a regular course. Prerequisite: Consent of dean. $\frac{1}{2}$ to 1 unit. May be repeated by M.S. students to a maximum of 1 unit; C.A.S. students, 2 units; or Ph.D. students, 4 units.
459. **CAS Project.** Individual study of a problem in library or information science; forms the culmination of the Certificate of Advanced Study program. Prerequisite: Admission to CAS program in library and information science. 0 to 2 units. May be taken for additional units, but only two will apply to the Certificate of Advanced Study.
469. **Principles of Research Methods.** Studies the design of research using historical, descriptive, and experimental methodologies; emphasizes applications in the library and information science fields. For doctoral students only. Prerequisite: A course in the principles of statistics, a library and information science course in quantitative methods; and consent of instructor. 1 unit.
471. **The History of Communications Media and Libraries.** Seminar in the different means of transmitting content through time and space; includes the history and comparison of libraries, books, and other communications media. Prerequisite: Open to doctoral students only. 1 unit.
472. **The Bibliographic Organization of Information and Library Materials.** Seminar in the relationship between knowledge and its bibliographic control; includes the structure of knowledge and classification, the descriptive and subject aspects of bibliography and indexing, and information theory. Prerequisite: Open to doctoral students only. 1 unit.
473. **The Social Basis of Library and Information Science.** Seminar in the interrelationships between librarians and information scientists and their communities of users; includes modern institutions of librarianship and information service, the education of librarians and information scientists, and the sociology of libraries and information centers. Prerequisite: Open to doctoral students only. 1 unit.
474. **The Management of Libraries and Information.** Seminar in the organizations and structures which facilitate both the achievement of library and information center goals and the flow of information; includes management and decision-making tools. Prerequisite: Open to doctoral students only. 1 unit.
475. **Seminar in Library and Information Science.** Preparation, presentation, and criticism of a scholarly paper of moderate length and publishable quality based on individual study. Prerequisite: Library and Information Science 471, 472, 473, or 474; open to doctoral students only. 1 unit. Required: To be repeated for a total of 4 units.
499. **Thesis Research.** Individual study and research. Section A: M.S. candidates, 0 to 2 units. Section B: doctoral candidates, 0 to 4 units.

LIFE SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Anatomical Sciences; Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology and Biophysics; and Plant Biology.)

Director of School: S. Kaplan

School Office: 387 Morrill Hall, 505 South Goodwin, Urbana

LINGUISTICS

(Including African Languages, Arabic, Hebrew, Hindi, Persian, and Sanskrit)

Chairperson of Department: C. W. Kisseberth

Department Office: 4088 Foreign Languages Building, 707 South Mathews, Urbana

Linguistics

- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Introduction to Language Science.** An introduction to the theory and methodology of general linguistics; includes the various branches and applications of linguistics. 3 hours.
- 202. Elements of Syntax.** Introduction to the types of syntactic and semantic phenomena found in natural language, with material drawn from a variety of languages; emphasis on the implications of such phenomena for linguistic theory: formalism and application of generative grammar. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
- 225. Elements of Psycholinguistics.** Introduction to the theory and methodology of psycholinguistics with emphasis on language acquisition and linguistic behavior. 3 hours.
- 260. American Sign Language.** Same as Psychology and Speech and Hearing Science 260. See Psychology 260.
- 290. Individual Study.** Individual readings and research reports on special topics dealing with the theoretical or applied aspects of the linguistic sciences. Prerequisite: Written consent of instructor on form available in linguistics departmental office. 2 to 4 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Study and research for honors thesis; open only to seniors in the linguistics field of concentration who are eligible for departmental distinction. Prerequisite: Written consent of instructor on form available in linguistics departmental office; linguistics course average of 4.4. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 300. Introduction to Linguistic Structure.** Same as Anthropology 300. Introduction to the theory and methodology of the science of linguistics with special reference to phonology and syntax. 3 hours or 1/2 unit.
- 301. Introduction to General Phonetics.** Introduction to the main branches of general phonetics and phonological theory; emphasis on analysis of non-Western languages and research techniques. 3 hours or 1/2 unit.
- 302. Introduction to Language History.** Introduction to the nature of language change; includes sound change, change through language contact (such as Pidgins and Creoles), semantic change (etymology), language relationship and reconstruction, and language history as an aid to understanding cultural history (philology). This course cannot be used to fulfill departmental graduate requirements. Prerequisite: Four years of high school foreign language study or fulfillment of the College of Liberal Arts and Sciences foreign language requirement. 3 hours or 1/2 unit.
- 303. Non-Western Linguistic Structures.** Intensive study of linguistic structure of a selected non-Western language. 3 hours or 1 unit. May be repeated for credit with consent of instructor.
- 304. Tutorials in Nonwestern Languages.** Advanced or intensive language instruction in a selected nonwestern language; does not cover instruction in East or Southeast Asian languages. Prerequisite: Consent of instructor. 1 to 5 hours, or 1/2 to 1 unit. May be repeated with consent of instructor.
- 305. Introduction to Applied Linguistics.** Same as English as a Second Language 305.

Introduction to the applications of general linguistic theory to the specific fields of stylistics, theory of translation, contrastive analyses, and the teaching and learning of foreign and second languages; practical assignment work. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.

- 306. Introduction to Computational Linguistics.** Introduces the use of computers in linguistics and application of linguistics in high technology. Topics include spelling and grammar-checking in word processing, natural language and man-machine communication, data organization, language understanding systems, and computer-assisted language instruction. Students write several computer programs. Prerequisite: Linguistics 300 or equivalent; and a Computer Science 100-level programming course (not Computer Science 106), or Computer Science 400, or consent of instructor. 3 hours or 1 unit.
- 307. Introduction to Mathematical Linguistics.** Same as Anthropology 307. Principles of set theory, logic and formal systems, group theory, and automata theory; introduction to the formal theory of grammars. Prerequisite: Linguistics 300. 3 hours or 1 unit.
- 309. Introduction to Indo-European Linguistics.** Same as Greek 310 and Latin 310. Introductory survey of Indo-European languages and their mutual relations; exemplification of methods of reconstruction; principles of comparative phonology and introductory survey of morphology; and discussion of theories about the original home, culture, and society of the Indo-Europeans. Prerequisite: Fulfillment of the language requirement of the College of Liberal Arts and Sciences. 3 hours or 1 unit.
- 311. Introduction to Syntax: A Typological Approach.** Introduces the study of syntax through typological survey of syntactic systems of natural languages; examines material from diverse language families; implications of typological studies for syntactic theory. Prerequisite: Linguistics 300. 3 hours, or 1/2 or 1 unit.
- 312. Stylistics and Literary Criticism.** Same as English 304. See English 304.
- 314. Introductory Coptic, I.** Same as Coptic and Religious Studies 301. See Coptic 301.
- 315. Introductory Coptic, II.** Same as Coptic and Religious Studies 302. See Coptic 302.
- 316. Structure of the French Language.** Same as French 316. See French 316.
- 320. Introduction to African Linguistics.** Introduction to genetic and typological classification of the main language families of Africa; concentration on grammatical and phonological characteristics. Prerequisite: Linguistics 200 or 300; consent of instructor. 3 hours or 1 unit.
- 323. Language Acquisition.** Same as Communications 323 and Psychology 323. See Psychology 323.
- 325. Introduction to Psycholinguistics.** Same as Communications 325. Introductory survey of psychological and linguistic approaches to the study of communication. Prerequisite: Credit or concurrent registration in Linguistics 300. 3 hours or 1 unit. Credit is not given for both Linguistics 325 and Psychology 325.
- 330. Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Korean 330. Introduction to genetic relation of the Far Eastern languages with other languages; concentration on synchronic analysis of phonology and syntax. Prerequisite: Linguistics 300; consent of instructor. 3 hours or 1 unit.
- 332. Women and Language.** Same as Speech Communication and Women's Studies 332. See Speech Communication 332.
- 335. Neurolinguistics and Second Language Learning.** Same as English as a Second Language 335. See English as a Second Language 335.
- 338. Philosophy of Language.** Same as Philosophy 338. See Philosophy 338.
- 340. History of Linguistics.** Survey of linguistic theories from ancient to modern times; special emphasis on comparative grammar and the development of structural linguistics; and extended discussion of at least one other period. 3 hours or 1 unit.
- 350. Introduction to Sociolinguistics.** Same as English as a Second Language 350. Critical study of the sociologically oriented general linguistic theories; special reference to language varieties, language attitudes, language diversity, language standardization, linguistic geography, and language and political roles (language loyalty); emphasis on research methodology and techniques. Prerequisite: Introductory course in linguistics or consent of instructor. 3 hours, or 1/2 or 1 unit.

- 353. Spanish Structure.** Same as Spanish 353. See Spanish 353.
- 362. Introduction to Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 367. Introduction to Germanic Linguistics.** Same as Germanic 367. See Germanic 367.
- 370. Language, Culture, and Society.** Same as Anthropology 370 and Communications 370. See Anthropology 370.
- 375. Speech Science, I.** Same as Speech and Hearing Science and Speech Communication 375. See Speech and Hearing Science 375.
- 376. Speech Science, II.** Same as Speech and Hearing Science and Speech Communication 376. See Speech and Hearing Science 376.
- 380. Introduction to Slavic Linguistics.** Same as Slavic 380. See Slavic 380.
- 382. Introduction to Sanskrit Linguistics.** A linguistic introduction to the structure of Sanskrit (phonetics, phonology, and morphology) and its historical antecedents and development, with reading of sample texts. Prerequisite: Linguistics 300 and consent of instructor. 3 hours or 1 unit.
- 385. Reading in a Second Language.** Same as English as a Second Language 386. See English as a Second Language 386.
- 386. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, Slavic, and Spanish 382. See Humanities 382.
- 387. The Structure of English.** Critical evaluation of traditional and structuralist grammatical descriptions; introduction to transformational grammatical studies; detailed survey of a transformational syntax of English; and brief introduction to generative phonology and morphophonemic analysis of English, especially stress. 3 hours or $\frac{3}{4}$ unit.
- 388. English Phonology and Morphology for ESL Teachers.** Same as English as a Second Language 388. See English as a Second Language 388.
- 389. Theoretical Foundations of TESL Methodology.** Same as English as a Second Language 389. See English as a Second Language 389.
- 400. Introduction to General Linguistics.** Same as Anthropology 400 and English as a Second Language 402. Introduction to the linguistic sciences; linguistic theory and methodology; and branches of linguistics and their application. 1 unit. Credit may not be applied toward a graduate degree in linguistics.
- 401. Syntax.** Critique of traditional and contemporary theories of syntactic structure; systematic introduction to transformational grammar. Prerequisite: Linguistics 300 or equivalent. 1 unit.
- 402. Phonology.** Examination of language-specific phonological problems with a view toward formulating a language-independent theory of phonology. Prerequisite: Linguistics 301 or consent of instructor. 1 unit.
- 403. Seminar in Linguistic Analysis.** Discussion of advanced topics of current interest. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit with consent of instructor.
- 404. Practicum.** Classroom- and homework-solving of assorted problems in syntactic and phonological analysis of many languages. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit as topic varies with consent of instructor.
- 405. Seminar in Stylistics.** Same as Comparative Literature 405. Seminar designed to evaluate and discuss earlier and current linguistically motivated stylistic theories; emphasis on the theoretical and methodological problems in application of linguistics to stylistic analysis of literary texts. Prerequisite: Linguistics 300 or 305; consent of instructor. 1 unit.
- 406. Topics in Computational Linguistics.** Speech sampling and linguistic redundancy; phonology in speech recognition; syntactic parsing of natural language; domains of linguistic knowledge including lexical, syntactic, semantic, discourse, and pragmatic representations; quantitative reasoning; linguistic expert system; speech synthesis. Prerequisite: Linguistics 306 and 401; Linguistics 402 or consent of instructor. 1 unit.
- 408. Russian Phonology.** Same as Russian 408. See Russian 408.
- 411. Historical Linguistics.** Introduction to historical and comparative linguistics with

- particular attention to theoretical issues. Prerequisite: Credit or concurrent registration in Linguistics 300 and 301. 1 unit.
- 412. Research Seminar in Historical Linguistics.** Research work in etymology, linguistic geography, and historical syntax. Prerequisite: Linguistics 411 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units, as topics vary, with consent of instructor.
- 413. Pedagogical Grammar.** Same as English as a Second Language 412. See English as a Second Language 412.
- 416. Field Methods.** Analysis of the phonetic, phonological, morphological, and syntactic structure of an undescribed language through the elicitation of data from a native language consultant. The class develops a linguistic sketch of the language, including a computerized lexicon. Prerequisite: Linguistics 401 and 402. 1 unit.
- 419. Contrastive Linguistics.** Same as English as a Second Language 419. Critical survey of contemporary linguistic models; special reference to their relevance in preparing contrastive analyses of languages; and detailed discussion on contrastive analysis of English and selected non-Western languages at different linguistic levels. Prerequisite: Linguistics 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 420. Linguistic Phonetics.** Principles of scientific description of the phonic aspect of language; distinctive features and phonetic alphabets; relations between phonetics and other linguistic levels; and inventory of speech sounds. Prerequisite: Linguistics 301 or equivalent. 1 unit.
- 424. Developmental Psycholinguistics.** Same as Communications and Psychology 424. See Psychology 424.
- 425. Psycholinguistics.** Same as Communications 425 and Psychology 425. See Psychology 425.
- 429. Second Language Acquisition and Bilingualism.** Same as Psychology 429. Examination of the field from a psycholinguistic perspective; topics discussed include first versus second language acquisition; the nature of language aptitude and competence; methods of second language teaching; the nature of bilingualism; and comparative psycholinguistics. Prerequisite: Consent of instructor. 1 unit.
- 440. Seminar in History of Linguistics.** Analysis of recent theoretical approaches. Prerequisite: Linguistics 340. 1 unit.
- 441. Syntax, II.** Advanced analysis and critique of syntactic descriptions, with special attention to implications for universal grammar. Prerequisite: Linguistics 401 or consent of instructor. 1 unit.
- 442. Phonology, II.** Continuation of Linguistics 402. Prerequisite: Linguistics 402. 1 unit.
- 450. Linguistics and the Study of Meaning.** Consideration of those aspects of meaning which are the concern of linguistic theory. Prerequisite: Linguistics 300. 1 unit.
- 460. Seminar in Bilingualism.** A research-oriented seminar on theoretical and applied aspects of bilingualism: critical evaluation of linguistic, neurolinguistic, sociolinguistic, and psycholinguistic approaches to bilingualism; and concentration on selected case studies from western and nonwestern societies, especially Asia and Africa. Prerequisite: Linguistics 350 or an introductory course in linguistics. 1 unit.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
- 475. Experimental Phonetics, I.** Same as Speech and Hearing Science 475. See Speech and Hearing Science 475.
- 476. Experimental Phonetics, II.** Same as Speech and Hearing Science 476. See Speech and Hearing Science 476.
- 481. Topics in Syntactic Theory.** Investigation of syntactic universals; recent developments in the theory of syntax. Prerequisite: Linguistics 441 or consent of instructor. 1 unit. May be repeated as topics vary with consent of instructor.
- 482. Topics in Phonological Theory.** Recent developments in the theory of phonology. Prerequisite: Linguistics 442 or consent of instructor. 1 unit. May be repeated for credit as topic varies with consent of instructor.
- 490. Special Topics in Linguistics.** Individual studies in the areas of linguistics not covered by regular course offerings. $\frac{1}{2}$ to 2 units.

499. Thesis Research. 0 to 4 units.

LANGUAGES OFFERED BY THE DEPARTMENT OF LINGUISTICS.

Other languages may be offered by tutorial (see Linguistics 304). See also APPENDIX A for a list of all languages currently offered on this campus.

African Languages

- 201. Elementary Hausa, I.** Same as African Studies 201. Introduction to Hausa; emphasizes grammar, pronunciation, reading, and conversation in standard Hausa. Language lab participation required. 5 hours.
- 202. Elementary Hausa, II.** Same as African Studies 202. Continuation of elementary Hausa, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Hausa. Participation in language laboratory required. Prerequisite: African Languages 201. 5 hours.
- 211. Elementary Lingala, I.** Same as African Studies 211. Introduction to Lingala; emphasizes grammar, pronunciation, reading and conversation in standard Lingala. Participation in language laboratory required. 5 hours.
- 212. Elementary Lingala, II.** Same as African Studies 212. Continuation of elementary Lingala, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Lingala. Participation in language laboratory required. Prerequisite: African Languages 211. 5 hours.
- 231. Elementary Swahili, I.** Same as African Studies 231. Beginning spoken Swahili with minimum of formal grammar; conversation with a native Swahili tutor under the supervision of a linguist-instructor. 5 hours.
- 232. Elementary Swahili, II.** Same as African Studies 232. Second semester of spoken Swahili; more conversation with a native tutor; and further grammar. Prerequisite: African Languages 231. 5 hours.
- 241. Elementary Wolof, I.** Same as African Studies 241. Introduction to Wolof; emphasizes grammar, pronunciation, reading, and conversation in standard Wolof. Participation in language laboratory required. 5 hours.
- 242. Elementary Wolof, II.** Same as African Studies 242. Continuation of elementary Wolof, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Wolof. Participation in language laboratory required. Prerequisite: African Languages 241. 5 hours.
- 303. Intermediate Hausa, I.** Same as African Studies 303. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and spoken Hausa, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 202. 5 hours or 1 unit.
- 304. Intermediate Hausa, II.** Same as African Studies 304. Continuation of African Languages 303. Emphasizes ability to engage in reasonably fluent discourse in Hausa, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Hausa dialects. Participation in language laboratory required. Prerequisite: African Languages 303. 5 hours or 1 unit.
- 313. Intermediate Lingala, I.** Same as African Studies 313. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in the standard and spoken Lingala dialects, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 212. 5 hours or 1 unit.
- 314. Intermediate Lingala, II.** Same as African Studies 314. Continuation of African Languages 313. Emphasizes ability to engage in reasonably fluent discourse in Lingala, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Lingala dialects. Participation in language laboratory required. Prerequisite: African Languages 313. 5 hours or 1 unit.

- 333. Intermediate Swahili, I.** Same as African Studies 333. Second-year Swahili with emphasis on developing conversational fluency; some readings on Swahili culture and customs. Prerequisite: One year of Swahili. 5 hours or 1 unit.
- 334. Intermediate Swahili, II.** Same as African Studies 334. More of second-year Swahili with emphasis on conversational fluency; some reading in Swahili literature. Prerequisite: One year of Swahili. 5 hours or 1 unit.
- 335. Advanced Swahili, I.** Same as African Studies 335. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and East African culture materials. Prerequisite: African Languages 334 or equivalent. 5 hours or 1 unit.
- 336. Advanced Swahili, II.** Same as African Studies 336. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and East African culture materials. Prerequisite: African Languages 335 or equivalent. 5 hours or 1 unit.
- 343. Intermediate Wolof, I.** Same as African Studies 343. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and Dakar Wolof, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 242. 5 hours or 1 unit.
- 344. Intermediate Wolof, II.** Same as African Studies 344. Continuation of African Languages 343. Emphasizes ability to engage in reasonably fluent discourse in Wolof, comprehensive knowledge of formal grammar, and ability to read ordinary texts in standard and Dakar Wolof. Participation in language laboratory required. Prerequisite: African Languages 343. 5 hours or 1 unit.

Arabic

- 201. Elementary Standard Arabic, I.** Mastery of the Arabic alphabet and phonetics; elementary formal grammar and the development of reading and writing skills; and conversation in the formal noncolloquial style. All students are required to register for one hour per week in the language laboratory. 5 hours.
- 202. Elementary Standard Arabic, II.** Continuation of Arabic 201. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 201. 5 hours.
- 210. Colloquial Arabic, I.** Development of conversational fluency in one of the major colloquial dialects; see Timetable for dialect to be taught each semester. 4 hours.
- 211. Colloquial Arabic, II.** Continuation of Arabic 210. Prerequisite: Arabic 210. 4 hours.
- 303. Intermediate Standard Arabic, I.** Survey of more advanced grammar; emphasis on increasing conversational fluency in the formal noncolloquial style; and reading of prose texts reflecting aspects of Arabic culture. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 202. 5 hours or 1 unit.
- 304. Intermediate Standard Arabic, II.** Continuation of Arabic 303. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 303. 5 hours or 1 unit.
- 305. Advanced Standard Arabic, I.** Practice to attain conversational fluency in the formal noncolloquial style; introduction to Arabic literature; and readings in social, political, and historic writings. Prerequisite: Arabic 304. 5 hours or 1 unit.
- 306. Advanced Standard Arabic, II.** Continuation of Arabic 305. Prerequisite: Arabic 305. 5 hours or 1 unit.

Hebrew

201. **Elementary Modern Hebrew, I.** Introduction to Hebrew; includes conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. Students are required to register for one hour weekly in the language laboratory. 5 hours.
202. **Elementary Modern Hebrew, II.** Continuation of Modern Hebrew 201, with introduction of more advanced grammar, and with emphasis on more fluency in speaking and reading. Prerequisite: Hebrew 201. 5 hours.
205. **Introduction to Classical Hebrew, I.** Same as Religious Studies 205. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills. 4 hours.
206. **Introduction to Classical Hebrew, II.** Same as Religious Studies 206. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills; translation of simple biblical prose. Prerequisite: Hebrew 205 or equivalent. 4 hours.
210. **Biblical Prose.** Same as Religious Studies 210. Reading and discussion of selections from the Books of Samuel with emphasis on grammar and exegesis; exercises in prose composition. Prerequisite: Hebrew 205 and 206. 4 hours.
303. **Intermediate Modern Hebrew, I.** First term of the second year of the Hebrew language, including drill for more advanced conversational fluency, increased study of the written language, and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Modern Hebrew, II.** Concentration on ability to engage in reasonable fluent discourse in Hebrew, comprehensive knowledge of formal grammar, and an ability to read ordinary written Hebrew. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Modern Hebrew, I.** Advanced spoken and written standard modern Hebrew; introduction to modern Hebrew literature. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours or $\frac{3}{4}$ to 1 unit.
306. **Advanced Modern Hebrew, II.** A course for advanced knowledge of spoken and written standard Modern Hebrew with emphasis on Modern Hebrew literature and language. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.
307. **Topics in Modern Hebrew Language and Literature, I.** Selected readings from modern Hebrew authors, with emphasis on the novel and short story; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 306 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
308. **Topics in Modern Hebrew Language and Literature, II.** Selected readings from modern Hebrew authors, with special emphasis on Eastern European "Revival" literature; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 307 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
311. **Hebrew Poetry.** Same as Religious Studies 311. Translation and analysis of ancient Hebrew poetry, with emphasis on the development of Hebrew prosodic style and on textual criticism; research paper required for graduate credit. Prerequisite: Hebrew 210 or equivalent. 4 hours or 1 unit.

Hindi

201. **Elementary Hindi/Urdu, I.** An introduction to the Hindi/Urdu language; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, and a minimum of formal grammar and Devanagari writing; introduction to Arabic-Persian script by arrangement. All students are required to register for one hour per week in the language laboratory. 5 hours.

- 202. Elementary Hindi/Urdu, II.** Second term of spoken Hindi/Urdu; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials, and work on written Hindi; concentration on written Urdu by arrangement. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 201. 5 hours.
- 301. Intensive Hindi, I.** An intensive course on the Hindi language including conversation with a native Hindi-speaking tutor under the direction of a linguist-instructor; study of the formal grammar and the Devanagari script. 10 hours or 2 units.
- 302. Intensive Hindi, II.** Includes drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; increasing study of the written language and more formal grammar; and concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 301 or equivalent, or consent of instructor. 10 hours or 2 units.
- 303. Intermediate Hindi, I.** First term of second year of the Hindi language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 202 or equivalent. 5 hours or 1 unit.
- 304. Intermediate Hindi, II.** Concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 303 or equivalent. 5 hours or 1 unit.
- 305. Advanced Hindi, I.** A course for advanced knowledge of spoken and written Hindi. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 304 or consent of instructor. 5 hours or 1 unit.
- 306. Advanced Hindi, II.** A course for advanced knowledge of spoken and written Hindi with emphasis on modern Hindi literature and language. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 305 or consent of instructor. 5 hours or 1 unit.
- 308. Introduction to South Asian Literature.** Introduces selected literatures of South Asia in a cross-cultural and comparative perspective; emphasizes relating literary texts and trends to the historical, sociocultural, political, and literary contexts of the subcontinent. Texts for South Asian languages are offered in English translation; in addition, there will be texts by South Asian authors written in English. Knowledge of a South Asian language not required. Prerequisite: Consent of course coordinator. 3 hours, or 1/2 or 1 unit.

Persian

- 201. Elementary Persian, I.** Introduction to Persian, including conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 202. Elementary Persian, II.** Continuation of Persian 201, with introduction of more advanced grammar and with emphasis on more fluency in speaking and reading. Prerequisite: Persian 201 or equivalent. 5 hours.
- 205. Introduction to Persian Culture and Literature, I.** Same as Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
- 206. Introduction to Persian Culture and Literature, II.** Same as Comparative Literature

204. Continuation of Persian 205/ Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
- 303. Intermediate Persian, I.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 202. 5 hours or 1 unit.
- 304. Intermediate Persian, II.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 303. 5 hours or 1 unit.
- 305. Advanced Persian, I.** Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 304. 3 hours or 1 unit.
- 306. Advanced Persian, II.** Continuation of Persian 305. Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 305. 3 hours or 1 unit.

Sanskrit

- 201. Elementary Sanskrit, I.** Introduction to Sanskrit, treating in full the grammar of the language as preparation for reading, and including the reading of sections of the Mahabharata. 5 hours.
- 202. Elementary Sanskrit, II.** Continuation of Sanskrit 201. Prerequisite: Sanskrit 201. 5 hours.
- 303. Readings in Sanskrit, I.** Same as Religious Studies 312. Introduction to the reading of Sanskrit texts. Prerequisite: Sanskrit 202. 3 hours or 1 unit.
- 304. Readings in Sanskrit, II.** Same as Religious Studies 313. Readings in Sanskrit texts. Topics may vary according to students' needs; they may include religious texts, classical literature, or general survey of texts. Prerequisite: Sanskrit 303 and consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.

MATHEMATICS

Head of Department: H. Halberstam

Department Office: 273 Altgeld Hall, 1409 West Green, Urbana

- 101. Basic Mathematics.** Review of arithmetic and the following topics in basic algebra: signed numbers, absolute value and the number line, first degree equations and inequalities, algebraic expressions and rules of exponents, factoring, and graphing. Enrollment is restricted. Prerequisite: Placement is determined by score on appropriate placement test, or consent of the Mathematics Department. 3 hours. Credit may not be used toward graduation in the College of LAS.
- 102. Introductory Algebra.** Methods of elementary algebra, including simplification of algebraic expressions, solving linear and quadratic equations, equations of lines, systems of linear equations, and radicals. Enrollment is restricted. Prerequisite: Mathematics 101, or score on appropriate placement test, or consent of Mathematics Department. 3 hours. Credit may not be used toward graduation in the College of LAS.
- 112. Algebra.** Rapid review of basic techniques of factoring, rational expressions, equations and inequalities; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; and the binomial theorem. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 1/2 units of high school algebra, and 1 unit of high school geometry. 3

hours. Credit is not given for both Mathematics 112 and 116. Credit not applicable toward graduation in certain colleges.

- 114. Trigonometry.** Studies degrees and radians, the trigonometric functions, identities and equations, inverse functions, oblique triangles and applications. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 $\frac{1}{2}$ units of high school algebra, or concurrent registration in Mathematics 112; 1 unit of high school geometry. 2 hours. Credit is not given for both Mathematics 114 and 116. Credit not applicable toward graduation in certain colleges.
- 116. Algebra and Trigonometry.** A unified treatment of algebra and trigonometry that combines Mathematics 112 and 114. Students who need Mathematics 112 and 114 should enroll in Mathematics 116. Prerequisite: 1 $\frac{1}{2}$ units of high school algebra; 1 unit of high school geometry. 5 hours. Credit is not given for both Mathematics 116 and 112. Students with credit in Mathematics 114 may receive 3 hours credit for Mathematics 116. Credit not applicable toward graduation in certain colleges.
- 118. Introduction to Mathematics, I.** An elementary course for students whose major interests are not in engineering or the physical sciences; provides an overall view of mathematics; emphasizes ideas and concepts rather than routine drill; and includes concepts from the following areas: combinatorics, number theory, the real and rational number systems, topology, representation of numbers, and map coloring. Prerequisite: 1 unit of high school algebra; 1 unit of high school plane geometry; or equivalent. 3 hours.
- 119. Introduction to Mathematics, II.** Continuation of Mathematics 118; includes concepts from the following areas: combinatorics, algebraic number theory, constructions, cardinal numbers, probability and statistics, analytic geometry, and calculus. Prerequisite: Mathematics 118. 3 hours.
- 120. Calculus and Analytic Geometry, I.** First course in calculus and analytic geometry; basic techniques of differentiation and integration with applications, including curve tracing in the plane. Students with strong backgrounds in analytic geometry should normally enroll in Mathematics 135. Prerequisite: Mathematics 116; or Mathematics 112 and 114; or an adequate mathematics placement test score. 5 hours. Credit is not given for Mathematics 120 and Mathematics 134 or 135.
- 124. Finite Mathematics.** An introduction to finite mathematics for students in the social sciences; introduces the student to the basic ideas of logic, set theory, probability, vectors and matrices, and Markov chains. Problems are selected from social sciences and business. Prerequisite: Mathematics 112, or an adequate mathematics placement test score. 3 hours.
- 125. Elementary Linear Algebra with Applications.** Basic concepts and techniques of linear algebra; includes systems of linear equations, matrices, determinants, vectors in n -space, and eigenvectors, together with selected applications, such as Markov processes, linear programming, economic models, least squares, and population growth. Prerequisite: Mathematics 112, or an adequate placement test score. 3 hours. Credit is not given for both Mathematics 125 and 225.
- 132. Calculus and Analytic Geometry, II.** Second course in calculus and analytic geometry; techniques of integration, conic sections, polar coordinates, and infinite series. Prerequisite: Mathematics 120. 3 hours.
- 134. Calculus for Social Scientists, I.** Introduction to the concept of functions and the basic ideas of the calculus. Prerequisite: Mathematics 112. 4 hours. Credit is not given for Mathematics 134 and Mathematics 120 or 135.
- 135. Calculus.** First course in calculus. Differentiation and integration; applications to curve-tracing, maxima and minima, area, and volume. Prerequisite: Completion of a thorough course in plane and solid analytic geometry, or equivalent. 5 hours. Credit is not given for both Mathematics 135 and 120.
- 149. Honors Course in Mathematics.** Concurrent registration in an honors section of Mathematics 120, 132, 135, 242, or 245; consent of the department. Enrollment is strictly limited to students with superior mathematical talents. 1 hour.
- 161. Statistics.** Same as Statistics 100. See Statistics 100.

- 198. Freshman Seminar.** Guides the student in the study of selected topics not considered in standard courses. Prerequisite: Enrollment in the mathematics honors program; consent of department. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Computers for Elementary Teachers.** Introduction to computers and basic programming principles and practices with special emphasis on applications to elementary mathematics. 3 hours. May be used for credit only in teacher preparation programs leading to certification in elementary or early childhood education.
- 201. Mathematics for Elementary Teachers.** Analyzes the mathematical issues underlying elementary school mathematics. Topics include sets, place-value notation, arithmetic algorithms, elementary number theory, rational and irrational numbers, applications. Simple programming problems are assigned. Prerequisite: Mathematics 200 or equivalent. 3 hours. May be used for credit only in teacher preparation programs leading to certification in elementary or early childhood education. Credit may not be granted for both Mathematics 201 and 202.
- 202. Mathematics for Elementary Teachers.** A systematic presentation of elementary mathematics for juniors and seniors who are preparing to teach in elementary schools. Topics include decimal numerals, number systems, sets, and introductory algebra. A simultaneous development of teaching methods and materials may be included. Not acceptable for credit in the College of Liberal Arts and Sciences. Prerequisite: Junior standing in elementary education. 5 hours.
- 225. Introductory Matrix Theory.** Systems of linear equations, matrices and inverses, determinants, and a glimpse at vector spaces, eigenvalues and eigenvectors. Prerequisite: Mathematics 120. 2 hours. Credit is not given for both Mathematics 225 and 125. Also, students with earned credit in Mathematics 315 may not receive additional credit for Mathematics 225, when 225 is taken after 315.
- 242. Calculus of Several Variables.** Third course in calculus and analytic geometry: three dimensional space, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 132. 3 hours. Credit is not given for both Mathematics 242 and either Mathematics 244 or 245.
- 244. Calculus for Social Scientists, II.** Continuation of Mathematics 134. The calculus of the trigonometric functions, Taylor polynomials, and infinite series; analytic geometry in n dimensions, vector calculus, classical extremum problems in n variables, and Lagrange multipliers; and multiple integrals. Prerequisite: Mathematics 134 or consent of instructor. 5 hours. Students may not receive credit for both Mathematics 244 and either Mathematics 242 or 245.
- 245. Calculus, II.** Continuation of Mathematics 135. Polar coordinates, vectors and parametric equations, infinite series, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 135. 5 hours. Students may not receive credit for both Mathematics 245 and either Mathematics 242 or 244.
- 247. Intermediate Analysis.** Advanced calculus for students in mathematics: topics include continuity, gradients, Jacobians, optimization, vector integration, Stokes' theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 247 and 343. (Counts for advanced hours in LAS.)
- 250. Advanced Problem Solving.** The art and technique of solving mathematical problems. Prerequisite: The calculus. 1 hour. May be repeated to a maximum of 6 hours.
- 257. Numerical Methods.** Same as Computer Science 257. See Computer Science 257.
- 263. Statistics for Scientists.** Same as Statistics 210. See Statistics 210.
- 270. Actuarial Problem Solving.** Methods and techniques of solving problems in actuarial mathematics for advanced students intending to enter the actuarial profession. Prerequisite: Consent of instructor. 1 to 2 hours. May be repeated to a maximum of 4 hours.
- 280. Advanced Calculus.** Introductory study of vector calculus and functions of several variables; topics include directional derivatives; Jacobians; change of variables in multiple integrals; maxima and minima; line and surface integrals; theorems of Gauss, Green, and Stokes; infinite series; and uniform convergence. Prerequisite: Mathematics

242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 280 and 247. (Counts for advanced hours in LAS.)

- 285. Differential Equations and Orthogonal Functions.** Intended for engineering students and others who require a working knowledge of differential equations; included are techniques and applications of ordinary differential equations and an introduction to partial differential equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Credit is not given for Mathematics 285 and either 340 or 341. (Counts for advanced hours in LAS.)
- 290. Individual Study.** Guided individual study of advanced topics not covered in other courses. Prerequisite: Mathematics 347 with grade of B or better, or consent of department. 2 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Guided individual study of advanced topics not covered in other courses; for students seeking honors credit. Prerequisite: Mathematics 347 with grade of B or better, or consent of Mathematics Honors Committee. 2 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 296. Honors Seminar.** Careful study of a selected area of mathematics, carried out either deductively from axioms or inductively through problems; subject matter varies with instructor. Prerequisite: Consent of Mathematics Honors Committee. 3 hours. May be repeated to a maximum of 6 hours.
- 302. Topics on Geometry.** Historical development of geometry; includes tacit assumptions made by Euclid, Euclid's Fifth Postulate and its equivalents; the discovery of non-Euclidean geometries; geometry as a mathematical structure; and geometry as a study of invariants of set transformations. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
- 303. Advanced Aspects of Euclidean Geometry.** Selected topics from geometry, for example circumcircle, the nine-point circle, theorems on centroid and ortho-center, the construction of regular figures, isometries in the plane and space, rotations and translations, fixed points, ordered and affine geometries, and geometry of inversive plane. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
- 305. Teacher's Course.** Presents selected topics in mathematics that are related to the content of secondary school mathematics programs; provides background for enrichment topics for secondary school students. Subject matter varies with the instructor. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 306. History of Calculus.** An examination of the historical origins and genesis of the concepts of the calculus; includes mathematical developments from the ancient Greeks to the eighteenth century. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 308. Actuarial Statistics, I.** Same as Statistics 308. Examines elementary theory of probability, including independence, conditional probability, and Bayes' theorem; combinations and permutations; random variables, expectations, and probability distributions; joint and conditional distributions; functions of random variables; sampling; central limit theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit. Credit is not given for both Mathematics 308 and either Mathematics 361 or Statistics 310.
- 309. Actuarial Statistics, II.** Same as Statistics 309. Continuation of Mathematics 308. Examines parametric point and interval estimation, including maximum likelihood estimation, sufficiency, completeness, and Bayesian estimation; hypothesis testing; linear models; regression and correlation. Prerequisite: Mathematics 308. 4 hours or 1 unit. Credit is not given for both Mathematics 309 and Statistics 311.
- 310. Theory of Interest.** A study of compound interest and annuities; applications to problems in finance. Prerequisite: Mathematics 242 or 245. 3 hours or 1 unit.
- 311. Actuarial Linear Techniques.** Introduces techniques of linear algebra and linear programming; topics include matrix operations, determinants, linear equations, vector spaces, linear programs, the simplex method, and duality for linear programs. Prerequisite: Credit or concurrent registration in Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 311 and either 315 or 383.

- 312. Graph Theory and Its Applications.** Examines basic concepts and applications of graph theory, where graph refers to a set of vertices and edges that join some pairs of vertices; topics include subgraphs, connectivity, trees, cycles, vertex and edge coloring, planar graphs and their colorings. Draws applications from computer science, operations research, chemistry, the social sciences, and other branches of mathematics, but emphasis is placed on theoretical aspects of graphs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 313. Combinatorial Mathematics.** Same as Computer Science 313. Permutations and combinations, generating functions, recurrence relations, inclusion and exclusion, Polya's theory of counting, and block designs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 314. Introduction to Mathematical Logic.** Introduction to the formalization of mathematics and the study of axiomatic systems; expressive power of logical formulas; detailed treatment of propositional logical and predicate logic; compactness theorem and Gödel completeness theorem, with applications to specific mathematical theories; algorithmic aspects of logical formulas. Proofs are emphasized in this course, which can serve as an introduction to abstract mathematics and rigorous proof; some ability to do mathematical reasoning required. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
- 315. Linear Transformations and Matrices.** An introductory course emphasizing techniques of linear algebra; topics include matrix operations, determinants, linear equations, vector spaces, linear transformations, eigenvalues, and eigenvectors. Prerequisite: Mathematics 242 or 245; elementary knowledge of matrix multiplication, Gaussian elimination, matrix inverses, and calculation of determinants (students who lack this linear algebra background can take Mathematics 125 or 225). 3 hours or 1 unit.
- 317. Introduction to Abstract Algebra.** An introductory course in abstract algebra; includes modular arithmetic, permutations, group theory through the isomorphism theorems, ring theory through the notions of prime and maximal ideals, and additional topics such as unique factorization domains and classification of groups of small order. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 318. Introduction to Linear Algebra.** Abstract approach emphasizing concept of linear transformation; topics include linear equations, vector spaces, linear transformations, matrices, determinants, invariant subspaces, direct sum decompositions, canonical forms, inner product spaces, and bilinear forms. Emphasizes proofs. Prerequisite: Junior standing and two courses beyond calculus, or consent of instructor. 3 hours or 1 unit.
- 319. Applied Modern Algebra.** Same as Electrical Engineering 319. Sets and functions, finite-state machines, partially ordered sets, Boolean algebras, normal form of switching functions, the semigroup of a machine, and group codes. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 323. The Calculus of Curves and Surfaces.** Applications of the calculus to the study of shape and curvature of curves and surfaces; introduction to vector fields, differential forms on Euclidean spaces, and the method of moving frames for low-dimensional differential geometry. Prerequisite: Mathematics 242 or 245; or equivalent. 3 hours or 1 unit.
- 332. Introduction to Set Theory and Topology.** Informal set theory, cardinal and ordinal numbers, and axiom of choice; topology of metric spaces and introduction to general topological spaces. Prerequisite: Credit or concurrent registration in Mathematics 347. 3 hours or 1 unit.
- 339. Philosophy of Mathematics.** Same as Philosophy 339. See Philosophy 339.
- 341. Differential Equations.** A basic course in ordinary differential equations; topics include existence and uniqueness of solutions and the general theory of linear differential equations; treatment is more rigorous than that given in Mathematics 285. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 341 and either 285 or 340.
- 342. Fourier Series and Boundary Value Problems.** Deals with the theory of Fourier series and applications to solving partial differential equations. Prerequisite: Mathematics 285, 340, or 341. 3 hours or 1 unit.

- 344. Elementary Real Analysis.** Careful treatment of the theoretical aspects of the calculus of functions of a real variable; topics include the real number system, limits, continuity, derivatives, and the Riemann integral. Prerequisite: Mathematics 242 or 245. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
- 346. Complex Variables and Applications.** For students who desire a working knowledge of complex variables; covers the standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, Laplace transforms, and potential fields. Students desiring a systematic development of the foundations of the subject should take Mathematics 348. Prerequisite: Mathematics 280 or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
- 347. Introduction to Higher Analysis: Real Variables.** Careful development of elementary real analysis including such topics as completeness property of the real number system; basic topological properties of n -dimensional space; convergence of numerical sequences and series of functions; properties of continuous functions; and basic theorems concerning differentiation and Riemann integration. Prerequisite: Mathematics 242 or 245 (or equivalent) and junior standing; or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
- 348. Introduction to Higher Analysis: Complex Variables.** For students who desire a rigorous introduction to the theory of functions of a complex variable; topics include Cauchy's theorem, the residue theorem, the maximum modulus theorem, Laurent series, the fundamental theorem of algebra, and the argument principle. Prerequisite: Mathematics 347. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
- 351. Topics in Applied Mathematics.** Deals with topics in the application of mathematics to the physical, biological, and social sciences; see Timetable or department office for current topics. Prerequisite: Consent of instructor. 3 hours or 1 unit. May be repeated with consent of instructor.
- 352. Multivariate Real Analysis.** Rigorous treatment of the calculus of functions of several real variables; topics covered include differentials, maxima and minima, Lagrange multipliers, transformation of multiple integrals, Jacobian's, implicit function theorems, line and surface integrals, Stokes' theorem, and vector analysis. Prerequisite: Mathematics 347. 3 hours or 1 unit.
- 353. Elementary Theory of Numbers.** Topics covered include divisibility, primes, congruences, quadratic reciprocity, and Farey sequences. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 355. Numerical Methods for Partial Differential Equations.** Same as Computer Science 355. See Computer Science 355.
- 357. Mathematical Models in the Social Sciences.** Use of many models drawn from the social sciences to motivate, illustrate, and give a unified development of topics in one or more of the following areas: linear algebra, graph theory; Markov chains, linear and nonlinear systems of difference equations, and optimization. Prerequisite: Mathematics 134 or equivalent. 3 hours or 1 unit.
- 358. Numerical Linear Algebra.** Same as Computer Science 358. See Computer Science 358.
- 359. Numerical Approximation and Ordinary Differential Equations.** Same as Computer Science 359. See Computer Science 359.
- 361. Introduction to Probability Theory, I.** Same as Statistics 351. Introduction to mathematical probability; includes the calculus of probability, combinatorial analysis, random variables, expectation, distribution functions, moment-generating functions, and central limit theorem. Prepares students for Mathematics 366. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 363. Introduction to Mathematical Statistics and Probability, I.** Same as Statistics 310. See Statistics 310.
- 364. Introduction to Mathematical Statistics and Probability, II.** Same as Statistics 311. See Statistics 311.
- 365. Analysis of Variance.** Same as Statistics 324. See Statistics 324.

- 366. Introduction to Probability Theory, II.** Same as Statistics 356. Continuation of Mathematics 361. Includes random walks, discrete and continuous time Markov chains, and special topics selected from weak stationarity, multivariate central limit theorem, probability model building, stochastic equations, martingale theory, and renewal theory. Prerequisite: Mathematics 361 or Statistics 311. 3 hours or 1 unit.
- 368. Topics in Applied Statistics.** Same as Statistics 330. See Statistics 330.
- 369. Methods of Applied Statistics.** Same as Statistics 320. See Statistics 320.
- 370. Finite Differences.** Finite differences, finite integration, interpolation, difference equations, numerical integration, and iterative methods of solving equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
- 371. Actuarial Theory, I.** Single-life mortality functions, annuities, life insurance, premiums, and reserve. Prerequisite: Mathematics 310 or consent of instructor. 3 hours or 1 unit.
- 372. Actuarial Theory, II.** Continuation of Mathematics 371. Emphasis is on multiple-life functions. Prerequisite: Mathematics 371. 3 hours or 1 unit.
- 373. Combinatorial Algorithms.** Same as Computer Science 373. See Computer Science 373.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Computer Science 375. See Computer Science 375.
- 376. Actuarial Risk Theory.** Mathematical analysis of the risk to an insurer due to variations in expected claim numbers and amounts; optimal insurance systems; the probability of ruin in the long run; reinsurance; dividend formulas. Prerequisite: Credit or concurrent registration in Statistics 309 or 311. 3 hours or 1 unit.
- 377. Theory of Computable Functions.** An introductory course in which the concept of effective computability is made precise and studied; presents various types of algorithms, such as Turing machines and abstract register machines; studies the class of functions computable by such algorithms, with applications to the existence of algorithmically unsolvable problems in mathematics. Topics treated include sets which can be listed by algorithms, universal algorithms, unsolvability of the halting problem and generalizations, and self-referential algorithms and their applications. Prerequisite: Mathematics 375 or 314 or 317. 3 hours or 1 unit.
- 381. Vector and Tensor Analysis.** Vector spaces, transformation properties, covariant and contravariant tensors, and differential geometry of surfaces; with applications to relativity theory. Prerequisite: Mathematics 280 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 382. Linear Programming and Combinational Optimization.** Rigorous introduction to wide range of topics in optimization; includes thorough treatment of basic ideas of linear programming; additional topics are drawn from numerical considerations, linear complementarity, integer programming and networks, polyhedral methods and matroids. Prerequisite: Mathematics 315. 3 hours or 1 unit. Credit not given for Mathematics 383 if taken after Mathematics 382.
- 383. Linear Programming.** Same as Computer Science 383. Systems of linear inequalities, the standard canonical and general linear problems, and simplex methods of solution. Prerequisite: Mathematics 125, 225, or 315; or equivalent. 3 hours or 1 unit.
- 384. Nonlinear Programming.** Iterative and analytical solutions of constrained and unconstrained problems of optimization; gradient and conjugate gradient solution methods; Newton's method, LaGrange multipliers, and duality and the Kuhn-Tucker theorem; and quadratic, convex, and geometric programming. Prerequisite: Mathematics 242 or 245, and a knowledge of linear algebra equivalent to Mathematics 315, or consent of instructor. 3 hours or 1 unit.
- 385. Differential Equations, II.** Continuation of Mathematics 285. Linear systems of differential equations, including a self-contained development of the necessary matrix theory; the Laplace transform; and nonlinear differential equations. Prerequisite: Mathematics 285 or 341. 3 hours or 1 unit.
- 388. Mathematical Methods in Engineering and Science.** Matrices, determinants, bounds and approximations to eigenvalues, introduction to linear operator theory and

- inner product spaces, orthogonal expansions, and Fourier transforms. Prerequisite: Mathematics 280 or equivalent. 3 hours or 1 unit.
- 391. Switching Theory.** Same as Computer Science 391 and Electrical Engineering 391. See Electrical Engineering 391.
- 393. Statistical Computing.** Same as Statistics 328. See Statistics 328.
- 394. Time Series Analysis.** Same as Statistics 329. See Statistics 329.
- 400. General Seminar.** General seminar required of all graduate students who have passed the departmental written qualifying examination for the Ph.D. 0 units.
- 401. Second Course in Abstract Algebra, I.** Isomorphism theorems for groups; solvability of p -groups; simplicity of the alternating group on 5 letters; Sylow theorems and Jordan-Hölder theorem; principal ideal domains; Gauss' lemma; Eisenstein's criterion; fundamental theorem of Galois theory; finite fields; cyclotomic fields; and solvability of equations by radicals. Prerequisite: Mathematics 317 and 318. 1 unit.
- 402. Second Course in Abstract Algebra, II.** Modules; Hilbert basis theorem; Krull-Schmidt theorem; Wedderburn theorem on semisimple rings; finitely generated modules over principal ideal domains, with applications to abelian groups and canonical forms for matrices; categories and functors; tensor products; and bilinear and quadratic forms. Prerequisite: Mathematics 401. 1 unit.
- 403. Theory of Rings.** Ideal theory in commutative rings; structure of noncommutative rings. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 404. Group Theory.** Structure of groups, derived groups, nilpotence and solvability, and extensions and products. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 405. Algebraic Number Theory.** Further development of the theory of fields covering topics from valuation theory, ideal theory, units in algebraic number fields, ramification, function fields, and local class field theory. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 406. Homological Algebra.** Definition and properties of the functors Ext and Tor ; projective, injective, and flat modules; group extensions; dimensions of rings, and Hilbert theorem on syzygies. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 407. Group Representation Theory.** Representation of groups by linear transformations, group algebras, character theory, and modular representations. Prerequisite: Mathematics 402 or equivalent. 1 unit.
- 408. Lie Algebras.** Examples of Lie algebras (low dimensions, Lie algebras of Lie groups, free algebras, and universal enveloping algebra); Poincaré-Birkhoff-Witt theorem; nilpotent and solvable algebras; Cartan subalgebras; structure of semisimple algebras; real forms; and representations. Prerequisite: Mathematics 401; credit or concurrent registration in Mathematics 402. 1 unit.
- 410. Mathematical Logic.** Development of first order predicate logic; completeness theorem; formalized number theory and the Gödel incompleteness theorem. Prerequisite: Mathematics 314 or 317 or consent of instructor. 1 unit.
- 411. Model Theory.** Techniques for constructing models, including compactness and Löwenheim-Skolem theorems, unions of elementary chains, and omitting types construction; categorical theories; ultraproducts; saturated models; quantifier elimination; applications to algebraically closed fields, real closed fields, and other fundamental structures of mathematics. Prerequisite: Mathematics 410, or consent of instructor. 1 unit.
- 412. Recursive Function Theory.** Various characterizations of the class of recursive (i.e., computable) functions; the Church-Turing thesis; unsolvability of the halting problem; the recursive theorem and the enumeration theorem; relative computability, the jump operation, and the arithmetical hierarchy; recursively enumerable sets; degrees of unsolvability; and the priority method. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.
- 413. Set Theory.** Zermelo-Fraenkel axiomatic set theory; basic concepts in set theory such as ordinal, cardinal, rank, and definition by transfinite recursion; Gödel's constructible universe; introduction to forcing; Boolean valued universes; large cardinals; consistency and independence of the continuum hypothesis and the axiom of choice. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.

- 414. Advanced Topics in Logic.** Prerequisite: Mathematics 410; consent of instructor. 1 unit.
- 415. Advanced Topics in the Theory of Groups.** Prerequisite: Consent of instructor. 1 unit.
- 416. Advanced Topics in Abstract Algebra.** Prerequisite: Consent of instructor. 1 unit.
- 418. Graph Theory.** Same as Computer Science 472. Structure of graphs; planarity and colorability of graphs; matrices associated with a graph; and automorphism group of a graph. Prerequisite: Mathematics 313, 317, or 319, or equivalent. 1 unit.
- 422. Algebraic Geometry.** Properties of affine and projective varieties defined over algebraically closed fields; rational mappings, birational geometry and divisors, especially on curves and surfaces; introduction to the language of schemes; and Riemann-Roch theorem for curves. Prerequisite: Mathematics 402. 1 unit.
- 423. Differentiable Manifolds.** Definition and properties of differentiable manifolds and maps, introducing vector fields, tangent bundles, differential forms, exterior derivatives, and foliations. Prerequisite: Mathematics 323 or 381, or consent of instructor. 1 unit.
- 424. Riemannian Geometry.** Local and global properties of Riemannian manifolds. Prerequisite: Mathematics 423. 1 unit.
- 425. Linear Analysis on Manifolds, I.** Study of topological invariants of differentiable and complex manifolds. Prerequisite: Mathematics 423 and 431, or consent of instructor. 1 unit.
- 427. Lie Groups.** Study of groups which are also differentiable manifolds. Prerequisite: Mathematics 423. 1 unit.
- 428. Topics in Geometry.** Prerequisite: Consent of instructor. 1 unit.
- 430. Elementary Geometry from a Modern Viewpoint.** Designed for secondary school teachers of mathematics; primary purpose is to discuss critically the logical structure and content of Euclidean geometry from the modern point of view; and consideration is given to the historical development of the modern approach. Prerequisite: Consent of instructor. 1 unit.
- 431. Algebraic Topology, I.** Homological algebra techniques, simplicial and singular homology, fundamental group and covering spaces, and applications. Prerequisite: Mathematics 318 and 332; concurrent registration in Mathematics 401 or consent of instructor. 1 unit.
- 432. Algebraic Topology, II.** Continuation of Mathematics 431. Axiomatic homology theory, fibrations and cofibrations, CW-complexes, cohomology products, and other topics. Prerequisite: Mathematics 431; concurrent registration in Mathematics 402. 1 unit.
- 433. Fiber Spaces and Characteristic Classes.** Continuation of Mathematics 432. Study of fiber bundles and their associated characteristic classes; applications to geometric problems. Prerequisite: Mathematics 432. 1 unit.
- 435. General Topology, I.** Study of topological spaces and maps, including Cartesian products, identifications, connectedness, compactness, uniform spaces, and function spaces. Prerequisite: Mathematics 332 or consent of instructor. 1 unit.
- 436. General Topology, II.** Continuation of Mathematics 435. Prerequisite: Mathematics 435. 1 unit.
- 438. Topics in Topology.** Prerequisite: Consent of instructor. 1 unit.
- 440. Theory of Functions of a Complex Variable, I.** Topics include the Cauchy theory, harmonic functions, entire and meromorphic functions, and the Riemann mapping theorem. Prerequisite: Mathematics 346 and 347, or Mathematics 348. 1 unit.
- 441. Real Analysis, I.** Lebesgue measure on the real line; integration and differentiation of real valued functions of a real variable; and additional topics at discretion of instructor. Prerequisite: Mathematics 347 or equivalent. 1 unit. Credit is not given for both Mathematics 441 and 481.
- 442. Real Analysis, II.** Abstract measure theory; integration on general measure spaces; and introduction to functional analysis. Prerequisite: Mathematics 441. 1 unit.
- 443. Ordinary Differential Equations.** Existence, uniqueness, and continuation of solutions; topics selected from the following: the theory of linear differential operators,

- Sturm-Liouville theory, stability theory, and qualitative theory of differential equations. Prerequisite: Mathematics 347; a first course in ordinary differential equations. 1 unit.
- 444. Partial Differential Equations.** A basic introduction to the study of partial differential equations; topics include: the Cauchy problem, power-series methods, characteristics, classification, canonical forms, well-posed problems, Riemann's method for hyperbolic equations, the Goursat problem, the wave equation, Sturm-Liouville problems and separation of variables, Fourier series, the heat equation, integral transforms, Laplace's equation, harmonic functions, potential theory, the Dirichlet and Neumann problems, and Green's functions. Prerequisite: Consent of instructor. 1 unit.
- 445. Theory of Functions of a Complex Variable, II.** Continuation of Mathematics 440. Topics include subharmonic functions, Nevanlinna theory, analytic continuation and Riemann surfaces, and univalent functions. Prerequisite: Mathematics 440. 1 unit.
- 446. Hilbert Spaces.** Geometrical properties of Hilbert spaces; linear operators; and the spectral theory for self adjoint and related operators. Prerequisite: Mathematics 442. 1 unit.
- 447. Banach Spaces.** Geometrical properties of Banach spaces; bounded linear operators; applications to analysis; and linear topological spaces. Prerequisite: Mathematics 442. 1 unit.
- 448. Harmonic Analysis.** Locally compact groups; Haar measure; Fourier analysis; and Tauberian theorems. Prerequisite: Mathematics 442. 1 unit.
- 451. Theory of Probability, I.** Same as Statistics 451. Mathematical foundations or probability and stochastic processes: probability measures, random variables, distribution functions, convergence theory, the Central Limit Theorem, conditional expectation, and martingale theory. Prerequisite: Mathematics 442. 1 unit. Credit is not given for both Mathematics 451 and either 481 or 482.
- 452. Theory of Probability, II.** Same as Statistics 452. Continuation of Mathematics 451. Prerequisite: Mathematics 451. 1 unit. Credit is not given for both Mathematics 452 and 482.
- 453. Analytic Theory of Numbers, I.** Problems in number theory treated by methods of analysis; topics chosen from prime number theory, Riemann zeta function, sieve methods, diophantine approximation, metric theory, partitions, lattice points, Waring's problem, and asymptotic properties of arithmetrical functions. Prerequisite: Mathematics 317 or 348. 1 unit.
- 454. Analytic Theory of Numbers, II.** Continuation of Mathematics 453. Prerequisite: Mathematics 453. 1 unit.
- 455. Mathematical Methods of Physics.** Introduction to inner product spaces, linear operators, and Schwartz distribution theory; Green's functions for ordinary differential equations; and integral equations: Hilbert-Schmidt theory and Sturm-Liouville theory. Prerequisite: Mathematics 280 and 346. 1 unit.
- 456. Mathematical Methods of Physics.** Calculus of variations; Euler-Lagrange theory, Rayleigh-Ritz method, and Dirichlet principle; integral transform methods and separation of variables; and approximation methods: finite differences, Galerkin's method, and asymptotic expansions. Prerequisite: Mathematics 455 or consent of instructor. 1 unit.
- 457. Numerical Solution of Ordinary Differential Equations.** Same as Computer Science 457. See Computer Science 457.
- 458. Topics in Numerical Analysis.** Same as Computer Science 458. See Computer Science 458.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Nuclear Engineering, Physics and Theoretical and Applied Mechanics 459. An advanced methods course in asymptotic methods, with examples drawn from fluid mechanics, but designed to be mathematically instructive to all students of applied mathematics, engineering, and the physical sciences. Prerequisite: Mathematics 346 or Physics 413; or consent of instructor. 1 unit.
- 460. General Relativity and Cosmology.** Same as Astronomy and Physics 424. See Physics 424.
- 461. Applied Stochastic Processes.** Same as Statistics 455. Introduction to topics such as

- spectral analysis, filtering theory, and prediction theory of stationary processes; Markov chains and Markov processes. Prerequisite: Mathematics 346 and 347. 1 unit.
- 463. Information Theory.** Same as Computer Science 463 and Electrical Engineering 463. Mathematical models for information channels and sources, existence theorems for and construction of error-correcting codes. Prerequisite: Mathematics 361. 1 unit.
- 465. Topics in Automata Theory.** Same as Computer Science 465 and Electrical Engineering 465. Prerequisite: Mathematics 392 or consent of instructor. 1 unit.
- 466. Topics in Ordinary Differential Equations.** Introduction to current research in such areas as stability and asymptotic behavior of solutions; topological dynamics; numerical methods; and boundary value problems and spectral theory of differential operators. Prerequisite: Consent of instructor. 1 unit.
- 468. Topics in Analysis.** Prerequisite: Consent of instructor. 1 unit.
- 470. Statistical Decision Functions.** Same as Statistics 470. See Statistics 470.
- 471. Multivariate Analysis.** Same as Statistics 471. See Statistics 471.
- 472. Special Topics in Actuarial Theory.** Selected topics in advanced actuarial science. Prerequisite: Consent of instructor. 1 unit. May be repeated once for credit.
- 475. Topics in Combinatorics.** Same as Computer Science 475. See Computer Science 475.
- 476. Coding Theory.** Same as Electrical Engineering and Computer Science 456. See Electrical Engineering 456.
- 477. Graduation and Demography.** Construction and graduation of mortality and other tables; mathematical aspects of demography, especially measures of mortality and morbidity; and risk theory and reinsurance. Prerequisite: Mathematics 370 and 371. 1 unit.
- 478. Topics in Statistics.** Same as Statistics 478. See Statistics 478.
- 479. Computational Complexity.** Same as Computer Science 479 and Electrical Engineering 479. See Electrical Engineering 479.
- 480. Optimization by Vector Space Methods.** Same as Electrical Engineering 480. Introduction to normed, Banach, and Hilbert spaces; applications of the projection theorem and the Hahn-Banach Theorem to problems of minimum norm, least squares estimation, mathematical programming, and optimal control; the Kuhn-Tucker Theorem and Pontryagin's maximum principle; and introduction to iterative methods. Prerequisite: Mathematics 315 or 383, and Mathematics 347 or consent of instructor. 1 unit.
- 481. Probability and Measure, I.** Same as Statistics 453. Measures and probabilities; integration and expectation; convergence theorems and inequalities for integrals and expectations; independence; convergence in probability, almost surely, and mean; Three Series Theorem; laws of large numbers. Prerequisite: Mathematics 347 or consent of instructor. 1 unit. Credit is not given for both Mathematics 481 and either Mathematics 441 or 451.
- 482. Probability and Measure, II.** Same as Statistics 454. Measure extensions, Lebesgue-Stieltjes measure, Kolmogorov consistency theorem; conditional expectation, conditional probability, martingales; distribution functions and characteristic functions; convergence in distribution; Central Limit Theorem. Prerequisite: Mathematics 481. 1 unit. Credit is not given for both Mathematics 482 and either 451 or 452.
- 483. Optimization in Networks.** Theory and methods for optimization over directed graphs; paths, cuts, flows, and potentials; matchings; PERT and CPM; max flow, min path, out-of-kilter, Hungarian, and other algorithms; nonlinear cost functionals; painting theory; and existence and duality. Prerequisite: Mathematics 242 or 245. 1 unit.
- 484. Conjugate Duality and Optimization.** Convex analysis for constrained extremum problems; convex sets, cones, and functions; separation; Fenchel transform; duality correspondences; differential theory; nonlinear programming; sensitivity; and perturbational duality for primal, dual, and Lagrangian problems. Prerequisite: Mathematics 315 and 347, or consent of instructor. 1 unit.
- 485. Topics in Optimization.** May be repeated for credit. Prerequisite: Consent of instructor. 1 unit.
- 487. Theory of Approximation.** Same as Computer Science 487. General approximation

theory in normed linear spaces; primary emphasis on functions defined on an interval, and periodic functions; existence and uniqueness theorems; characterization of Chebyshev approximants; degree of approximation; interpolation with emphasis on the quality of interpolants as approximants; and use of approximations in computing. Prerequisite: Mathematics 318 and 348, or consent of instructor. 1 unit.

488. Topics in Applied Mathematics. Prerequisite: Consent of instructor. 1 unit.

490. Reading Course. Prerequisite: Consent of instructor. 1 to 2 units.

499. Thesis Research. Prerequisite: Consent of instructor. 0 to 4 units.

MECHANICAL AND INDUSTRIAL ENGINEERING

Head of Department: A. L. Addy

Department Office: 154 Mechanical Engineering Building, 1206 West Green, Urbana

Industrial Engineering

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

203. Engineering Economics. Principles of engineering economy and their applications to manufacturing problems; relevant accounting principles; studies of typical manufacturing processes and their economic factors; and exercises in planning processes for maximum efficiency. Prerequisite: Junior standing in engineering. 4 hours.

232. Methods-Time Analysis. Principles of motion economy affecting the design of a product or service; the effective use of human effort as related to the tools and equipment used in manufacturing and commercial endeavors; reasons for time study and the principles of determining time standards; study of standard data and other specific types of micromotion standards; and applications of all phases of the studies to specific cases. Prerequisite: Industrial Engineering 248 and junior standing. 3 hours.

238. Analysis of Data. Nature of probabilistic models for observed data; discrete and continuous distribution function models; inferences on universe parameters based on sample values; and introduction to control charts, acceptance sampling, and measurement theory. Prerequisite: Completion of basic calculus. 3 hours.

248. Human Factors in Human-Machine Systems. Same as Psychology 258. See Psychology 258.

287. Job Evaluation and Wage Incentives. Study of job evaluation techniques and wage incentive systems; problems of installing and maintaining job and position evaluation systems in industrial organizations. Prerequisite: Industrial Engineering 232 or equivalent; senior standing. 3 hours.

291. Seminar. A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of industrial engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in industrial engineering; must be taken in Spring Semester. 0 hours.

296. Honors Project. Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

297. Honors Seminar. Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

305. Principles of Ergonomics. Same as Physiology and Kinesiology 305. Concepts and design criteria to achieve optimum mutual adjustment of man and his work; consideration of such topics as static and dynamic forces on the human frame; response to environmental stress (heat, vibration, noise); vigilance and fatigue; and man-machine systems. Prerequisite: Senior standing; consent of instructor. 4 hours or 1 unit.

- 329. Human-Computer Interaction Laboratory.** Same as Psychology 329. See Psychology 329.
- 332. Standard Time Systems.** The study of development, uses, and limitations of standard time data and predetermined time systems. Prerequisite: Industrial Engineering 232. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 334. Introduction to Reliability Engineering.** Same as General Engineering 334. An introduction to concepts in engineering design, testing, and management for highly reliable components and systems. Prerequisite: Industrial Engineering 238 or Mathematics 361, or equivalent with consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 335. Industrial Quality Control.** Control charts for attributes and variables; modified control chart techniques; acceptance sampling for attributes and variables; relationship to design, production, and procurement; quality cost analysis; military standards practice; survey and reports of current quality literature; and management of quality programs. Prerequisite: Industrial Engineering 238 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 336. Design and Analysis of Industrial Experimentation.** Randomized blocks, t-tests, and factorial and fractional factorial designs; concepts of randomization, blocking, screening, and confounding; second-order designs, response surface methodology, and evolutionary operation; and introduction to mechanistic model building and nonlinear estimation. All topics are treated through engineering applications and case studies. Prerequisite: Industrial Engineering 238 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 350. Computer-aided Manufacturing Systems.** The application of computer technology and operations research in manufacturing systems; includes the use of minicomputers and microprocessors for direct numeric control of machine tools, adaptive control and optimization, and integrated manufacturing systems, including applications of industrial robots. Prerequisite: Mechanical Engineering 285 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 355. Numerical Control of Manufacturing Processes.** Study of numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control. Prerequisite: Mechanical Engineering 285 or consent of instructor; background in computer technology. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 357. Safety Engineering.** Study of engineering principles applied to industrial accident prevention; safe plant layout; safety in maintenance; boilers and pressure vessels; design and application of machine guards; material handling and storage; hand and power tools; welding hazards; electrical hazards; flammable liquids and fire protection; industrial health engineering; and toxic materials. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 360. Analysis of Materials Machining.** An analytical approach to the mechanics and physics of various machining processes; covers the basic phenomena underlying process characteristics, such as wear, plastic flow, surface integrity, friction, and economics. Prerequisite: Mechanical Engineering 231 and 285, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 363. Facilities Planning and Design.** Reviews the process of facility planning, plant layout design and materials handling analysis; includes the determination of facilities requirements, site selection, materials flow, use of analytical and computerized techniques, and applications to several areas such as manufacturing, warehousing, and office planning. Prerequisite: Credit or concurrent registration in Industrial Engineering 232 and Mechanical Engineering 285. 3 hours or $\frac{1}{4}$ unit. Graduate students in industrial engineering may not receive credit for Industrial Engineering 363.
- 370. Industrial Engineering Design Laboratory.** Covers basic experiments and computer-based laboratory projects in manufacturing, production planning and facilities management, and human factors, using realistic industrial engineering problem settings; stresses the development of objectives and evaluation criteria as well as methods for design synthesis, analysis, and testing. Prerequisite: Credit or concurrent registration

in all required courses in the industrial engineering curriculum which carry the I E designation. 3 hours or $\frac{3}{4}$ unit.

- 373. Production Planning and Control.** Examines the scope of production systems, and the activities involved in their design, establishment, management, operation, and maintenance; mathematical and computer models for planning and control of facilities, human resources, projects, products, material, and information in production systems. Prerequisite: Industrial Engineering 203 and 385. 3 hours or $\frac{3}{4}$ unit. Graduate students in industrial engineering may not receive credit for Industrial Engineering 373.
- 385. Operations Research, I.** A first course in operations research techniques and their application to systems analysis and design; includes linear programming, linear models, simplex method, transportation methods, assignment algorithms, sensitivity analysis, dynamic programming, and introduction to inventory and queueing theory. May not be used toward fulfillment of the M.S. in industrial engineering degree requirements nor toward the Ph.D. in mechanical engineering degree requirements for industrial engineering majors. Prerequisite: Completion of basic calculus: junior standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 386. Operations Research, II.** Continuation of Industrial Engineering 385; includes advanced linear programming, matrix forms, revised simplex method, bounded variables, primal-dual methods, parametric programming, integer programming, stochastic processes, queues, inventories, maintenance, simulation, and modeling; and emphasizes model building and treatment of uncertainty. Prerequisite: Industrial Engineering 238 and 385, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 393. Special Problems.** Study of advanced problems related to industrial engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Mathematical Programming, I: Applied Nonlinear Programming.** Optimization of nonlinear systems, including a survey of classical methods and concepts such as the Lagrangian method, the Jacobian method, and Kuhn-Tucker conditions; emphasizes modern algorithms, numerical methods for digital computers, applications in engineering design, and use of state of the art computer codes. Prerequisite: Industrial Engineering 385 or equivalent, or consent of instructor. 1 unit.
- 402. Mathematical Programming, II: Dynamic and Geometric Programming.** The formulation and construction of dynamic programming models and advanced dynamic programming concepts such as treatment of multistate variables, nonserial systems, and Markov processes; geometric programming, including treatment of degree of difficulty, mixed signs, and computational refinements; and emphasis on applications in engineering design. Prerequisite: Statistics 310 and Industrial Engineering 385, or equivalent; or consent of instructor. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Civil Engineering 416. Basic concepts, theories, and techniques of systems analysis, including modeling of large scale systems, forecasting, planning, control, and information handling; emphasizes the modeling of systems with network techniques, including distance, flow, and project networks; and discusses advanced network topics such as out-of-kilter algorithm and project resource analysis. Prerequisite: Industrial Engineering 373 or Civil Engineering 292, or equivalent, or consent of instructor. 1 unit.
- 417. Systems Analysis, II: Digital Simulation.** Same as Civil Engineering 417. The application of simulation techniques to systems analysis; includes modeling for simulation, design of simulation experiments, random number generation, process generation, simulation of queueing systems, inventory systems, and project networks, analysis of simulation results, and some digital simulation languages and programs in use, such as GASP II and GERTS III. Prerequisite: Industrial Engineering 385 or Civil Engineering 293, and some exposure to computer programming. 1 unit.
- 458. Laboratory Investigations in Industrial Engineering.** Special investigations of such problems as optimization of operations, programming systems, work standards, plant layout, and flow of materials. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.

Mechanical Engineering

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Thermodynamics.** Introduction to classical thermodynamics through the second law; system and control volume analyses of thermodynamic processes; irreversibility and availability; relations for ideal gas mixtures. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
- 207. Thermodynamics.** Energy and its transformations; properties of thermodynamic media, including kinetic theory analysis; thermodynamic processes of open and closed systems; reversibility and limitations; entropy and the second law; thermodynamics temperature scales; and second law analysis of chemically reactive systems. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
- 209. Thermodynamics and Heat Transfer.** Thermodynamic analysis of energy transfer and transformation; properties of simple working substances; analysis of open and closed systems, direct and reversed cycles, and processes involving transfers of mass and energy; and basic laws of heat transfer. Prerequisite: Physics 107 and Mathematics 242; or equivalent. 3 hours.
- 211. Introductory Gas Dynamics.** Introduction to dynamics; special emphasis on the theory and engineering applications of compressible high velocity flows. Prerequisite: Mathematics 345, Physics 107, and credit or concurrent registration in Mechanical Engineering 205. 3 hours.
- 213. Heat Transfer.** Principles and application of heat transfer by conduction, convection, and thermal radiation. Prerequisite: Mechanical Engineering 211. 3 hours.
- 220. Mechanics of Machinery.** Fundamentals of linkages, design of cams, kinematics of gearing, analysis of gear trains, velocity, acceleration and force analysis of systems of rigid bodies, and balance of rigid rotors and reciprocating machinery. Prerequisite: Engineering mechanics (statics and dynamics) and Computer Science 101. 3 hours.
- 225. Mechanism, Kinematics and Design.** Linkages, cams and gears, velocities, accelerations, inertia forces, vibrations, fasteners, springs, clutches and other machine elements. Prerequisite: Theoretical and Applied Mechanics 154 and 221. 4 hours.
- 231. Processing and Structure of Materials.** Atomic and microscopic structure of materials as the basis for their properties; processing to both shape materials and control their structure; chemical bonding, crystal defects, forming processes, phases and phase change, heat treatment, solidification processing; metals, polymers, composites, ceramics. Prerequisite: Theoretical and Applied Mechanics 221; either Mechanical Engineering 209 or credit or concurrent registration in Mechanical Engineering 213. 4 hours.
- 232. Behavior of Materials in Service.** Introduction to material response to stress, cyclic load, impact, high temperature, corrosive and abrasive conditions; selection of materials for specified service conditions; characteristics of major material project and case study; microstructural dependence of performance characteristics. Prerequisite: Mechanical Engineering 231. 2 hours.
- 240. Modeling and Analysis of Dynamic Systems.** Dynamic analysis of mechanical systems; modeling of mechanical components and systems; analysis of single and multiple degree of freedom linear systems; simulation of nonlinear systems; introduction to continuous systems and lumping techniques; and introduction to feedback control systems. Prerequisite: Mathematics 345. 4 hours. Credit is not given for both Mechanical Engineering 240 and General Engineering 222.
- 250. Thermal Science Laboratory.** Basic experiments in thermodynamics, gas dynamics, and heat transfer and their applications; experiments selected to introduce pertinent instrumentation and experimental techniques, and to further the understanding of fundamentals via physical observations. Prerequisite: Mechanical Engineering 205 and 213. 3 hours.
- 261. Introduction to Instrumentation, Measurement, and Control Fundamentals.** Basic elements of a measurement system; recording instruments, transducers, and signal conditioning; and data recording and controls, analog and digital devices and control. Prerequisite: Electrical Engineering 260. 3 hours.

- 270. Analysis and Design of Machines.** Applications of mathematics, material science, and engineering mechanics to problems in analysis and design of machine components: considers function, production, and economic factors of design; and includes fasteners, springs, gearing, bearings, shafting, clutches, and lubrication. Prerequisite: Mechanical Engineering 220 and Theoretical and Applied Mechanics 221. 4 hours.
- 275. Creativity in Engineering Design.** Study of engineering systems to show the creative use of scientific principles and design procedures; survey of natural laws and examples of their creative application; and introduction to methods for promoting creativity in engineering. Prerequisite: Mechanical Engineering 270. 3 hours.
- 285. Analysis of Manufacturing Processes.** Introduction to materials processing methods, including chip formation and deformation processes; analysis of process performance, including forces and energy, surface roughness, tool wear and tool life, and dimension precision; machine tool dynamics and vibrations, process planning, and optimization; nontraditional machining processes; introduction to numerical control of machine tools; and polymer processing and the use of various materials including plastics. Prerequisite: Creditor or concurrent registration in Mechanical Engineering 231, or equivalent. 3 hours.
- 291. Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of mechanical engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in mechanical engineering; must be taken in Spring Semester. 0 hours.
- 293. Special Projects.** Experimental and analytical investigation in mechanical engineering research. Prerequisite: Senior standing in mechanical engineering; consent of head of department. 1 to 3 hours. May be repeated; students may register for two different topics in the same semester.
- 296. Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 301. Intermediate Thermodynamics.** Basic considerations of the three laws of thermodynamics; elementary statistical principles for the prediction of properties of pure substances and mixtures; transport properties; electric, magnetic, and chemical processes. Prerequisite: Mechanical Engineering 205 or first course in thermodynamics. 3 hours, or $3/4$ or 1 unit.
- 302. Nuclear Power Engineering.** Same as Nuclear Engineering 302. See Nuclear Engineering 302.
- 303. Applied Combustion.** Applies thermodynamics, heat transfer, and chemical reaction rate concepts to combustion and combustion devices; discusses basic combustion phenomena and practical combustion systems, including gas turbine combustor, coal furnaces, and rocket motors. Prerequisite: Mechanical Engineering 213 and 304. 3 hours, or $3/4$ or 1 unit.
- 304. Energy Conversion Systems.** Analyzes processes and systems for energy conversion, including power and refrigeration cycles, air conditioning, thermoelectrics, and fuel cells. Prerequisite: Mechanical Engineering 205 or 209; or consent of instructor. 3 hours or $3/4$ unit. May not be taken for credit by graduate students in mechanical engineering.
- 305. Intermediate Gas Dynamics.** Solution of internal compressible flow problems by one-dimensional techniques, both steady and unsteady; considers flows with area change (smooth and abrupt), with friction, with heat addition, and with mass addition. Examines flows with weak and strong waves, multiple confined streams, and shock waves. Prerequisite: Mechanical Engineering 205 and 211, or first course in fluid mechanics. 4 hours or 1 unit.
- 306. Intermediate Heat Transfer.** Conduction heat transfer, radiation heat transfer, mass transfer, phase change, heat exchangers, and introductory numerical methods. Prerequisite: Undergraduate courses in fluid mechanics and heat transfer, or consent of instructor. 4 hours or 1 unit.

- 307. Solar Energy Utilization.** Emphasizes solar thermal processes; considers basic sun-earth geometry, the optics of solar energy collectors, and associated heat transfer mechanisms in detail; and includes flat plate collectors, concentrating collectors, energy storage, modeling and system simulation, and economics. Prerequisite: Mechanical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 308. Fluid Mechanics of Convective Heat Transfer.** Same as Theoretical and Applied Mechanics 308. Analyzes viscous flows and heat transfer by convection processes; solution to Navier-Stokes equations for heat conducting laminar and turbulent shear layers; similarity concepts; thermal entry lengths pipe flows; computer solution techniques. Prerequisite: Mechanical Engineering 211 or first course in fluid mechanics. 4 hours or 1 unit.
- 312. Modern Control Theory.** The concept of state; state-space representation of systems; transfer function decomposition and state-variable diagrams; state response of continuous and discrete-data systems; determination of the transition matrix; diagonalization; state response of time-varying systems; controllability and observability; stability and Lyapunov's method; and introduction to optimization and design. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 313. Computer Control of Mechanical Engineering Systems.** Examines microcomputer control of thermal and mechanical systems; sensing and transducing of variables, transmitting and converting signals, and actuating regulators associated with mechanical engineering systems. Prerequisite: Mechanical Engineering 261 or Agricultural Engineering 311. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Introduction to Tribology.** Basic concepts of friction and wear; lubricants and their application; hydrodynamic bearing theory; lubrication requirements and methods; externally pressurized bearings; gas bearings; dynamics and stability of bearings systems; elastohydrodynamic lubrication of rolling element bearings and gears; numerical approaches to lubrication problems. Prerequisite: Mechanical Engineering 211 or equivalent; or consent of instructor. 4 hours or 1 unit.
- 321. Refrigeration and Cryogenics.** The theory of operation and the design of equipment for the production of low temperatures from below ambient down to near absolute zero; applications to industrial, consumer, aerospace, medical, and various research uses. Prerequisite: Mechanical Engineering 205, 211, and 213, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Design of Thermal Systems.** Selection of components in fluid- and energy-processing systems to meet system performance requirements; computer-aided design; system simulation; optimization techniques; and investment economics and statistical combinations of operating conditions. Prerequisite: Credit or concurrent registration in Mechanical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Internal Combustion Engines.** Study of the fundamental principles underlying the theory and analysis of reciprocating internal combustion engines, fuels, carburetion, combustion, exhaust emissions, detonation, fuel injection, and factors affecting performance; basic laboratory work involving measurements of effects of variables on performance. Prerequisite: Credit or concurrent registration in Mechanical Engineering 304 or Agricultural Engineering 346, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 332. Theory of Internal Combustion Engines.** Analysis of internal combustion engines, including thermodynamics, combustion and effects of mixtures, chemical equilibrium and dissociation, exhaust emissions and air pollution, flow through valves, breathing, supercharging and turbocharging, lubrication, friction, and combustion chamber design. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 335. Power Systems Engineering and Economy.** Application of thermodynamic principles and fluid flow and heat transfer processes to power systems; determination of system characteristics and methods to satisfy these requirements with awareness of economic factors and ecological considerations. Prerequisite: Mechanical Engineering 211, 213, and credit or concurrent registration in Mechanical Engineering 304; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 336. Automotive Vehicle Dynamics.** Introduction to the dynamics and control of automotive multidegree of freedom systems; the development and solution of governing equations for both steady state and transient conditions by computer simulation techniques; investigation of the performance, handling, and safety aspects of vehicles and their interaction with external and internal interfaces; examination of the influence of tires, suspension, steering, and aerodynamic forces; and laboratory experiments and demonstrations. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Engineering Analysis and Design.** Correlation of previously acquired design experience with the creative problem of synthesis and analysis that depend upon design judgment. Prerequisite: Mechanical Engineering 270 or senior standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 342. Kinematic Analysis and Synthesis.** Geometry of constrained motion; application of mathematical and other techniques to the kinematic analysis and synthesis of mechanisms. Prerequisite: Undergraduate course in kinematics and senior standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Introduction to Finite Element Analysis.** Applies the finite element method to solve problems from various branches of mechanical engineering; topics include stress analysis, vibration, heat transfer, and fluid flow. Prerequisite: Computer Science 101, Mechanical Engineering 213, and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 346. Materials and Design.** Examines the relationship of material properties and mechanics concepts to the design of structures and components; topics include a brief introduction to elasticity, plasticity, viscoelasticity, creep, fatigue, and fracture as they relate to materials selection and design. Prerequisite: Theoretical and Applied Mechanics 221, Mechanical Engineering 232, or Theoretical and Applied Mechanics 224; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 347. Failure Prevention and Reliability of Mechanical Components.** Mechanisms of material deterioration in service, root cause analysis with applications to design, reliability, and residual life assessments; applications of fault tree analysis, Weibull analysis, cause-consequence diagrams to identification of errors and defects in design and production; discussion of probabilistic structural mechanics and its relationship to reliability; human error analysis, reliability of inspection techniques, quality assurance. Prerequisite: Mechanical Engineering 231, 232, and 270. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 355. Polymer Processing.** Analyzes polymer processing operations from engineering fundamentals; fluid and heat flow of non-Newtonian fluids; relationship of processing to material structure and properties; considers conventional processes, such as extrusion and injection molding; uses computer-aided design techniques; synthesis of new processes. Prerequisite: Mechanical Engineering 232 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 357. Introduction to Laser Materials Processing.** Examines the application of lasers in materials processing; laser/material interaction mechanisms, laser optics, welding, surface alloying, cladding, chemical vapor deposition, heat treatment, cutting and surface glazing processes, mathematical modeling of processes, microstructure and mechanical properties of processed materials, and correlation of process parameters and properties through transport phenomena modeling. Prerequisite: Mechanical Engineering 231 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 375. Introduction to Bionics.** Biological concepts and data aiding in the solution of engineering problems; analysis of mechanisms found in living systems and their application to the design of mechanical devices. Prerequisite: Mechanical Engineering 270 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 388. Industrial Control Systems.** The study of industrial control techniques by case studies of actual industrial systems; provides competence in the design, selection, and maintenance of industrial control systems; and introduces applications to electromechanical, pneumatic, thermal, and hydraulic systems. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 389. Solidification Processing.** Fundamentals of control of shape, structure, and properties of metals in casting processes; relationships between processing conditions and microstructure and introduction to simulation of processes; examples of processes considered: foundry-, die-, continuous casting, and rapid solidification processes. Prerequisite: Mechanical Engineering 231. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 393. Special Problems.** Study of advanced problems related to mechanical engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Thermodynamics and Transport Properties.** Thermodynamic and microscopic considerations for the prediction of properties; caratheodory principle; relations among properties; microscopic considerations and statistical methods; thermodynamic and transport properties; and fluctuation and nonequilibrium thermodynamics. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
- 402. Nonequilibrium Multiphase Processes.** Dynamics and thermodynamics of multiphase and multicomponent systems with special relevance to air pollution control and energy conversion; relaxation phenomena; general motion of systems of disparate elemental masses; diffusion in gravitational and electric fields, and boundary layer motion with mass transport; dispersion and collection of particulate matter; and transport with surface reactions. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
- 403. Fundamentals of Combustion.** Same as Aeronautical and Astronautical Engineering 438. See Aeronautical and Astronautical Engineering 438.
- 404. Gas Dynamics, I.** Introduction to theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Prerequisite: Mechanical Engineering 305 or equivalent, or consent of instructor. 1 unit.
- 405. Convective Heat Transfer.** Fundamentals of convective heat transfer; calculation of heat transfer within conductor and over submerged objects for laminar and turbulent flow; natural convection; film condensation and boiling; and liquid metals. Prerequisite: Mechanical Engineering 308 or consent of instructor. 1 unit.
- 406. Heat Conduction.** Fundamentals of heat conduction in isotropic and anisotropic materials; methods of solution to steady and transient heat conduction problems in one, two, and three dimensions; internal heat sources; periodic flow of heat; problems involving phase change; approximate analytical techniques; numerical methods; study of current articles on the subject. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
- 409. Laboratory Investigations in Mechanical Engineering.** Special investigation in flow, metering, heat transfer, and heat exchanger performance and design. Prerequisite: Courses in thermodynamics and fluid mechanics. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 410. Thermal Radiation.** Fundamentals of radiant energy transport in absorbing and nonabsorbing media; pyrometry; and applications to selected problems involving combined energy transport mechanisms. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
- 411. Control of Air Pollution from Stationary Sources.** Same as Civil Engineering 448. See Civil Engineering 448.
- 412. Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Environmental Studies 449. See Civil Engineering 449.
- 423. Thermal Systems.** Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: Mechanical Engineering 323. 1 unit.
- 432. Theory of Rotary Compressors.** Thermodynamical and mechanical fundamentals; compression with and without cooling; classification of compressors; similarity considerations and characteristics; principles of and computations for radial compressors; improvement in performance of integrating parts; axial flow compressors; lattice and airfoil theory; change in operating conditions of turbo-compressors; regulation, and rotary positive blowers. Prerequisite: Mechanical Engineering 304 and 305, or consent of instructor. 1 unit.
- 433. Gas Turbine Engines.** Comprehensive description of gas turbine theory and tech-

- nology; aerothermodynamics of inlet, compressor, combustor, turbine, and nozzle flows; optimization of performance; and applications to aircraft engines and stationary gas turbine power plants. Prerequisite: Mechanical Engineering 305 or equivalent. 1 unit.
- 440. Analysis, Modeling, and Design of Man-Machine Systems.** Input-output models of man as an information processor, controller, and decision maker are critically evaluated and applied to the analysis and design of specific man-machine systems. Intended for graduate students working in areas of man-machine systems, engineering psychology, control systems, or operations research. Prerequisite: Mechanical Engineering 240 and Industrial Engineering 238, or equivalent and consent of instructor. 1 unit.
- 443. Dynamics of Machinery.** Examines generalized equations of motion for single-degree-of-freedom mechanisms; modeling of mechanical systems; dynamics of flexible cam systems; dynamics of rotor systems; dynamics of clutches and brakes; isolation of mechanical vibration and impact; introduction to impact; balancing of machines. Prerequisite: Theoretical and Applied Mechanics 311 or equivalent; consent of instructor. 1 unit.
- 445. Design of Internal Combustion Engines.** Comprehensive study of the design of internal combustion engines, including gas forces, inertia loads, bearing analysis, torsional vibration, balance, lubrication, valve and cam design, and stress analysis of major parts of the engine. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 1 unit.
- 452. Solidification Processing.** Same as Metallurgical Engineering 452. Principles of control of structure, properties, and shape in processes involving liquid/solid transformations; stresses heat flow, mass transport, solute redistribution, nucleation and growth kinetics; and the relationship between process variables and structures and properties in the resultant material. Examples are drawn from existing commercial and new developing processes. Prerequisite: Mechanical Engineering 389 or consent of instructor. 1 unit.
- 455. Polymer Rheology and Processing.** Continuum models for non-Newtonian fluids; generalized Newtonian, linear viscoelastic and nonlinear viscoelastic models; examines relationship of rheology to processing; considers advanced problems in polymer processing such as numerical simulations of nonisothermal non-Newtonian flows, reactive processing and processing of composites. Prerequisite: Mechanical Engineering 355 or consent of instructor. 1 unit.
- 456. Fatigue Analysis.** Examines fatigue analysis methods for the design of structures and components; includes stress life, strain life, and crack propagation approaches; considers multiaxial and high temperature fatigue; emphasis is placed on the interrelationship between material properties, geometry, and design methodology appropriate for the wide range of mechanical engineering components. Prerequisite: Mechanical Engineering 346 or consent of instructor. 1 unit.
- 457. Inelastic Design Methods.** Principles of material deformation under combined and thermal loading; constitutive equation applications in engineering design and in inelastic finite element methods; material and structural degradation under fatigue and creep conditions. Prerequisite: Mechanical Engineering 345 and 346, or consent of instructor. 1 unit.
- 458. Fracture Resistant Design.** Application of fracture mechanics and microstructural behavior to material selection for design; practical approximation of linear and inelastic fracture parameters for evaluation of complex components; destructive and nondestructive tests for control of toughness in manufacture; residual life assessment involving time dependent fracture (creep, fatigue, stress, corrosion); case study and design project oriented. Prerequisite: Mechanical Engineering 346 or consent of instructor. 1 unit.
- 468. Modeling and Control of Electro-Mechanical Systems.** Same as Electrical Engineering 468. See Electrical Engineering 468.
- 493. Seminar.** Required of all graduate students each semester with the exception of doctoral candidates who have passed their preliminary examination. Presentation and discussion of significant developments in mechanical engineering. 0 units.
- 497. Special Problems in Mechanical Engineering.** Lectures, seminars, and individual

investigations or studies in selected areas of mechanical engineering. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.

499. Thesis Research. 0 to 4 units.

MEDICAL SCIENCES

Associate Dean of College of Medicine: W. E. Sorlie

College Office: 190 Medical Sciences Building, 506 South Mathews, Urbana

- 300. Medical Sciences.** First-year program in preparation for the M.D. degree involving guided study of anatomy, behavioral science, biochemistry, genetics, immunology, microbiology, neuroscience, pathology, embryology, histology, introduction to clinical medicine, nutrition and medical statistics, and physiology. Elements of clinical experience are monitored and presented by faculty in the clinical and basic medical sciences. Prerequisite: Enrollment is limited to students accepted by the College of Medicine. 19 hours (summer session, 9 hours).
- 301. Clinical Medicine.** Second-year program in preparation for the M.D. degree involving classroom and clinical instruction in skills required for acquisition of clinical data base (history-taking, physical exam), lab use, epidemiology and biostatistics, pathology and pharmacology; and patho-physiological bases of clinical problems. Seminars in socio-medicine are also presented. Faculty present and monitor learning experiences, which include lecture/discussion, clinical tutorials, and supervised clinical experiences. Prerequisite: Limited to second-year students in the College of Medicine. 19 hours (summer session, 9 hours).
- 302. Supervised Medical Practice.** Third year of preparation for the M.D. degree. Students rotate among affiliated hospitals in medicine, surgery, obstetrics and gynecology, psychiatry, pediatrics, and other fields and are assigned to patient care teams. Physicians and clinical faculty supervise their clinical practice. Increases students' understanding of the pathophysiological basis of patient problems and teaches patient management skills. Prerequisite: Third-year standing in the College of Medicine. 19 hours (summer session, 9 hours).
- 303. Medical Electives.** Fourth year of preparation for the M.D. degree. With approval and guidance of their faculty advisor, students select a program of elective courses which will enhance their clinical skills. These elective courses may be in medicine, surgery, obstetrics and gynecology, pediatrics, family practice, urology, dermatology, basic science or clinical research, and other fields. Prerequisite: Fourth-year standing in the College of Medicine. 0 or 19 hours (summer session, 0 or 9 hours).
- 374. General Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
- 461. Advanced Clinical Nutrition, I.** Same as Nutritional Sciences 461. See Nutritional Sciences 461.
- 462. Advanced Clinical Nutrition, II.** Same as Nutritional Sciences 462. See Nutritional Sciences 462.
- 463. Statistical Techniques in Epidemiological Research.** Same as Health and Safety Studies 427 and Environmental Studies 427. See Health and Safety Studies 427.

METALLURGY AND MINING ENGINEERING

Acting Head of Department: D. A. Payne

Department Office: 201 Metallurgy and Mining Building, 1304 West Green, Urbana

Metallurgical Engineering

- 198. Introduction to Metallurgy.** Lecture series by the faculty to orient freshmen to the field of metallurgy and to the study of materials. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 296. Metallurgical Seminar.** Review of current metallurgical literature; classroom reports and discussions; and preparation of technical abstracts and reports. Prerequisite: Senior standing in metallurgical engineering. 2 hours.
- 299. Thesis.** Investigation of special problems and preparation of a thesis. May be substituted for certain technical subjects in the senior year. Prerequisite: Senior standing; approval of head of department. 1 to 3 hours.
- 301. Welding and Joining Processes.** Same as Civil Engineering 375. The physical principles of fusion welding; heat flow; thermal cycles; physical metallurgy and mechanical properties of welded joints; applications of welding to large structures; testing of welds; nondestructive testing; design, economics, and weld specifications; and laboratory experiments in welding. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 306. Design of Engineering Alloys.** A study of the fundamental principles which determine the constitution, structure, treatment, and application of alloy steels and other special-purpose high-performance alloys. Prerequisite: Metallurgical Engineering 372. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 307. Corrosion of Metals.** Electrochemistry, thermodynamics, and kinetics of corrosion; behavior of ferrous and nonferrous metals; corrosion rates; corrosion control; cathodic and anodic protection; high-temperature corrosion; corrosion testing; and electrolytic machining methods. Prerequisite: Mechanical Engineering 234 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 310. Crystallography and Diffraction.** Study of structure and composition of solids using X-rays and electron beams; radiography, spectroscopy, and X-ray and electron metallography. Prerequisite: Physics 108. 4 hours or 1 unit.
- 312. Ternary Phase Diagrams.** Interpretation of ternary phase diagrams and applications to engineering alloy systems. Prerequisite: Metallurgical Engineering 334 or 370 or equivalent, or consent of instructor. 1 hour or $\frac{1}{4}$ unit. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
- 314. Metallurgical Thermodynamics.** Thermodynamic principles applied to the study of phase and chemical equilibrium and to the calculation of free energy of phases. 3 hours or $\frac{3}{4}$ unit.
- 316. Mechanical Metallurgy.** Fundamentals of plastic deformation of crystalline solids; elementary theory of statics and dynamics of dislocations; applications to deformation of single crystals and polycrystals; fracture; and effect of metallurgical variables on mechanical properties. Prerequisite: Junior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Fracture Mechanisms and Failure Analysis.** Mechanisms of the various forms of fracture of metals and alloys; relationships between microstructure and resistance to common modes of fracture; environmental effects on fracture; alloy design to optimize fracture resistance; and failure analysis using optical and electron microscopy. This course emphasizes the atomistic aspects of fracture and is complementary to Theoretical and Applied Mechanics 324. Prerequisite: Theoretical and Applied Mechanics 224 or Metallurgical Engineering 316, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 318. Physics of Metals.** The nature of the perfect and imperfect crystal, the electronic structure of solids, electrical conduction in metals and semiconductors, and dielectric

and magnetic properties of solids. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 334. Physical Metallurgy for Engineers.** Fundamentals of crystallography, imperfections, alloying, and deformation; consideration of composition, temperature, and prior thermal and mechanical treatment in the use of metals, with emphasis on their mechanical properties. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 or Aeronautical and Astronautical Engineering 224, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Physical Metallurgy, I.** First of a two-semester sequence treating metallurgical phenomena and their utilization in engineering materials and processes: defects, diffusion, phase diagrams, solidification and casting, and plastic deformation and annealing. Prerequisite: Junior standing in engineering; Mathematics 345; Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
- 371. Physical Metallurgy Laboratory, I.** Laboratory course to be taken simultaneously with Metallurgical Engineering 370. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 370. 3 hours or 1 unit.
- 372. Physical Metallurgy, II.** Continuation of Metallurgical Engineering 370. Precipitation; eutectoid reactions; martensite; ordering; surface reactions; cast iron; and joining. Prerequisite: Metallurgical Engineering 370 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 373. Physical Metallurgy Laboratory, II.** Laboratory course to be taken simultaneously with Metallurgical Engineering 372. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 372. 3 hours or 1 unit.
- 375. Introduction to Polymers.** Fundamentals of polymer science and engineering; polymer chain structure and statistics; polymerization mechanisms and kinetics; molecular weight distributions; rheological and mechanical properties of amorphous polymers; the glassy state; crystalline morphology, mechanisms and kinetics of polymer crystallization, and mechanical behavior of crystalline polymers; methods of fabrication; and solution properties. Prerequisite: Advanced undergraduate or graduate standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 377. The Crystalline State of Polymers.** Examines the crystalline state of polymers in terms of molecular structure, thermodynamics and kinetics of crystallization, morphology, mechanical, thermal and electrical properties, and processing. Prerequisite: Metallurgical Engineering 375 or consent of instructor. 3 hours or 1 unit.
- 378. Polymer Characterization Laboratory.** Characterizes polymeric materials experimentally to investigate molecular, microstructural and macroscopic aspects of their mechanical, thermal, electrical, and optical properties. Prerequisite: Metallurgical Engineering 375 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 386. Electron Microscopy and Diffraction Theory.** Theory and application of transmission electron microscopy and diffraction with emphasis on thin crystals: electron optics, interference phenomena, interpretation of images and diffraction patterns, specimen preparation, etc. Prerequisite: Metallurgical Engineering 310 or equivalent. 3 hours or 1 unit.
- 387. Advanced Physical Metallurgy.** Advanced physical metallurgy designed for graduate students whose undergraduate degrees are in engineering or physical science fields other than metallurgy or materials science; discusses the standard topics of physical metallurgy with an emphasis on underlying physical principles; and includes selected laboratory experiments. Not to be taken by undergraduates registered in the Department of Metallurgy and Mining Engineering. Students may not receive credit for Metallurgical Engineering 387, and Metallurgical Engineering 370 or 372. Prerequisite: Advanced undergraduate standing in a field other than metallurgy, or graduate standing. 4 hours or 1 unit.

- 401. Defects and Plastic Deformation in Metals.** Studies point, line, and surface defects in metals; configuration, thermodynamics, and motion; quantitative description of single dislocation properties; and interactions among defects. For students in metallurgy, ceramics, physics, and other solid state sciences. Prerequisite: Mathematics 345 and Metallurgical Engineering 316 and 318; or consent of instructor. 1 unit.
- 408. Dislocations and Mechanical Properties of Metals.** General static and dynamic properties of single dislocations in crystals; dislocation interactions; properties of dislocation arrays; and role of dislocations in metallurgical phenomena with particular emphasis on mechanical properties. Prerequisite: Consent of instructor. 1 unit.
- 410. Advanced X-Ray Metallography.** X-ray diffraction as applied to the study of metals and alloys; effects of cold work, annealing, substructures, preferred orientation, and ordering; and principles of electron and neutron diffraction. Prerequisite: Consent of instructor. 1 unit.
- 420. Metallurgical Thermodynamics.** Fundamental thermodynamic considerations and applications of thermodynamics to metallurgical problems; particular emphasis on heterogeneous equilibrium and thermodynamic properties of solutions. Topics approached from the viewpoints of both macroscopic thermodynamics and statistical mechanics. Prerequisite: Metallurgical Engineering 314 or equivalent. 1 unit.
- 421. Kinetics of Phase Changes in Metals.** The viewpoint of statistical thermodynamics, rate theory, diffusion in solids, interface energy, nucleation theories, and phenomenological analysis of nucleation and growth; application to crystal growth, diffusionless phase changes, oxidation, pearlite reaction, precipitation, and sintering. Prerequisite: Metallurgical Engineering 420 or consent of instructor. 1 unit.
- 430. Surface Physics.** Same as Physics 430. Introduction to theory and experiment of atomic behavior on crystal surfaces; thermodynamics of surfaces; surface energy; diffraction and structure; gas-solid collisions; Brownian motion, diffusion, and evaporation; electron and ion emission, tunnelling; Van der Waals forces; theory of chemical interactions; and kinetics and statistics of adsorption. Prerequisite: Metallurgical Engineering 421 or Physics 489, or consent of instructor. 1 unit.
- 452. Solidification Processing.** Same as Mechanical Engineering 452. See Mechanical Engineering 452.
- 485. Metallurgical Engineering Problems.** Individual study in areas of metallurgy not covered by regular course offerings; carried out under the supervision of a member of the faculty. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
- 486. Laboratory Investigations in Metallurgy.** Special investigations in metallurgy providing an opportunity for instruction in experimental methods of research. Available only to nonthesis students enrolled in a Master of Science program. Prerequisite: Consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 492. Research Seminars.** Discussion and lectures on current research topics. 0 or $\frac{1}{4}$ unit. May be repeated each semester.
- 498. Colloquium on Materials Research.** Reviews current materials research in other laboratories by visiting lecturers; also presents some of the research currently done in the department. Required of all graduate students in the department. 0 or $\frac{1}{4}$ unit. May be repeated. No more than $\frac{1}{2}$ unit may be counted toward the M.S. degree.
- 499. Thesis Research.** Individual research in specialized problems under the supervision of members of the staff. Results of research may be used for graduate thesis. 0 to 4 units.

Mining Engineering

- 302. Political, Economic, and Environmental Aspects of Minerals and Their Utilization.** The availability and utilization of national and world mineral resources and the related environmental, economic, and political implications are examined through lectures, readings, student reports, panel discussions, guest speakers, field trips, and films. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 351. Geophysical Prospecting.** Same as Geology 351. See Geology 351.
- 393. Special Problems.** Individual studies of any phase of mining or petroleum engineering selected by the student and approved by his adviser and the staff member who supervises the study. Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit.
- 414. Physical Chemistry of Clays and Soils.** Same as Soils and Ceramic Engineering 414. See Soils 414.
- 497. Special Problems.** Individual studies in areas of mining or petroleum engineering not covered by regular course offerings; carried out under the supervision of a member of the staff. Prerequisite: Consent of instructor. 0 to 2 units.
- 499. Thesis Research.** Individual research in some phase of the general field of mining or petroleum engineering under the supervision of a member of the staff. 0 to 4 units.

MICROBIOLOGY

Head of Department: J. Konisky

Department Office: 131 Burrill Hall, 407 South Goodwin, Urbana

- 100. Introductory Microbiology.** Introduction to the principal activities and properties of microorganisms, including bacteria, yeasts, molds, and viruses; consideration of the role of natural processes, such as photosynthesis; and man's use and control of microorganisms in the production of antibodies and vaccines in industrial fermentations, in sanitation and public health, and in agriculture. There are no prerequisites for Microbiology 100, but some chemistry is recommended. 3 hours. Credit is not given for more than one of the following: Microbiology 100, 113, or 200.
- 101. Introductory Experimental Microbiology.** Laboratory introduction to the techniques employed in the investigation of microbial activities and properties; experiments designed to familiarize the student with the handling, identification, and characterization of microorganisms and their activities, particularly those of interest to man. Prerequisite: Credit or concurrent registration in Microbiology 100. 2 hours. Credit is not given for both Microbiology 101 and 201.
- 113. Man and Microbes.** General education biological science course for nonscience majors; examines the effects of microbes on the activities of man; emphasizes environmental, economic, and disease effects of microbial activity on society; and presents microbiology as an example of a modern biological science. 3 hours. Credit is not given for more than one of the following: Microbiology 113, 200, or 100.
- 200. Microbiology.** Emphasizes fundamental concepts of microbiology, including nutrition, ecology, physiology, genetics and molecular biology of microorganisms, and their role in nature and in infection and immunity. Prerequisite: Credit or concurrent registration in organic chemistry. 3 hours. Credit is not given for more than one of the following: Microbiology 200, 100, or 113. (Counts for advanced hours in LAS.)
- 201. Experimental Microbiology.** Laboratory emphasizing the fundamentals of microbiology, including the biochemical basis of microbial physiology, ecology, and nutrition; microbial genetics and gene-enzyme relationships. Emphasis and encouragement are given to the experimental approach to microbiology. Prerequisite: Credit or concurrent registration in Microbiology 200 and in organic chemistry. 3 to 5 hours. Credit is not given for both Microbiology 201 and 101. (Counts for advanced hours in LAS.)
- 290. Research and Special Problems.** Prerequisite: Fifteen hours of microbiology; consent of instructor. 3 to 5 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 292. Senior Thesis.** Research under the direction of a senior staff member in microbiology. Normally, the student takes two semesters of Microbiology 292 in the senior year. Recommended for all those planning future research and graduate study; prerequisite for graduation with distinction in microbiology. In the semester preceding initial enrollment, interested students should consult with their advisors concerning the pro-

cedures for enrollment. A minimum of 2 hours per senior semester is required, and a thesis must be presented for credit to be received, but graduation with distinction is not an automatic result of enrollment in Microbiology 292. Prerequisite: Consent of senior thesis adviser. 2 to 6 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)

- 309. Biochemical Basis of Microbial Diversity.** Examines the biochemical ecology of diverse microbial groups with emphasis on anaerobic systems. Prerequisite: Biochemistry 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 311. Food and Industrial Microbiology.** Same as Food Science 311. Relationship of microorganisms to food manufacture and preservation, to industrial fermentation and processing, and to sanitation. Prerequisite: Microbiology 101 or 201 or equivalent; credit or concurrent registration in organic chemistry laboratory, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 312. Techniques of Applied Microbiology.** Consideration, through experimentation, of properties of bacteria, yeasts, molds, and actinomycetes important to industrial processes; exploration of methods of control of microbial processes in industry and sanitation. Prerequisite: Credit or concurrent registration in Microbiology 311, and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 316. Genetic Analysis of Microorganisms.** Prokaryotic and eukaryotic microbial genetic systems; emphasis on typical data analyses, together with the basic classes of genetic phenomena. Prerequisite: General genetics, Microbiology 200, or Microbiology 330. 3 hours or $\frac{3}{4}$ unit.
- 317. Experimental Techniques in Molecular Biology.** Laboratory emphasizing current molecular biology techniques. Topics include genetic techniques, use of transposons, genetic regulation, in vitro transcription, restriction endonuclease mapping, cloning, and DNA sequencing. Prerequisite: Microbiology 201, and credit or concurrent registration in Microbiology 316; Biochemistry 355; consent of instructor. 5 hours or 1 unit.
- 319. Yeast Cell Biology.** Emphasis on fundamental problems in eukaryotic cell biology with yeast as the focal organism. Topics include: chromosome structure, regulation, mRNA splicing, cell cycle, growth control, organelle biogenesis, and secretion. Prerequisite: Microbiology 200 or Biology 213; and Biology 210; and credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 326. Biology of Bacterial Pathogens.** Emphasizes prokaryotes that cause important diseases in humans and other animals; host-parasite bacteriology; and chemistry and genetics of mechanisms of pathogenesis. Prerequisite: Microbiology 200 or 309; and Biochemistry 350 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 327. Immunochemistry.** Study of the field of immunology with emphasis on the chemistry of the proteins and cells involved in the immune response. Lectures and laboratory. Prerequisite: Credit or concurrent registration in biochemistry, and consent of instructor. 5 hours or 1 unit.
- 328. Properties of Bacterial Pathogens.** Laboratory study of methods of recognition and differentiation, diagnostic tests, and mechanisms of pathogenesis; students are voluntary donors of microorganisms used in experiments. Prerequisite: Microbiology 101, 201, or 409; credit or concurrent registration in Microbiology 326 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 329. Lectures in Immunochemistry.** Analyzes the field of immunology emphasizing chemistry of antigens, antibodies and their interactions. Prerequisite: Biochemistry 350 or equivalent, and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated as segments differ to a maximum of 4 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Microbiology 329 and 327.
- 330. Molecular Biology of Microorganisms.** Modern contributions to the science of microbiology; emphasizes the structure, function, and synthesis of informational macromolecules and on the role microorganisms have played in molecular biology. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.

- 331. Microbial Physiology.** Examines bacterial physiology, including discussions of energetics, regulation of metabolism, and cell structure. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 351. Viruses.** Same as Plant Biology 351. Introduces the molecular basis of virus structure, replication, genetics, infection, and virus-host interactions; discusses also animal viruses as agents of disease and their role in epidemics and persistent infections. Prerequisite: Credit or concurrent registration in Microbiology 330 or Biochemistry 350; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 405. Molecular Genetics: Gene Action.** Structure, synthesis, and function of molecules and organelles concerned with the intracellular transmission of genetic information (including gene regulation, transcription, and translation). Prerequisite: Microbiology 330, Microbiology 316 plus biochemistry, or consent of instructor. $\frac{3}{4}$ unit.
- 409. Cultivation and Properties of Microorganisms.** Nutritional and metabolic properties of the major groups of microorganisms; a comparative study of the ecology, selective isolation, and cultivation of bacteria. Laboratory. Prerequisite: Biochemistry 355 or equivalent; credit or concurrent registration in Microbiology 309; consent of instructor. 1 unit.
- 412. Advances in Microbiology.** Discussions of current research in the following areas of microbiology: (a) general microbiology; (b) microbial physiology and metabolism; (c) immunochemistry; and (d) molecular genetics. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 419. Animal Virology.** Same as Veterinary Pathobiology 419. See Veterinary Pathobiology 419.
- 446. Bacterial Energetics.** Same as Biophysics 446. See Biophysics 446.
- 485. Topics in Microbiology and Molecular Biology.** Discussions, reviews, and appraisal of special topics in microbiology and molecular biology; seminar or lecture. Topics do not repeat. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
- 490. Individual Problems.** Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.
- 491. Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. First seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 492. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 492. Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. Second seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 491. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 495. Seminar.** Required of all graduate students whose major is microbiology. Prerequisite: Ten hours of microbiology; consent of instructor. 0 or $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

MILITARY SCIENCE

Head of Department: Lieutenant Colonel M. K. Lynett

Department Office: 111 Armory Building, 505 East Armory, Champaign

- 111. Introduction to Military Science.** An introduction to the U.S. Defense Establishment and its significance in modern society; includes the organization, mission, and functions of the Army, as well as an insight into military life and customs. Normally the first Military Science course taken. 1 hour.

- 112. Leadership Laboratory.** Introductory practical application of military skills and leadership; includes basic military mountaineering and rappelling, first aid, individual marching and weapons familiarization. Field trip may be required. 0 hours.
- 113. Military Rifle Marksmanship.** Characteristics of small bore rifles, weapons safety, and basic military marksmanship techniques. Prerequisite: Military Science 111 or consent of the instructor. 1 hour.
- 114. Leadership Laboratory.** A continuation of Military Science 112 to include actual firing of weapons. Field trip may be required. 0 hours.
- 121. Land Navigation.** Fundamentals of military and USGS map reading including methods such as intersection and resection; includes land navigation and orienteering techniques and their application during a field trip. 1 hour.
- 122. Leadership Laboratory.** Intermediate level practical application of military skills and leadership; includes mountaineering and rappelling, first aid, small unit marching, weapons firing, and physical fitness. Field trip required. 0 hours.
- 123. Military Tactics.** Basic concepts of tactical doctrine including Principles of War, the evolution of tactics, mechanized warfare, Soviet doctrine and tactics, the affect of technology on modern tactics, and the application of contemporary tactics in small unit offensive and defensive operations. 1 hour.
- 124. Leadership Laboratory.** A continuation of Military Science 122 to include military radio communication procedures and defense measures in a nuclear or chemical environment. Field trip required. 0 hours.
- 231. Military Operations.** Fundamentals of small unit military operations including operations planning, military orders, troop leading procedures, deployment techniques such as fire and maneuver, and combined arms operations. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 3 hours.
- 232. Leadership Laboratory.** Advanced level practical application of military skills and leadership with emphasis on the student's ability to direct and supervise others; includes advanced land navigation, advanced first aid, platoon and company drill and ceremonies, and advanced communications procedures. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
- 233. Military Leadership.** Principles of leadership including management practices and their relationship to leadership, problem solving, decision making, human behavior and motivation, superior-subordinate relations and the problems of leadership in the military environment. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
- 234. Leadership Laboratory.** A continuation of Military Science 232 to include small unit tactics and reconnaissance operations. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
- 241. Military Law.** Fundamentals of military law including the Law of Land Warfare, the application of federal law to the military, and the Military Justice system; includes financial and legal affairs. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
- 242. Leadership Laboratory.** A unique opportunity for advanced course students to fully plan, execute, and supervise the military training and activities of other military science students. Emphasis is on leadership, organizing and managing activities, decision making, and effective instructional techniques. Prerequisite: Concurrent registration in the AROTC advanced course. Field trip required. 0 hours.
- 243. Military Professionalism and Ethics.** Examines ethics, values and professional standards through military case studies; discusses military administrative skills, written and verbal communications, meeting management, and briefing techniques. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
- 244. Leadership Laboratory.** A continuation of Military Science 242. Prerequisite: Concurrent registration in AROTC advanced course. Field trip required. 0 hours.

MINING ENGINEERING

(See Metallurgy and Mining Engineering)

MUSIC

Director of School: A.J. McDowell

School Office: 3054 Music Building, 1114 West Nevada, Urbana

- 100. Introduction to Music Theory.** Basic terminology and notation of Western music, plus visual and aural recognition of simple melodic and harmonic intervals; provides remedial assistance to music majors wishing to take Music 101. Music majors can not use this course as credit for graduation. 2 hours.
- 101. Fundamentals of Music Theory and Practice, I.** Notation, vocabulary, and basic concepts, including scales, modes, intervals, chords, and terminology; aural and visual analysis of musical forms and procedures; and stresses the development of melodic, harmonic, and rhythmic vocabularies. Prerequisite: Music 100 or placement into Music 101 by examination. 3 hours.
- 102. Fundamentals of Music Theory and Practice, II.** A continuation of Music 101 with gradually increased emphasis on visual elements (score reading and analysis); links theory and practice through analytical understanding. Prerequisite: Music 101. 3 hours.
- 103. Fundamentals of Music Theory and Practice, III.** Continuation of Music 102 with gradually increased emphasis on contrapuntal techniques, dissonance in tonal music, and musical form. Prerequisite: Music 102 and 107. 3 hours.
- 104. Fundamentals of Music Theory and Practice, IV.** Continuation of Music 103 with emphasis on late tonal chromaticism; introduction to serial techniques, nontonal centrality, cellular structure, twentieth-century rhythmic techniques, and noise and indeterminacy. Prerequisite: Music 103 and 108. 3 hours.
- 106. Beginning Composition.** Music composition in its beginning stages; practice in phrase, section, and short form construction, analysis, and writing; instruction in range, characteristics, and idiom of instruments and voices. Prerequisite: Consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
- 107. Aural Skills, I.** Practice in developing basic reading, notating, and listening skills in rhythmic, melodic, contrapuntal, harmonic, and formal aspects of musical structure; emphasizes diatonic tonal pitch structures. Prerequisite: Music 101 or placement by examination. 1 hour.
- 108. Aural Skills, II.** Continuation of Music 107 with emphasis on extensions of tonality by means of changing tonal centers and altered chords. Prerequisite: Music 107 or placement by examination. 1 hour.
- 109. Aural Skills, III.** Continuation of Music 108 with emphasis on atonal pitch structures. Prerequisite: Music 108. 1 hour.
- 110. Basic Music Literature.** An introduction to the standard concert repertory through intensive guided listening. Representative works by major composers are chosen to illustrate the principal forms, styles, and techniques of vocal and instrumental music emphasizing the period since 1700. Required of freshmen in music. 2 hours.
- 120. Seminar in Music Education.** Music education lecture and performance series. Selected topics and performances are presented each week focusing on trends in music and music education. Prerequisite: Registration in music education. 0 hours.
- 130. Introduction to the Art of Music.** Designed to provide the non-music students with basic listening skills, the ability to discuss music intelligently, and an acquaintance with many types of music. 4 hours.
- 131. Masterworks of Western Music.** Studies in detail approximately half a dozen works of different eras and types with regard to form, style, performance practice, and historical significance. Prerequisite: Music 130; consent of instructor. 4 hours.

132. **The Varieties of Music.** The appreciation of a major musical type such as the symphony, the concerto, chamber music, opera, jazz, or popular music. 3 hours.
133. **Introduction to World Music.** A survey of the musics of Asia, Africa, and Oceania and the native traditions of the Americas. 3 hours.
134. **The Eras of Music.** Examines major works and composers representative of an era in the history of music such as the Baroque, the Classical, or the Romantic. 3 hours.
135. **Composers' Lives and Works.** A survey of the life and work of a single composer, or of a pair of composers, that will relate the musical and biographical material to pertinent social and historical events. 3 hours.
140. **Introduction to Music Education.** Introduces basic issues and principles of music education and teaching, with an emphasis on philosophy and the identification of the exceptional child and learning disabilities; includes 16 clock hours of early field experience in the teaching of music. 2 hours.
142. **Elements of Conducting.** Fundamentals of conducting, score preparation, and transcription for choral and instrumental ensembles. 2 hours.
143. **Pre-Student Teaching Experience.** Early field experience in teacher education, including a practicum of observation, teacher aide, and teaching experiences in music. Thirty-two clock hours of early field experience is required for each 1 hour of credit. 1 or 2 hours. May be repeated to a maximum of 4 hours; only 2 hours may be applied toward the degree.
144. **Music Teaching Technique Laboratory.** Class and individual instruction on musical instruments and voice for non-music majors; serves as a laboratory for undergraduate music education students to teach in major music field. 2 hours. May be repeated to a maximum of 6 hours.
145. **Unit One Seminar and Instruction in Music.** Experimental seminar courses and individual and group music lessons to introduce non-music students to contemporary ideas in music and to encourage personal exploration of instrumental and voice performance. 1 to 4 hours.
150. **Jazz Piano Improvisation, I.** The study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 162 or equivalent; Music 104 and 109, or equivalent; consent of instructor. 2 hours.
151. **Jazz Piano Improvisation, II.** Continuation of Music 150. The study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 150 or consent of instructor. 2 hours.
158. **Group Instruction in Piano for Non-Music Majors, I.** Teaches non-music majors the fundamentals of beginning piano study: basics of reading, technique, and creative activities. Includes study and performance of simple solo and ensemble repertoire. 2 hours.
159. **Group Instruction in Piano for Non-Music Majors, II.** Elementary piano for non-music majors. Continuation of basic skills presented in Music 158: reading, technique, creative work, simple solo and ensemble repertoire. Prerequisite: Music 158 or equivalent. 2 hours.
160. **Group Instruction in Piano, I.** Beginning group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; studies simple piano literature and the development of skills in technique, sight reading, harmonization, transposition, improvisation, and analysis. 2 hours.
161. **Group Instruction in Piano, II.** Elementary group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; easy solos from the main periods with appropriate technical development; continuation of skills introduced in Music 160; and introduction of piano ensemble literature. Prerequisite: Music 160 or equivalent; consent of instructor. 2 hours.
162. **Group Instruction in Piano, III.** Intermediate group instruction in piano for music majors whose main performing medium is voice or an orchestral or band instrument; study of intermediate level solos and ensemble compositions; harmonization with chro-

matic chords, sight reading, transposition of four-voice works, improvisation, and learning of patriotic songs. Prerequisite: Music 161 or equivalent; consent of instructor. 2 hours.

- 163. Group Instruction in Piano, IV.** Moderately advanced group instruction in piano for music majors whose performing medium is voice or an orchestral or band instrument; continuation of Music 162 with emphasis on solos, ensemble works, technical development, and more advanced work in sight reading, harmonization, improvisation, transposition, and aural skills. 2 hours.
- 165. Class Instruction in Voice.** Group instruction in the fundamentals of singing. Places special emphasis upon the vocal skills needed for music teachers in the public schools unique to each of the following specializations: elementary-general, instrumental, and comprehensive. 2 hours.
- 166. English Diction.** Phonetics applied to English song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
- 167. Italian Diction.** Phonetics applied to Italian song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
- 168. German Diction.** German pronunciation as applied to German vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
- 169. French Diction.** Principles of French pronunciation applied to French vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
- 170. String Instruments.** Class instruction in the fundamentals of playing violin, viola, cello, and string bass. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 2 hours.
- 171. Woodwind Instruments.** Class instruction in the fundamentals of playing and teaching clarinet, flute, saxophone, oboe, and bassoon. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. $\frac{1}{2}$ or 2 hours.
- 172. Brass Instruments.** Class instruction in the fundamentals of playing and teaching trumpet, French horn, trombone, euphonium, and tuba. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. $\frac{1}{2}$ or 2 hours.
- 173. Percussion Instruments.** Class instruction in the fundamentals of playing and teaching percussion instruments. Prerequisite: Enrollment in the School of Music; for nonmajors, consent of instructor. 2 hours.
- 174. Guitar Techniques.** Techniques of playing and teaching classic and folk guitar. Prerequisite: Consent of instructor. 2 hours.
- 175. Techniques of Teaching Classroom Instruments.** Fundamental techniques for playing the guitar, the recorder, and the autoharp; includes methods for implementing the use of these instruments in the teaching of elementary and junior high school vocal-music classes. 2 hours.

NOTE: Music 178 through 198 (applied music) have the following prerequisite: Passing of a performing examination is required as a prerequisite to the initial registration in any applied music course.

- 178. Guitar.** Instruction in guitar at the undergraduate level, predominantly classical. 2 or 4 hours (summer session, 1 or 2 hours).
- 179. Harpsichord.** Instruction in harpsichord at the undergraduate level. 2 or 4 hours.
- 180. Piano.** Instruction in piano at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
- 181. Voice.** Instruction in singing at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
- 182. Organ.** Instruction in organ at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).

183. **Violin.** Instruction in violin at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
184. **Viola.** Instruction in viola at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
185. **Cello.** Instruction in violoncello at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
186. **String Bass.** Instruction in string bass at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
187. **Flute.** Instruction in flute at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
188. **Clarinet.** Instruction in clarinet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
189. **Oboe.** Instruction in oboe at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
190. **Bassoon.** Instruction in bassoon at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
191. **Cornet and Trumpet.** Instruction in cornet and trumpet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
192. **French Horn.** Instruction in French horn at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
193. **Trombone.** Instruction in trombone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
194. **Euphonium.** Instruction in euphonium at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
195. **Tuba.** Instruction in tuba at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
196. **Percussion.** Instruction in percussion at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
197. **Harp.** Instruction in harp at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
198. **Saxophone.** Instruction in saxophone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Instrumentation, I.** Orchestration and arranging for orchestral groups. Prerequisite: Senior standing in music. 2 hours.
201. **Instrumentation, II.** Problems in arranging for all wind instruments. Required of composition majors. Prerequisite: Music 200 or consent of instructor. 2 hours.
202. **Rudiments of Theory, I.** A course for nonmajors introducing basic terminology and notation, intervals, and triads, as well as the concepts of scale, tonality, and musical form. 3 hours.
203. **Rudiments of Theory, II.** Continuation of Music 202, for nonmajors only. Topics included are: modulations, chromatically altered chords, 18th/19th centuries musical forms, as well as twentieth century trends and contemporary music notation. Prerequisite: Music 202 or passing of placement test. 3 hours.
204. **Compositional Problems: Serial Techniques.** Studies serial techniques and levels of determinacy through composition and analysis. Prerequisite: Consent of composition/theory faculty. 2 hours.
205. **Compositional Problems: Technological and Visual Aspects.** Studies electronic and computer applications, visual and gestural elements, and levels of determinacy through composition and analysis. Prerequisite: Consent of composition/theory faculty. 2 hours.
206. **Intermediate Composition.** Music composition at the secondary stages, including analysis and writing of shorter musical forms. Prerequisite: Music 106 and consent of composition/theory faculty. 2 hours. May be repeated to a maximum of 6 hours.
209. **Kodaly: Philosophy and Methods.** An introduction to the music education philosophy of Zoltan Kodaly through experiences in relative sol-fa and the expansion of aural awareness. Prerequisite: Consent of instructor. 2 hours.

- 210. Computer-Assisted Instruction in Music.** Introduction to computer-assisted instruction (CAI) and its uses in public school, college, and continuing education programs in music; familiarization with visual and audio programming strategies and the research potential of CAI systems. Prerequisite: Consent of instructor. 2 hours.
- 211. Practicum in Piano Teaching.** Coordinates lesson planning for teaching pre-college piano pupils with extensive teaching experiences; gives close examination to beginning and intermediate teaching literature. Prerequisite: Music 143 or 242. 2 hours.
- 213. The History of Music, I.** Survey of music and its development in Western civilization to 1750; emphasis on an acquaintance with representative musical works and style, and on understanding musical concepts in the light of their historical background. Required of all music students. Prerequisite: Music 110 or consent of instructor. 3 hours.
- 214. The History of Music, II.** Survey of the development of music as an art in Western civilization from 1750 to the present; emphasis on an acquaintance with formal and stylistic problems through the study of representative works and on understanding specific musical concepts in the light of their historical and general cultural context. Required of all music students. Prerequisite: Music 213. 3 hours.
- 229. Thesis and Advanced Undergraduate Honors in Music.** Special individual research projects. Required of seniors in the history of music and composition-theory curricula; open also to advanced undergraduates, including James Scholars, who have achieved University or college honors and who desire to do research in specialized areas of music, including performance. Prerequisite: Senior standing in the history of music and composition-theory, or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
- 230. Choral Literature and Conducting, I.** A laboratory course which includes choral literature for secondary choral groups. Students conduct choral singing groups (their conducting is videotaped), learn to analyze and prepare choral scores, and conduct in a choral laboratory. Prerequisite: Music 142. 2 hours.
- 231. Choral Literature and Conducting, II.** A laboratory course which includes the study and conducting of public school choral music. Students conduct choral groups, prepare choral scores, learn rehearsal techniques, conduct in a choral laboratory, and conduct vocal ensembles in the public schools. Prerequisite: Music 230. 2 hours.
- 232. Instrumental Literature and Conducting, I.** Survey of music literature for wind ensemble and band; principles of interpretation and techniques of conducting emphasized through detailed study and performance of selected compositions. Prerequisite: Music 142. 2 hours.
- 233. Instrumental Literature and Conducting, II.** Principles of interpretation and techniques of orchestral conducting emphasized through detailed study and performance of selected orchestral compositions appropriate for public school groups. Prerequisite: Music 232. 3 hours.
- 234. Workshop in Elementary Music Education.** Detailed consideration of music objectives, principles of learning, and their implications for teaching methods; major emphasis on techniques and materials suitable for teaching music in the elementary school by the classroom teacher. Specifically designed for the experienced classroom teacher. Prerequisite: Consent of instructor; public school teaching experience. 2 hours. Offered in the summer session only.
- 235. Elementary and Junior High School Instrumental Music.** Examines pedagogical and organizational techniques for teaching elementary and junior high school instrumental music in a laboratory school setting. Prerequisite: Music 232. 2 hours.
- 236. Choral Techniques in Elementary and Junior High School.** A detailed consideration of literature, arranging for elementary and junior high school choruses, and the changing voice. Prerequisite: Advanced music undergraduate standing or consent of instructor. 3 hours.
- 237. Orff: Philosophy and Methods.** An introduction to the Carl Orff-Schulwerk approach to music for children; techniques include the use of Orff instruments and materials and the adaptation of these materials for classroom use with or without instruments. Prerequisite: Sophomore standing in music education or consent of instructor. 2 hours.
- 239. Principles and Techniques in Music Education.** A comprehensive examination of

interrelationships among the various segments of music education: the role of music education at all levels in the total school program, elementary through secondary, with emphasis upon philosophy, learning theory, curriculum design, identification of the exceptional and learning disabilities, administration and current trends; includes 20 clock hours of early field experience in the teaching of music. Prerequisite: Senior standing in music education or consent of instructor, plus 80 hours of early field experiences in the teaching of music. 3 hours.

- 240. Music for Elementary Teachers, I.** A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Junior standing in elementary education or consent of instructor. 3 hours.
- 241. Music for Elementary Teachers, II.** Continuation of Music 240. A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Music 240 or consent of instructor. 3 hours.
- 242. Teaching Music in the Elementary School.** Techniques of and material suitable for teaching music in the elementary school. 3 hours.
- 243. Teaching Music in the Junior High School.** Detailed consideration of the music program in the junior high school; special emphasis on instructional material and methods of instruction. 3 hours.
- 244. Teaching of Instrumental Music.** Organizing and rehearsing school marching and jazz bands; techniques of administering and publicizing school instrumental music programs. Prerequisite: Music 232. 3 hours.
- 245. Choral Score Preparation.** Detailed consideration of the techniques of choral music analysis and score preparation for performance; includes stylistic considerations and effective programming. Prerequisite: Music 142, 230, or 231, or consent of instructor. 2 hours.
- 246. Teaching of Choral Music.** A methods course designed for junior and senior high school vocal and choral majors; includes rehearsal management, choral style, and materials suitable for organizing and teaching choral music in the public schools. Prerequisite: Music 142, 230, 231, or consent of instructor. 3 hours.
- 247. Repertory for the Secondary School Choral Program.** An exploration of literature appropriate for public school music groups through demonstrative rehearsals and public performances. Prerequisite: Music 142, 230, 231, or consent of instructor. 1 or 2 hours. May be repeated to a maximum of 6 hours.
- 249. Music for Early Childhood Teachers.** Development of musical competencies essential for teachers in nursery schools and kindergartens; singing, rhythmic keyboard improvisation, and creative and music reading skills; and extensive study of music materials suitable for use in early childhood music. Prerequisite: Music 240 or consent of instructor. 3 hours.
- 250. University Orchestra.** Prerequisite: Consent of instructor. 0 or 1 hour.
- 251. Chamber Orchestra.** A chamber orchestra for the purpose of performing literature of all periods written specifically for a chamber-sized orchestra. Prerequisite: Consent of instructor. 1 hour.
- 253. Collegium Musicum.** Ensemble work in the performance of medieval, Renaissance, and baroque music; various small groups formed for the performance of sonatas and cantatas of Bach and Handel, wind serenades of Mozart, etc. Interested students may play on viola, lute, harpsichord, and other instruments from the University's collection. Prerequisite: Consent of instructor. 1 hour.
- 254. String Ensemble.** The student participates in various ensemble groups, such as trios, quartets, quintets, etc., for the study of chamber music literature. The course may be repeated or taken during the freshman and sophomore year without credit. Prerequisite: Consent of instructor. 1 hour.
- 255. Woodwind Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 256. Brass Ensemble.** Ensembles of mixed brassy in both small and large forms. Prerequisite: Consent of instructor. 1 hour.
- 257. Percussion Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 258. Piano Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 259. Organ Keyboard Techniques.** Development of practical keyboard skills related to

the work of the church organist; transposition, score-reading, harmonization, modulation, hymn-playing, and solo and anthem accompaniment. Prerequisite: Consent of instructor. 1 hour.

- 260. Oratorio Society.** Performance of oratorios and other major choral works in cooperation with the University Symphony Orchestra; an advanced mixed-voice chorus open to students, faculty, and townspeople. Prerequisite: Consent of instructor. 0 or 1 hour.
- 261. University Chorus.** Performance of cantatas and other choral works; a mixed-voice chorus for average and beginning singers. Open to students, faculty, and townspeople. Prerequisite: Consent of instructor. 0 or 1 hour.
- 262. Women's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all women students. Prerequisite: Consent of instructor. 0 or 1 hour.
- 263. Men's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all men students. Prerequisite: Consent of instructor. 0 or 1 hour.
- 264. Concert Choir.** Practical experience in mixed-voice singing of accompanied and unaccompanied music of various periods and styles; a highly advanced group of competent student singers. Prerequisite: Consent of instructor. 0 or 1 hour.
- 265. Opera-Musical Theatre.** Preparation and public performance of grand or light opera; covers the music and acting only. Students desiring experience in costuming, stage management, scenery, publicity, etc., should apply to the University Theatre which cooperates in the opera productions. Admission is by audition. Prerequisite: Consent of instructor. 1 hour.
- 266. Jazz Band.** Designed to acquaint proficient instrumentalists with jazz compositions, arrangements, and improvisational procedures, and to promote a high degree of stylistic and technical competence in performance. Prerequisite: Consent of instructor, determined by auditions. 0 or 1 hour.
- 267. Harp Ensemble.** Ensembles of multiple harps and harp in combination with other instruments. Prerequisite: Consent of instructor, or Music 197 or 397. 1 hour.
- 268. Small Choral Ensembles.** Open to a limited number of undergraduate students who desire experience in performance of music specifically written for smaller choral groups. Membership through audition only. Prerequisite: Consent of instructor. 1 hour.
- 269. String Chamber Music, Literature, and Performance.** Extensive study of chamber music literature for or including string instruments (violin, viola, cello, double bass); assigns students to chamber groups coached on a weekly basis by members of the string faculty. Requires one performance per semester. Prerequisite: Enrollment in instrumental music curriculum for string instrument majors, or consent of instructor. 1 hour. May be repeated to a maximum of 8 hours.
- 270. String Education, I: Teaching of Stringed Instruments at the Elementary Level.** Organization, materials, and techniques. Prerequisite: String major standing or consent of instructor. 3 hours.
- 271. String Education, II: Teaching of Stringed Instruments at the Secondary Level.** Organization, materials, and techniques. Prerequisite: Music 270 or consent of instructor. 3 hours.

NOTE: Music 280-290 are open to all students who have been accepted by examination, with assignments being made according to proficiency and instrumentation. Completion of each course involves, in addition to the regular schedule of rehearsals, participation in the public appearances of the bands.

- 280. Wind Ensemble.** Mixed woodwind-brass-percussion ensembles for the study and performance of wind chamber compositions. Prerequisite: Junior standing or consent of instructor. 0 or 1 hour.
- 281. Symphonic Band.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 0 or 1 hour.
- 282. Symphonic Band, II.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 0 or 1 hour.

- 283. First Concert Band.** Maintains the instrumentation of the standard band and serves as a training organization for the symphonic bands. The literature studied and performed is of the highest calibre and technical difficulty. 0 or 1 hour.
- 284. Second Concert Band—A.** Enrolls those who do not at first qualify for positions in the other bands until they become eligible for promotion as improvement is shown and as vacancies occur. The band literature studied is of high quality but technically is less difficult than the music for the top three bands. 0 or 1 hour.
- 285. Second Concert Band—B.** Enrolls those who do not at first qualify for positions in the other bands until they become eligible for promotion as improvement is shown and as vacancies occur. The band literature studied is of high quality but technically is less difficult than the music for the top three bands. 0 or 1 hour.
- 286. Marching Band.** The Marching Band prepares and performs at least six shows per football season; music used is of the highest available quality. 1 hour.
- 287. Basketball Band.** This band is organized to perform for home basketball games. Prerequisite: Band Department audition during early November. 1 hour. Credit is given for spring semester only.
- 288. Brass Band.** Maintains a complete British Brass Band Instrumentation for the study and performance of all types and styles of brass band literature. Prerequisite: Concurrent registration in one of the concert bands: Bands 101, 102, 103, 104, or 105. 1 hour.
- 289. Summer Band.** Maintains the instrumentation of the Standard Band for the study and performance of all types of band literature. Prerequisite: Consent of instructor. 1 hour.
- 290. Clarinet Choir.** Maintains a complete clarinet choir instrumentation for the study and performance of all types and styles of clarinet choir literature. Prerequisite: Concurrent registration in one of the concert bands: Music 281, 282, 283, 284, or 285. 1 hour.
- 300. Counterpoint and Fugue.** The study of contrapuntal writing in the eighteenth century, including fugue, with emphasis on the works of J. S. Bach; involves both writing and analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 301. Schenkerian Analysis of Tonal Music.** Studies analytical systems and their application to tonal music; includes a survey of theoretical works by important theorists from Rameau to Schenker. Emphasizes practical application of Schenkerian analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 302. Musical Acoustics.** Theory and application of simple resonators, wave motion, resonances of string and pipes; perception of loudness, pitch and timbre; musical scales; and acoustics of rooms and musical instruments. Prerequisite: Mathematics 112 and Music 101, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 303. Music Formalization.** Surveys the logical tools introduced in the theory and practice of the musical composition by Xenakis, Hiller, and others; intended for musicians with no more than limited familiarity with mathematics. Prerequisite: Music 104 and consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 304. Contemporary Compositional Techniques.** Studies in specialized areas of composition for advanced undergraduates and graduates majoring in composition-theory. May be elected by others with consent of instructor. Prerequisite: Music 104, 106, or 109, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 305. Analytical Systems for Twentieth Century Music.** Studies analytical techniques developed for music written in the twentieth century not based upon tonal principles from the common practice period. Includes a survey of important theorists such as Forte, Hindemith, and Babbitt; studies set theory and twelve-tone theory; and surveys other specialized analytical systems. Prerequisite: Music 104, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 306. Composition.** Work in original composition including small and large forms. Prerequisite: for undergraduates, Music 204, 205, and 206 and consent of composition faculty; for graduate students, consent of composition faculty. Students submit scores of their compositions to the composition faculty in order to obtain consent to register; consent

is granted on the basis of the quality of the music the student has composed and the level of skill demonstrated in the work submitted. 3 hours or $\frac{1}{2}$ unit.

- 308. Analysis of Musical Form.** An extensive study of the formal structure of representative musical compositions from various historical periods, including Renaissance and Baroque, Viennese Classical, Nineteenth Century, first half of Twentieth Century, and since World War II. Prerequisite: Music 104 and 109. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 9 hours or $1\frac{1}{2}$ units.
- 310. Ancient and Medieval Music.** A history of Western music to about 1400. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 311. Music in the Renaissance.** A history of music from about 1400 to 1600. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 312. Music of the Seventeenth Century.** A history of music from about 1600 to 1700. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 313. Music of the Eighteenth Century.** A history of music from about 1700 to 1800. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Music of the Nineteenth Century.** A history of music from about 1800 to 1900. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 315. Music of the Twentieth Century.** A history of music from about 1900 to the present. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 316. Anthropology of Music.** Same as Anthropology 316. An introduction to the anthropological study of music, including the role of music in the world's societies and nonwestern musical systems and cultures. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 317. Area Studies in Ethnomusicology.** Same as Anthropology 315. A seminar devoted to intensive study in the music of one specific culture, e.g., Japan, China, Indonesia, India, the Near East, African and New World Negro, European and American folk cultures, or American Indian. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 12 hours or 2 units.
- 318. History of Performance Practices, I.** Study of musical performance from about 900 to 1650 A.D.; discussion of musical instruments, makeup of instrumental and vocal ensembles, etc., supplemented by demonstration performances of selected works using the University's collection of instruments. Prerequisite: Senior standing in music theory and music history, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 319. History of Performance Practices, II.** Study of musical performance from 1600 to 1750 A.D.; discussion of musical instruments, ornamentation, basso, continuo, etc., supplemented by demonstration performances using the University's collection of instruments. Prerequisite: Senior standing in music theory and music history, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 320. Proseminar.** Special preparation in specialized fields of musicology, theory and composition, and music education. Prerequisite: Senior or graduate standing in music or music education; consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units. Open Option Students may repeat to a maximum of 16 hours.
- 321. Electronic Music Techniques, I.** Introduces electro-acoustic music, including historical background, literature, techniques of notation and realization, and compositional application in the areas of musique concrete, classical electronic music, and voltage-controlled electronic music. Prerequisite: Junior standing in music or consent of instructor. 4 hours or 1 unit.
- 322. Electronic Music Techniques, II.** Advanced study in the use of voltage-controlled synthesizers in music composition and study of compositional, technical, and performance considerations in combining electronics with traditional instruments and/or voices in music composition. Prerequisite: Music 321 or placement by examination. 2 hours or $\frac{1}{2}$ unit.
- 323. Opera Production, I.** Helps interested students on the graduate level study the problems of the lyric stage; investigation of and practice with casting methods, program selection, production procedures, stage direction, coaching methods, and opera dra-

- matics. Prerequisite: Music 265 and 381; consent of instructor. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 324. Opera Production, II.** Helps interested students on the graduate level study the problems of the lyric stage; investigation of and practice with casting methods, program selections, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 323. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 325. Introduction to Musicology, I.** Survey of the discipline of musicology, its scope, and its history with bibliographical studies and sample problems for investigation. Prerequisite: Graduate standing in musicology or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit).
- 326. Introduction to Musicology, II.** Continuation of a survey of the discipline of musicology; special attention to class projects in systematic musicology and to the philosophy of music history. Prerequisite: Music 325 or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit).
- 327. Urban Popular Music.** Introduction to the world's popular music; emphasis on its role in society, based on American, European, Latin American, and nonWestern repertoires. Prerequisite: Music 130 or equivalent, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 328. Composer-Choreographer Workshop.** Same as Dance 328. See Dance 328.
- 330. Applied Music Pedagogy.** Survey of techniques, practices, and materials; presentation of group and individual instruction; an approach to teaching problems, tone production, musical styles, and interpretation for various age levels; and actual teaching experience under faculty supervision. Required of applied music majors in voice and string instruments. Prerequisite: Junior standing in music or consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
- 331. Piano Pedagogy, I.** Objectives, techniques, literature, and materials for teaching the child from about ages five through ten (elementary level); observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 332. Piano Pedagogy, II.** Objectives, techniques, literature, and materials for teaching the young pianist from about ages eleven through eighteen (middle school to pre-college level); teaching the adult beginner; and observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 333. The History of Opera.** Surveys opera and related forms from the end of the 16th century to the present; studies representative works in some detail. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 334. The Music of America, I.** Study of folk, popular, and art music in America from the time of the first European settlers through the middle of the nineteenth century; psalmody, early opera and concert life, African and European folk music, the singing school, music of European immigrants, and the roots of jazz. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 335. The Music of America, II.** Study of chamber, choral, and orchestral music written by American composers from 1850 to the present; jazz and its offshoots; folk and popular music; and experimental music in America. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 336. Music in Latin America.** The history of music in Latin America from colonial times to the present, including its cultural and social background. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 337. National and Regional Studies in European Music History.** Studies in the history of music of individual nations and regions of Europe. Each semester is devoted to one area, such as Great Britain, Spain and Portugal, Russia, Scandinavia, or eastern Europe. Prerequisite: Junior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
- 339. Functional Music for Exceptional Children and Youth.** Features techniques and

- methods to aid exceptional children and youth in acquiring and improving self-concept, socialization skills, attention span, listening skills, language acquisition, and academic readiness; considers the use of music techniques and methods in acquiring these skills in the mainstream classroom. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 340. Marching Band Procedures.** A detailed consideration of principles and procedures for preparing a marching band to participate in parades, ceremonies, and shows for sports events. Prerequisite: Junior standing in instrumental music education. 2 hours or $\frac{1}{2}$ unit.
- 341. Seminar in Instrumental Music Education.** Intensive study of musical, scientific, and educational concepts and principles related to the teaching of heterogeneous combinations of instruments. Prerequisite: Completion of student teaching or graduate standing in music education. 2 hours or $\frac{1}{2}$ unit.
- 342. Band Arranging.** The development of basic scoring and arranging skills for various instrumental ensembles. Marching and smaller instrumental combinations are the performance media used for scoring purposes. Prerequisite: Music 104 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 343. Tests and Measurement in Music Education.** Construction, design, appraisal, and use of measurement devices for music teaching and research. Prerequisite: Consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Teaching Techniques of Music Theory.** Teaching materials, methods, texts, and pedagogical sequence are discussed and analyzed, including an intensive survey of the structural materials normally covered during the first two years of collegiate study. Prerequisite: Music 300 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 346. Workshop in Music Education.** Development of essential facts, attitudes, and principles through a consideration of problems encountered in music education. Parallel with this study is the preparation of resource materials for music programs in elementary and secondary schools. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units. Offered in the summer session only.
- 347. Teaching of Woodwind Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
- 348. Teaching of Brass Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
- 349. Music in Early Childhood.** Same as Human Development and Family Ecology 349. Detailed consideration of the music program in nursery schools, kindergarten, and the primary grades; topics include the nature of early musical responses, objectives, experience levels of the program, methods of teaching, and materials. Observation of music teaching at the Child Development Laboratory is included in the course work. Prerequisite: Senior or graduate standing in music or human resources and family studies, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 350. Advanced Ensemble Music.** Selected projects in the study and performance of ensemble literature, including the areas of operatic, instrumental, and vocal-choral music and accompanying. Prerequisite: Consent of instructor. 0 to 2 hours, or 0 to $\frac{1}{2}$ unit.
- 355. School/Community Musical Theatre Production.** Problems and techniques involved with technical and artistic production of musicals in the junior and senior high schools and in the community. Prerequisite: Advanced undergraduate or graduate standing in music education or performance curricula, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 360. Advanced Group Instruction in Piano, I.** A comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163, and Music 104 and 109, or equivalent, consent of instructor. 2 hours or $\frac{1}{2}$ unit.

- 361. Advanced Group Instruction in Piano, II.** Continuation of Music 360. Comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163; Music 104 and 109 or equivalent; Music 360 or equivalent and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 362. Advanced Jazz Piano Improvisation.** Study of solo jazz piano improvisation on an advanced level. Includes practical experience in traditional, modern, and abstract solo performance, as well as theoretical, stylistic, and historical background. Prerequisite: Music 151 or equivalent. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
- 366. Vocal Repertoire, I.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice or consent of instructor. 1 hour.
- 367. Vocal Repertoire, II.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice; consent of instructor. 1 hour.
- 369. Accompaniment for Dance.** Same as Dance 369. See Dance 369.
- 377. Principles of Accompanying.** Grasp of the fundamental principles of accompanying singers and instrumentalists; practical experience in accompanying; and facility in sight reading for keyboard performers. Prerequisite: Advanced undergraduate or graduate standing in music or music education and consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit). May be repeated to a maximum of 16 hours or 4 units.

NOTE: Music 378 through 398 (applied music) have the following prerequisite: For students in the Bachelor of Music programs for the curricula in Vocal and Instrumental Music, junior standing in the major applied music subject as approved by the faculty of the appropriate applied music division; for students in music education, completion of the curricular requirement in the major applied music subject; and for students in other colleges of the University, completion of four semesters in the comparable applied music course at the 100-level.

- 378. Guitar.** Instruction in guitar at the advanced undergraduate and graduate levels; predominantly classical. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 379. Harpsichord.** Instruction in harpsichord at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 380. Piano.** Instruction in piano at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 381. Voice.** Instruction in singing at the advanced undergraduate and graduate level. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 382. Organ.** Instruction in organ at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 383. Violin.** Instruction in violin at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 384. Viola.** Instruction in viola at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 385. Cello.** Instruction in violoncello at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).

- 386. String Bass.** Instruction in string bass at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 387. Flute.** Instruction in flute at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 388. Clarinet.** Instruction in clarinet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 389. Oboe.** Instruction in oboe at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 390. Bassoon.** Instruction in bassoon at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 391. Cornet and Trumpet.** Instruction in cornet and trumpet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 392. French Horn.** Instruction in French horn at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 393. Trombone.** Instruction in trombone at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 394. Euphonium.** Instruction in euphonium at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 395. Tuba.** Instruction in tuba at the advanced undergraduate and graduate level. 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 396. Percussion.** Instruction in percussion at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 397. Harp.** Instruction in harp at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 398. Saxophone.** Instruction in saxophone at the advanced undergraduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 400. Advanced Instrumentation: Chamber and Symphonic.** Orchestration for chamber and symphony orchestras: works of classical, romantic, and modern composers. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
- 401. Advanced Instrumentation: Band.** Arrangement for the concert band of works from orchestra, organ, and chamber music by composers of the classical, romantic, and modern periods. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
- 402. Analysis in Relation to Performance and Interpretation, I.** A unifying course in the structure of music, in which analysis is related to the performance and understanding of music: course material drawn from standard literature from the Renaissance to the present day with emphasis on the smaller forms. Prerequisite: Music 104 or equivalent; consent of instructor. $\frac{1}{2}$ or 1 unit.
- 405. Individual Topics in Music Theory.** Studies in specialized areas of analysis, theory systems, and aesthetics for theory-composition majors. Prerequisite: Graduate standing in music; consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
- 406. Composition.** Advanced study of contrapuntal forms; study of contemporary melodic and harmonic practices; and original work in advanced composition. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
- 410. History of Music Theory.** Prerequisite: Graduate standing in musicology or composition, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 411. Introduction to Ethnomusicology.** Comprehensive survey of concepts, problems, and methods of research in non-Western and folk music. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
- 412. History of Musical Aesthetics, I.** Survey of the principal philosophies of music from Pythagoreanism to the humanistic period, their historical backgrounds, and their relation to musical styles. Prerequisite: Graduate standing in music. $\frac{1}{2}$ or 1 unit.
- 414. Notation, I.** History of notation from its beginning to 1400. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 415. Notation, II.** History of notation from 1400 to 1600, including instrumental tablatures. Prerequisite: Music 414 or consent of instructor. $\frac{1}{2}$ unit.

- 417. History of Instrumental Music from 1600 to 1750.** Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
- 418. Topics in Opera History.** Intensive study of a period or school of opera composition or of a particular aspect of the history of opera. Wide reading in the social and intellectual climate of the period concerned; literary, dramatic, and musical analysis; and work with primary sources whenever possible. Prerequisite: Music 428, graduate standing in musicology, or consent of instructor. 1 unit (summer session, $\frac{1}{2}$ unit).
- 419. Orchestral Literature, I.** Study of orchestral and symphonic literature from 1700 to 1850. Prerequisite: Graduate standing in music and consent of instructor. $\frac{1}{2}$ unit.
- 420. Orchestral Literature, II.** Study of orchestral and symphonic literature from 1850. Prerequisite: Graduate standing in music and consent of instructor. $\frac{1}{2}$ unit.
- 421. Research in Music Education.** Introduction to problems and methods of research in music education. Required of all candidates for the Doctor of Education in music education. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
- 422. Seminar in Theory of Music.** Intensive study of selected topics in the fields of music theory, history of theory, and history of musical materials. Prerequisite: Graduate standing in music theory or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 423. Seminar in Musicology.** Problems in historical and systematic musicology or ethnomusicology; discussions of special problems and reports on individual research. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
- 424. Seminar in the Works of a Selected Composer.** A seminar devoted to intensive historical and analytical study of the works of important composers; each semester devoted to one composer, e.g., Bach, Beethoven, Handel, Haydn, Mozart, or Wagner. Prerequisite: Music 213 and 214; two of the following: Music 310, 311, 312, 313, or 315, or equivalent. 1 unit (summer session, $\frac{1}{2}$ or 1 unit). May be repeated for a maximum of 2 units.
- 425. Readings in Musicology and Music Theory.** Individual guidance in intensive readings in the literature of musicology or music theory, selected in consultation with the instructor and in accordance with the needs and interests of the student. Prerequisite: Graduate standing in musicology or music theory. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit).
- 426. Choral Literature, I.** Survey of choral and vocal ensemble repertoire from the Middle Ages to 1750. Prerequisite: Open to graduate music students by consent of instructor. $\frac{1}{2}$ unit.
- 427. Choral Literature, II.** Survey of choral repertoire from 1750 to the present. Prerequisite: Open to graduate music students by consent of instructor. $\frac{1}{2}$ unit.
- 428. Problems and Methods.** Introduction to methods in research and stylistic criticism and to bibliographic aids, editions, and editing of music, as related to the work of the musician and composer. Reports of bibliographic problems and on individual projects are presented orally and in writing. Required of all students in the Master of Music program, except those majoring in musicology. 1 unit.
- 429. Historical Studies in Twentieth-Century Music.** A seminar in contemporary music, with emphasis on the historical foundations of current trends in musical composition. Prerequisite: Music 315 or 422, or equivalent. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit). May be repeated to a maximum of 2 units.
- 430. Advanced Orchestra Conducting and Literature.** Intensive study of conducting techniques and problems related to standard orchestral literature; survey of materials for school and community orchestras. Prerequisite: Music 233 or equivalent, and consent of instructor. $\frac{1}{2}$ or 1 unit.
- 431. Advanced Band Conducting and Literature.** Study of problems and techniques of band conducting; survey of literature for the concert band. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
- 432. Advanced Choral Techniques, I.** An intensive laboratory approach to the development of advanced techniques necessary for working effectively with choral ensembles. Prerequisite: Graduate standing in music. $\frac{1}{2}$ or 1 unit.
- 433. Advanced Choral Techniques, II.** An intensive survey of choral literature with

- laboratory organization for reading, conducting, and interpreting choral music of all periods, styles, and voice arrangements. Prerequisite: Graduate standing in music, Music 432 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 434. Piano Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 435. Vocal Literature.** Study of solo song in larger works, and solo art song. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 436. Organ Literature.** An intensive study of organ literature from Bach to the present; includes the music itself, recordings, and collateral readings. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 437. String Instrument Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 438. Wind Instrument Literature.** Survey at the graduate level of the field of solo and ensemble wind literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. 1 unit. May be repeated to a maximum of 2 units.
- 439. Percussion Instruments Literature.** Survey and analysis of the field of solo and ensemble percussion literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. Prerequisite: Graduate standing in music; consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 440. Foundations and Principles of Music Education, I.** A consideration of the historical and philosophical foundations of music education and their application to the process of program development in music education. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
- 441. Foundations and Principles of Music Education, II.** A consideration of the psychological foundations of music education and their application to the processes of instruction, administration, supervision, and evaluation of music education programs. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
- 442. The General Music Program in Secondary Schools.** Detailed consideration of the general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
- 443. Administration and Supervision of Music Education.** Deals with the functions of supervisors and directors of music education in administering music programs in elementary and secondary schools. $\frac{1}{2}$ or 1 unit.
- 444. The General Music Program in Elementary Schools.** Detailed consideration of elementary general music, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
- 445. Music in Higher Education.** An orientation to the organization, teaching, and administration of music in the college and university. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit. Offered in summer session only.
- 446. Seminar in Experimental Music, I.** Survey of contemporary electronic music, computer music, and related types of music; discussion of relevant music theory. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 447. Seminar in Experimental Music, II.** Continuation of Music 446. Prerequisite: Music 446 or consent of instructor. $\frac{1}{2}$ unit.
- 448. Computer Music.** Representation of sound signals in a digital computer; methods for input and output of sounds to and from a computer; sound synthesis programs; synthesis of simple musical structures; use of graphics; processing of live sounds by computer; editing and retrieval; fidelity of computer-produced sounds; and hybrid analog/digital computers. Prerequisite: Graduate standing in composition-theory or consent of instructor. 1 unit.
- 449. Problems in Band Conducting.** An examination of techniques of rehearsal, conducting, and preparation of band organizations for concert performance; emphasizes

- discussion, analysis, and preparation of selected scores and the problems they present. Prerequisite: Graduate standing or experience as a band conductor. $\frac{1}{2}$ or 1 unit.
- 450. History of Vocal Ensemble and Choral Music.** A critical and analytical study of vocal ensemble and choral music from the Middle Ages to the present. Prerequisite: Music 426 and 427, or equivalent, or consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 452. Choral Conducting Project.** Required of candidates for the degree of Master of Music with choral music option during the final semester in residence; includes participation in a graduate choral conducting laboratory and preparation of a choral ensemble for public performance. Prerequisite: Music 432 and consent of instructor. $\frac{1}{2}$ unit.
- 454. Advanced Choral Performance Techniques.** Study of performance problems and musical analysis of choral music with techniques of preparation and rehearsal from the various style periods: Renaissance, baroque, classic-romantic, and contemporary. Prerequisite: Admission into the Doctor of Musical Arts choral music program, or the equivalent background in other doctoral degree programs. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 455. The Choral Program in Secondary Schools.** An in-depth study of the methods and materials appropriate for teaching choral music in the secondary schools. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
- 456. Advanced Computer Music.** Compositional approaches to computer music; advanced digital computer sound synthesis using the computer programs MUSIC 360 and MUSIC 4BF; compositional algorithms; user-written sound generation routines; new concepts of timbre in digital sound synthesis; digital/analog and analog/digital conversion; and installation of computer music programs. Prerequisite: Music 448 or consent of instructor. 1 unit.
- 460. Practicum in Piano Teaching: Children and Teenagers.** Student teaching of group piano and musicianship classes for elementary, middle, and high school students; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 331 or equivalent. 1 unit.
- 461. Practicum in Piano Teaching: Adults.** Student teaching of group piano for adults in the private studio, community college, and university; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 332 or equivalent. 1 unit.
- 477. Advanced Accompanying.** Grasp of the fundamental principles of accompanying singers and instrumentalists, practical experience in accompanying, and facility in sight reading for keyboard performers. Prerequisite: Graduate standing in music or music education and/or consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 480. Piano.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 481. Voice.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 482. Organ.** Selected studies from the masterworks of organ literature. Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 483. String Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty; concurrent registration in Music 250 or 350, section K, for students working toward the Master of Music. $\frac{1}{2}$ or 1 unit.
- 484. Wind Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 485. Percussion Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition given by the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 489. Doctoral Projects.** Special projects for candidates for the Doctor of Musical Arts; open only to students in the Doctor of Musical Arts program. Prerequisite: Consent of instructor. 0 to 4 units (summer session, 0 to 2 units).

- 499. Thesis Research.** Research in special projects. Prerequisite: Consent of instructor. 0 to 4 units.

NAVAL SCIENCE

Head of Department: Captain R. L. Prath, USN

Department Office: 236 Armory Building, 505 East Armory, Champaign

- 100. Naval Science Laboratory.** A noncredit course designed to give the Naval ROTC student, through practical application, a better grasp of the naval science subjects taught in the classroom and a working knowledge of close order drill. 0 hours.
- 111. Introduction to Naval Science.** Naval organization and management practices examined within the context of the naval service; command and control, organization for logistics, service and support, functions and services of major components of the Navy and Marine Corps, and shipboard organization; and emphasis on management and leadership functions. Prerequisite: Approval of professor of naval science; concurrent registration in Naval Science 100. 2 hours.
- 112. Naval Ships Systems, I.** Studies ship compartmentation, propulsion systems, auxiliary power systems, interior communications, and ship control; types, structure, and purpose of naval ships; and examination of elements of ship design and ship stability. Prerequisite: Naval Science 111 or consent of instructor. 3 hours.
- 121. Naval Ships Systems, II.** Introduction to concepts of naval weapons systems, their capabilities and limitations, and their individual and complementary roles in a wide variety of offensive and defensive situations. Prerequisite: Credit or concurrent registration in Physics 102 or equivalent, and one course in computer science; or consent of instructor. 3 hours.
- 124. Sea Power and Maritime Affairs.** Investigates the characteristics of sea power and their impact on the affairs of our nation; discusses those characteristics with historical and modern applications to the United States and other world powers. 2 hours.
- 231. Navigation and Naval Operations, I.** Provides the student with an understanding of the theory and techniques of the three types of marine (nautical) navigation: piloting, electronic, and celestial. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100 or consent of instructor. 3 hours.
- 232. Navigation and Naval Operations, II.** Designed to give an understanding of the concepts and use of relative motion principles, international maritime law and the rules of the nautical road, and the fundamentals of U.S. fleet organization, communication, and operations. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
- 242. Naval Leadership and Management, II.** Continuation of Naval Science 241. Examines Navy organization, personnel administration procedures, human resource management programs, and military justice in terms of current management theory. Prerequisite: Naval Science 241 or consent of instructor. 2 hours.
- 291. Evolution of Warfare.** Survey of the evolution of warfare emphasizing the philosophies and trends which have been significant in land warfare. Prerequisite: Concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
- 293. History of Amphibious Warfare.** Studies amphibious operations and the evolution of amphibious warfare doctrine and development. Prerequisite: Advanced undergraduate standing or consent of instructor. 3 hours.

NUCLEAR ENGINEERING

Head of Department: B. G. Jones

Program Office: 214 Nuclear Engineering Laboratory, 103 South Goodwin, Urbana

- 197. Nuclear Energy and Its Uses.** Discussions and lectures to orient freshmen and sophomores to the role of nuclear engineering in society and technology. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 241. Introduction to Radiation Protection.** Same as Environmental Studies 241. An introductory course in the elements of radiation protection and health physics, emphasizing practical applications. Prerequisite: Mathematics 120 or equivalent; and one semester of biology, chemistry, or physics, or consent of instructor. 2 hours. Seniors in nuclear engineering may not receive credit for Nuclear Engineering 241.
- 243. Radiation Protection Laboratory.** A laboratory course designed to provide an understanding of radiation and to introduce various radiation detection instruments and devices used in radiation protection. Prerequisite: Credit or concurrent registration in Nuclear Engineering 241 or consent of instructor. 1 hour.
- 290. Special Topics.** Considers selected areas which are of current interest to undergraduates in nuclear engineering but which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours.
- 295. Special Problems.** Individual investigations or studies of any phase of nuclear engineering selected by the student and approved by the department. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours. May be repeated.
- 302. Nuclear Power Engineering.** Same as Mechanical Engineering 302. Principles of release and utilization of fission energy in nuclear power engineering; includes such topics as fission processes and controlled chain reactions; nuclear reactor types, design principles, and operational characteristics; power reactor design criteria; radiation hazards and radioactive waste treatment; economics; and other applications such as propulsion and research reactors. Students who plan to take more extensive training in nuclear technology are advised to take the Physics 346 - Nuclear Engineering 347 sequence. Prerequisite: Consent of instructor. 3 hours or 1 unit. Credit for both Nuclear Engineering 302 and Nuclear Engineering 347 cannot be given toward the same degree.
- 312. Nuclear Power Economics and Fuel Management.** A quantitative analysis of the economic impact of the nuclear power industry; nuclear fuel cycle and capital costs for thermal and fast reactors; optimization of the use of nuclear fuels to provide the lowest energy costs and highest system performance; and comparison between fossil fuel systems, fission systems, and controlled thermonuclear systems. Prerequisite: Junior standing; Mechanical Engineering 302, or Nuclear Engineering 302 or 347, or consent of instructor. 3 hours or 1 unit.
- 321. Introduction to Controlled Thermonuclear Fusion.** Same as Electrical Engineering 321. Review of Maxwell's equations and introduction to plasma physics as it applies to controlled thermonuclear fusion problems; energy balance; plasma confinement and stability, and recent approaches to the fusion reactor. Prerequisite: Senior or graduate standing, or consent of instructor. 4 hours or 1 unit.
- 331. Materials in Nuclear Engineering.** Develops a materials engineering background applied to nuclear systems; relates structure of metals, ceramics, glasses, and concretes to their physical and mechanical properties; develops phase formation and reaction kinetics from basic thermodynamics principles; and discusses materials performance in nuclear systems, including irradiation damage and effects. Prerequisite: Junior standing in engineering or the physical sciences. 3 hours or 3/4 unit.
- 341. Principles of Radiation Protection.** Sources of nuclear radiation; ionization and energy deposition in physical and biological media; principles of dosimetry; determination of protection limits for external and internal emitters; and basic shielding analysis. Prerequisite: Physics 346 or Chemistry 397, or consent of instructor. 4 hours or 1 unit.
- 342. Radioactive Waste Management.** Sources and characteristics of radioactive wastes; methods of treatment; monitoring techniques; methods of hazard evaluation; special

- aspects of solid, liquid, and gaseous wastes; and disposal, both temporary and permanent. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 2 hours or 1/2 unit.
- 346. Modern Physics for Nuclear Engineers.** Same as Physics 346. See Physics 346.
- 347. Introduction to Nuclear Engineering.** Energy resources and nuclear power systems; basic principles of fission and fusion reactors operations; fission reactor control and heat removal; radiation protection; shielding of reactors; safeguards, licensing, and environmental considerations. Prerequisite: Credit or concurrent registration in Physics 346, or equivalent. 4 hours or 1 unit. Credit for both Nuclear Engineering 347 and Nuclear Engineering 302 cannot be given toward the same degree.
- 351. Nuclear Engineering Laboratory.** Radiation detection and instrumentation; radiation dosimetry and shielding; basic measurements in nuclear engineering; engineering applications; and micro computer data acquisition and experimental control. Prerequisite: Physics 346 or equivalent. 3 hours or 3/4 unit.
- 352. Advanced Nuclear Engineering Laboratory.** Students can choose experiments from the following areas: reactor experiments, fusion experiments, subcritical assemblies, and nuclear engineering applications. Three experiments and five weeks per credit hour or 1/4 unit. Prerequisite: Nuclear Engineering 347 and 351 or equivalents; or consent of instructor. 1 to 3 hours, or 1/4 to 3/4 unit. May be repeated to a maximum of 5 hours or 1 1/4 units.
- 355. Reactor Statics and Dynamics.** Intermediate-level analysis of thermal and fast reactor assemblies; reactor statics, reactor dynamics, and introductory transport theory; homogeneous and heterogeneous reactors; and multigroup diffusion theory, perturbation theory, reactivity coefficients, and control rod analysis. Prerequisite: Nuclear Engineering 347 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 357. Safety Analysis of Nuclear Reactor Systems.** Basic safety philosophy in nuclear reactor systems; brief review of nuclear reactor systems; regulatory processes; siting considerations; safety problems related to reactor dynamics; evaluation of postulated accidents; risks associated with nuclear fuel cycle; and methods of systems safety analysis. Prerequisite: Nuclear Engineering 302 or 347, or equivalent, or consent of instructor. 3 hours, or 3/4 or 1 unit.
- 358. Design in Nuclear Engineering.** Introduction to design in nuclear engineering systems; basic principles of definition, organization, constraints, modeling, and optimization of system design; case studies; and class design projects applying these basic principles. Prerequisite: Nuclear Engineering 347. 3 hours or 3/4 unit.
- 390. Intermediate Special Topics.** Considers selected areas of current interest in nuclear engineering which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours, or 1/4 to 1 unit.
- 397. Radiochemistry.** Same as Chemistry 397. See Chemistry 397.
- 401. Fundamentals of Nuclear Engineering.** A lecture and problem course to provide background for further work in nuclear engineering: problems in materials, heat transfer, and fluid flow; and special emphasis on basic ideas and the mathematical similarity of problems in heat transfer, fluid flow, and neutron diffusion. Prerequisite: Mathematics 345 or equivalent; credit or concurrent registration in Chemistry 397 or Physics 382, or equivalent. 1 unit.
- 411. Nuclear Reactor Heat Transfer.** Selected topics in nuclear reactor heat transfer: thermal analysis of fuel elements under steady and transient operation; convective energy transport from reactor cores; two-phase flow and boiling in reactor cores; and liquid metal coolant systems. Prerequisite: Nuclear Engineering 401 or consent of instructor. 1 unit.
- 421. Interaction of Radiation with Matter.** Topics in the interaction of radiation with matter of interest to the nuclear engineering field: the kinematics, kinetics, and cross sections involved in the interaction of charged particles, electromagnetic radiation, and neutrons. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 1 unit.
- 422. Controlled Fusion Systems, I.** Same as Electrical Engineering 422. Development of plasma models for fusion analysis; treatment of plasma heating and confinement with applications to current experiments; energy balances; and energy extraction. Prerequisite: Nuclear Engineering 321 or consent of instructor. 1 unit.

- 423. Controlled Fusion Systems, II.** Development of plasma models for high-beta pulsed-fusion systems and for pellet fusion systems; heating and confinement mechanisms; energy balances and energy extraction; and applications to current experiments. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
- 424. Stability Problems in Fusion Systems.** Survey of instabilities of interest in controlled thermonuclear fusion; overall system instabilities in fusion power reactors and applications; macro-instabilities and micro-instabilities of interest in CTR devices, and practical implications for proposed fusion reactor designs; and instabilities resulting from refueling and heating. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
- 425. Nuclear-Electrical Energy Conversion.** Same as Electrical Engineering 425. Advanced concepts in nuclear radiation energy conversion of importance in both power production and radiation detection; analysis and applications of direct collection of charged particles; and theory and applications of radiation-induced ionization and excitation. 1 unit.
- 431. Nuclear Metallurgy.** Metallurgical principles applied to materials problems in nuclear engineering; includes topics in production of uranium, corrosion, radiation damage, fuel element fabrication, and fuel reprocessing. Prerequisite: Consent of instructor. 1 unit.
- 441. Nuclear Radiation Shielding.** Basic concepts, radiation sources, elementary gamma ray and neutron shielding, geometry factors in shielding, advanced techniques (such as Monte Carlo and discrete ordinates), special topics (such as shield heating, duct streaming, and albedo theory), and practical aspects. Prerequisite: Nuclear Engineering 341 or consent of instructor. 1 unit.
- 454. Nuclear Engineering Laboratory Investigations.** Individual investigation in nuclear engineering. Prerequisite: Consent of instructor. 1/4 to 2 units.
- 455. Reactor Theory, I.** Same as Physics 455. Advanced development of neutron transport theory; neutron slowing-down and resonance absorption; approximations to the transport equation; direct numerical methods and other techniques of approximation theory applied to the neutron transport equation; and advanced topics. Prerequisite: Nuclear Engineering 355, graduate standing in physics, or consent of instructor. 1 unit.
- 456. Reactor Theory, II.** Same as Physics 456. Advanced treatment of the theory of slow-neutron scattering, neutron thermalization, Doppler broadening, fuel depletion and fuel loadings, properties of neutron migration operators, and mathematical neutron transport theory; interpretation of related experiments; and advanced topics. Prerequisite: Nuclear Engineering 421 or 455, graduate standing in physics, or consent of instructor. 1 unit.
- 457. Advanced Reactor Analysis.** Forms of the multigroup neutron transport and diffusion equations; analysis of heterogeneous reactors; direct numerical solution of the transport and diffusion equations; integral and coarse mesh methods; iterative solutions, convergence, and acceleration; synthesis methods; Monte Carlo methods for particle transport; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
- 458. Advanced Nuclear Engineering Design.** A classroom exercise in the conceptual design of a nuclear engineering system involving a synthesis of previous learning in the field of nuclear engineering and related disciplines; the design includes all necessary ingredients for the system, such as core, thermal-hydraulics, shielding, material selection, and control. Prerequisite: Five 300- and or 400-level nuclear engineering courses including Nuclear Engineering 347 and 401, or equivalent; or consent of instructor. 1 unit.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Physics, and Theoretical and Applied Mechanics 459. See Mathematics 459.
- 460. Reactor Kinetics and Dynamics.** Diffusion and transport neutron balances with delayed neutrons; formal development of the point reactor kinetics equations; analytic and numerical solutions of the point reactor kinetics equations; space-dependent, mul-

tigroup reactor kinetics; reactivity measurements; reactor noise analysis; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.

- 490. Special Topics.** Considers selected areas of current interest in research which are not adequately covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
- 495. Nuclear Engineering Problems.** Individual study in areas of nuclear engineering and closely related fields not covered by regular course offerings. The work is carried out under the supervision of a member of the faculty. Prerequisite: At least 3 units of graduate work; consent of instructor. $\frac{1}{4}$ to 2 units.
- 497. Seminar in Nuclear Science and Engineering.** Lectures and discussions on current work in research and development in nuclear engineering and related fields by staff, advanced students, and visiting lecturers. 0 or $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

NURSING

(Including General Nursing, Medical-Surgical Nursing, and Public Health Nursing)

Assistant Dean: N. S. Creason

Office: 1115 $\frac{1}{2}$ West Oregon, Urbana

The following courses are among the first to be offered in the College of Nursing R.N. Baccalaureate Completion and Adult Health Nursing Graduate Programs on the Urbana-Champaign campus. Although these courses are part of the undergraduate and graduate offerings of the College of Nursing at the Chicago campus, which has ultimate responsibility for them, under a cooperative arrangement they are being offered on the Urbana-Champaign campus as well. The graduate offerings are a part of the Graduate College at the Chicago campus.

NOTE: In the following courses, enrollment is limited to students who have senior standing in the College of Nursing R.N. Baccalaureate Completion Program, or who are admitted to the Graduate College of the Health Sciences Center.

General Nursing

- 203. Nursing Concepts III.** Examines concepts related to organizational, management, and leadership theories and related processes applied to the health care and nursing care delivery systems. Prerequisite: Senior standing; concurrent registration in Medical-Surgical Nursing 203. 2 hours.
- 204. Concepts of Professional Practice.** Focuses on the nursing process as a basic tool of professional nursing practice; examines the basis of nursing practice in terms of concepts and theory as a means of organizing knowledge for nursing action. Prerequisite: Satisfactory score on ACT/PEP test; General Nursing 293 or consent of department; concurrent registration in General Nursing 205. 3 hours.
- 205. Professional Practice Practicum.** Application of nursing process in a variety of clinical settings. Prerequisite: Satisfactory score on ACT/PEP test; concurrent registration in General Nursing 204. 2 hours.
- 293. Seminar in Nursing.** Exploration, reporting, and discussion of issues in nursing and related fields; effect of contemporary concepts and values on nursing today and on future development of the profession. 3 hours.
- 296. Introduction to Research Methods.** Principles of scientific investigation; relationship of research design to nursing theory; sampling; data collection and analysis techniques; ethical issues. Application to critical examination of nursing research literature. Prerequisite: A course in introduction to statistics. 2 hours.

- 300. Principles of Nursing Administration.** Overviews the principles, objectives, and methods of managing nursing services in a division of a health services institution or agency and skill training in applying this knowledge. Prerequisite: Graduate standing in nursing. 2 hours.
- 400. Theoretical Basis of Adult Health Nursing.** The first in a sequence of graduate courses in adult health nursing. Examines selected adult development theories, the interaction of major postulates of those theories with the individual adult's health status and the relevance to nursing process in the nursing care of the adult. Prerequisite: Graduate standing in nursing or consent of instructor. 3 hours.
- 401. Concepts in Adult Health Nursing.** Follows in sequence of General Nursing 400. Critical analysis of selected theories of and concepts useful in the practice of adult health nursing; considers nursing behaviors essential to effective intervention. Emphasizes current research. Prerequisite: General Nursing 400, graduate standing in nursing, or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
- 402. Methods in Adult Health Nursing.** Provides concentrated field practice in adult health nursing in a variety of health care agencies (clinics, hospitals, public health agencies, etc.). Prerequisite: Graduate standing in nursing, and concurrent registration in General Nursing 400 and 401 or consent of instructor. 1 to 4 hours.
- 405. Theoretical Basis for Nursing.** Reviews several schemes for evaluating theory; evaluates selected theories using the above schemes. Pays particular attention to the historical development of nursing theory and the use of theory in nursing. Prerequisite: Graduate standing in nursing or consent of instructor. 2 hours.
- 410. Nursing Research Design.** Critically examines common research designs; presents a variety of data collection procedures; discusses concepts of reliability and validity; explores methods of analysis appropriate to the data; and investigates ethical issues associated with each stage of research. Prerequisite: Graduate standing in nursing or consent of instructor. 2 hours.
- 420. Methods of Teaching in Nursing.** Field experience in teaching nursing in classroom and clinical settings. Students have the opportunity to develop and teach content in their own nursing specialty; includes supervising, counseling, and evaluating students in clinical practice settings. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing; consent of instructor. 1 to 4 hours.
- 429. Methods of Management in Clinical Nursing.** Guided experience in planning, organizing, and managing a division of nursing service in the student's clinical specialty; includes opportunity to observe and participate in the supervisory role, planning a supervisory program, and designing strategy for effective change and for evaluating outcomes. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing, General Nursing 300, or consent of instructor. 3 or 4 hours.
- 440. Special Topics in Nursing.** Selected topics of current interest; offered if there is sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing and consent of instructor. 1 to 3 hours.
- 480. Independent Study in Nursing.** Investigation of special selected problems in nursing under direction of a graduate faculty member; the nature of the selected nursing problem determines the modes of investigation. Prerequisite: Graduate standing in nursing and consent of instructor. 1 to 4 hours.
- 491. Seminar in Nursing.** Identifies and analyzes a broad range of issues related to modern nursing and nursing research. Topics will vary according to student interest. Prerequisite: Graduate standing in nursing and consent of instructor. 1 hour.
- 493. Research in Nursing.** Prerequisite: Credit or concurrent registration in General Nursing 410; graduate standing in nursing. 1 to 5 hours.
- 499. Thesis Research.** 0 hours.

Medical-Surgical Nursing

- 203. Nursing Concepts III Practicum.** Application of the theoretical concepts of leadership and the management process as related to delivery of health care. Prerequisite: Senior standing; concurrent registration in General Nursing 203. 1 hour.
- 220. Medical-Surgical Nursing, II.** Studies concepts and principles of rehabilitation applied to the care of adults with long term, permanent, and progressive disabilities, emphasizing patients with neurological and musculoskeletal conditions; emphasizes the impact of disabilities on families and community systems. Prerequisite: Senior standing; concurrent registration in Medical-Surgical Nursing 221. 3 hours.
- 221. Medical-Surgical Nursing II Practicum.** Applies concepts and principles of rehabilitation to the care of persons with long term, permanent, or progressive disabilities with emphasis on patients with neurological and musculoskeletal conditions; emphasizes patient and family teaching to foster optimal levels of functioning in the community. Prerequisite: Senior standing; concurrent registration in Medical-Surgical Nursing 220. 2 hours.

Public Health Nursing

- 260. Public Health Nursing.** Concepts and principles needed to provide comprehensive health care to individuals and families in homes and community settings; functions of public health nursing in community assessment and community health planning. Prerequisite: General Nursing 204, Health and Safety Studies 374, or equivalent; concurrent registration in Public Health Nursing 261. 3 hours.
- 261. Public Health Nursing Practicum.** Gives students an opportunity to work with families and aggregates in the community, to apply newly acquired public health concepts, and to synthesize previously acquired nursing knowledge and skills. Prerequisite: General Nursing 204; concurrent registration in Public Health Nursing 260. 2 hours.

NUTRITIONAL SCIENCES

Director: J. A. Milner

Program Office: 451 Bevier Hall, 905 South Goodwin, Urbana

- 320. Nutritional Aspects of Disease.** Same as Foods and Nutrition 320. See Foods and Nutrition 320.
- 324. Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Foods and Nutrition 324. See Food Science 324.
- 400. Nutritional Sciences Seminar.** Discussions of current problems in nutritional sciences. Required of all graduate students in the nutritional sciences program. Prerequisite: Nutritional Sciences 410 and consent of instructor. 0 or $\frac{1}{4}$ unit.
- 410. Current Topics in Nutritional Research.** Same as Animal Sciences 410 and Food Science 410. Discussion of current research problems in experimental nutrition. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. $\frac{3}{4}$ unit.
- 411. Chemistry of Nutritional Processes.** Same as Animal Sciences 411 and Food Science 411. Biochemical aspects of nutrition with emphasis on the function, regulation, and metabolism of nutrients in man. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. 1 unit.
- 450. Problems in Clinical Nutrition.** Students meet weekly with University faculty and hospital clinical staff for rounds and tutorial-type discussions which evaluate the nutritional status of hospitalized patients and suggest appropriate nutritional management. Students write research proposals on specific problems or, by arrangement with

the instructor, term papers on the nutritional management of a clinical problem. Prerequisite: Nutritional Sciences 410 and 411, or consent of instructor. $\frac{1}{2}$ unit.

- 461. Advanced Clinical Nutrition, I.** Same as Medical Sciences 461. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; reviews the theory behind nutritional treatment of disease states. Prerequisite: Credit or concurrent registration in Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 461.
- 462. Advanced Clinical Nutrition, II.** Same as Medical Sciences 462. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; incorporates the nutritional assessment and treatments learned in the first semester into nutritional care of hospitalized patients. Prerequisite: Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 462.
- 493. Individual Topics in Nutrition.** For students majoring in nutritional sciences who wish to undertake individual studies of a nonthesis nature in problems or topics not covered in other courses; may be taken under the direction of any member of the nutritional sciences faculty, with the exception of the student's own thesis adviser. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

PAINTING

(See Art and Design)

PHILOSOPHY

Chair of Department: R. L. Schacht

Department Office: 105 Gregory Hall, 810 South Wright, Urbana

NOTE: Students are urged to consult the detailed descriptions of all philosophy courses to be offered in particular semesters. These descriptions may be obtained in the department office at any time beginning one week prior to advance enrollment.

- 101. Introduction to Philosophy.** Consideration of some main problems of philosophy concerning, for example, knowledge, God, mind and body, and human freedom. 3 hours.
- 102. Logic and Reasoning.** A practical study of logical reasoning; techniques for analyzing and criticizing arguments, with emphasis on assessing the logical coherence of what we read and write. 3 hours.
- 103. Scientific Reasoning.** Practical study of scientific reasoning; methods for evaluating scientific evidence and for using scientific information in making decisions. 3 hours.
- 105. Introduction to Ethics.** Some basic questions of ethics, discussed in the light of influential ethical theories and with reference to specific moral problems, such as: what makes an action morally right? are moral standards absolute or relative? what is the relation between personal morality and social morality, and between social morality and law? 3 hours. Credit is not given for both Philosophy 105 and 106.

- 106. Ethics and Social Policy.** An examination of the moral aspects of social problems, and a survey of ethical principles formulated to validate social policy. 3 hours. Credit is not given for both Philosophy 106 and 105.
- 107. Introduction to Political Philosophy.** An examination of the philosophical bases of democracy and some alternative political forms. 3 hours.
- 110. World Religions.** Same as Religious Studies 110. Survey of the leading living religions, including Hinduism, Buddhism, Taoism, Mohammedanism, Judaism, and Christianity; examination of basic texts and of philosophic theological elaborations of each religion. 3 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 198. Freshman Seminar.** Investigation of selected fundamental topics of philosophical inquiry. See Timetable for current topics. Prerequisite: Freshman James Scholar. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Philosophy in Literature.** A consideration of the philosophical themes implicit in a variety of important literary works, both classical and modern; includes such authors as Sophocles, Shakespeare, Goethe, Dostoevsky, and Sartre. 3 hours.
- 202. Symbolic Logic.** An introduction to the techniques of formal logic, dealing primarily with truth-functional logic and quantification theory. 3 hours.
- 203. Ancient Philosophy.** An introduction to ancient philosophy, concentrating on Plato and Aristotle, dealing with such topics as metaphysics, ethics, and the theory of knowledge. 4 hours.
- 206. Early Modern Philosophy.** The history of philosophy from Descartes to Kant. 4 hours.
- 207. Early Modern Philosophy, I.** Bacon, Hobbes, Locke, Berkeley, and Hume. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
- 208. Early Modern Philosophy, II.** Descartes, Spinoza, Leibniz, and Kant. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
- 210. Ethics.** Problems in ethical theory; the nature of right and wrong, justice, conscience, moral feelings, etc. 3 hours.
- 214. Moral Problems in Medicine and Biology.** A philosophical study of selected moral and social problems concerning medicine and biology, such as euthanasia, abortion, allocation of scarce medical resources, health care and rights, and genetic engineering. 3 hours.
- 225. Recent European Philosophy.** Introduction to the major recent philosophical movements in Europe, such as phenomenology, existentialism, philosophical anthropology, and neo-Marxism. 3 hours.
- 230. Philosophy of Religion: Introduction.** Same as Religious Studies 230. Introduction to philosophical analysis of religious thought and experience. 3 hours.
- 250. Conceptions of Human Nature.** A comparative examination of important historical and contemporary conceptions of human nature. 3 hours.
- 270. Philosophy of Science.** Investigation of the nature of scientific knowledge by examining archetypal examples from physical science (e.g., Ptolemaic and Copernican astronomy); nature of scientific truth, validation of theories, nature of scientific theories, evolution of theories, experimental procedure, role of presuppositions, scientific revolutions, etc. 3 hours.
- 275. Technology and Human Values.** Same as Science, Technology, and Society 201. See Science, Technology, and Society 201.
- 280. Current Controversies.** Philosophical examination of positions taken on some issue of current concern, e.g., human sexuality, death and dying, feminism, race, intelligence, war, and sociobiology. See Timetable for current topics. 3 hours. May be repeated with consent of department Chair.

- 290. Individual Study.** Readings in selected philosophical topics. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to juniors and seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the Chair of the department. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 292. Thesis.** Special training in philosophical investigation. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the chair of the department. 2 to 4 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
- 298. Advanced Undergraduate Seminar.** Seminar on selected philosophical topics; intended primarily for advanced undergraduate philosophy concentrators. Prerequisite: A grade-point average of 4.0 and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
- 301. Philosophy and Film.** Study of procedures for interpreting narrative films and evaluating specific interpretations, as well as an examination of philosophical issues raised in selected films. Prerequisite: One course in philosophy or in cinema studies. 4 hours or 1 unit.
- 304. Medieval Philosophy.** The history of philosophy from St. Augustine to William of Ockham. Prerequisite: Philosophy 101 or 203. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 310. Classical Ancient Philosophers.** An intensive study of one ancient philosopher or the intensive study of a major philosophical problem through the consideration of a number of ancient philosophers; chief emphasis on Plato and/or Aristotle. Prerequisite: One course in philosophy, preferably Philosophy 203. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit with the consent of the Chair of the Department.
- 311. Nineteenth Century Philosophy.** Examination of the thought of such major figures as Hegel, Marx, and Nietzsche. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 312. Classical Modern Philosophers.** Intensive study of one, or in special cases, two major philosophers of the period 1600-1900. e.g., Descartes, Hume, Kant, or Hegel. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
- 313. American Philosophy.** Examination of American philosophers from colonial to recent times, for example, Edwards, Peirce, James, Dewey. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Major Recent Philosophers.** Intensive study of one or two important philosophers of the present century, e.g., Wittgenstein, Dewey, Heidegger, or Quine. Topic varies; see Timetable. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit with consent of the department Chair.
- 316. Anglo-American Philosophy Since 1900.** Introduction to the major philosophical developments in England and America in the present century, focusing on such writers as G. E. Moore, Bertrand Russell, A. J. Ayer, Ludwig Wittgenstein, and W. V. Quine. Prerequisite: One course in philosophy. 3 hours or 1 unit.
- 317. Scientific Thought, I.** Same as History 339. A historical and critical survey of the development of science and its philosophical interpretation to the death of Newton. 3 hours or 1 unit.
- 318. Scientific Thought, II.** Same as History 340. A historical and critical survey of the development of science and its philosophical interpretation from the death of Newton to the early twentieth century. Prerequisite: Philosophy 317. 3 hours or 1 unit.
- 319. Space, Time, and Matter.** Same as Physics 319. See Physics 319.
- 321. Ethics and Value Theory.** A systematic study of selected classics in moral philosophy by such philosophers as Aristotle, Hume, and Kant. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 322. Recent Developments in Ethics.** Intensive treatment of issues in contemporary ethical theory. Prerequisite: One course in ethics. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit once with consent of the department Chair.

- 323. Philosophy of Art.** Examination of philosophical interpretations of art and aesthetic experience by influential classical and recent writers. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 324. Philosophy of Religion.** Same as Religious Studies 362. Considers central issues in the philosophy of religion, e.g., the justification of religious belief, the nature of God, religious experience, etc. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Philosophy of Mind.** Philosophical problems arising in connection with mental phenomena; the relation of mind and body; free will and determinism; our knowledge of other minds; and the self and personal identity. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 326. Metaphysics.** Investigation of various metaphysical issues concerning, for example, existence, substance, particulars and universals, and space and time. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 330. Theory of Knowledge.** Investigation of issues concerning, for example, the nature and possibility of knowledge; its forms and limits; its relation to belief, truth, and justification; and the nature of truth. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Analytic Philosophy.** Intensive study of works of important analytic philosophers, such as Wittgenstein, Austin, and Quine, on problems of knowledge, method, and other selected topics. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 335. Social Philosophy.** Selected topics from the nature of social organization, nature and convention, utility, justice, equality, liberty, rights, and duties. Prerequisite: Philosophy 105, 106, or 321, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 336. Philosophy of Law and of the State.** Examination of issues in the philosophy of law, such as the nature of law, law and morality, justice, liberty and authority, punishment, and legal responsibility. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 337. Semantics.** An investigation of semantical concepts such as denoting and truth; a study of the functions of language; definition, meaning and verification, and semantical paradoxes. Prerequisite: A course in logic. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 338. Philosophy of Language.** Same as Linguistics 338. A historical or comparative study of the philosophy of language. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 339. Philosophy of Mathematics.** Same as Mathematics 339. Introduction to some of the main philosophical problems and contemporary viewpoints concerning mathematical concepts, mathematical methods, and the nature of mathematical truths. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Existential Philosophy.** Study of a selection of the major writings of the more important existential philosophers, e.g., Heidegger, Jaspers, and Sartre. Prerequisite: One course in philosophy (preferably Philosophy 225 or 311), or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 343. Phenomenology.** Study of the development of phenomenology from Husserl to the present. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Topics in Phenomenology.** Examination of phenomenological treatments of selected phenomena, such as interpersonal relationships, emotions, the body, and perception; see Timetable for current topics. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Marxist Philosophy.** Examination of the philosophical writings of a number of Marxist writers, from Marx himself to such neo-Marxists as Schaff, Petrovic, Sartre, and Marcuse. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 347. Post-Structuralist French Philosophy.** Intensive study of a selection of the major writings of recent French philosophers, such as Foucault and Derrida. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 353. Formal Logic and Philosophy.** Techniques and results of symbolic logic, with special attention to topics of philosophical importance. Prerequisite: Philosophy 202, graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 354. Advanced Symbolic Logic.** Completeness, compactness, and Lowenheim-Skolem

theorems for first-order logic; incompleteness and undecidability of formal systems; and additional material on proof theory, model theory, or axiomatic set theory as time permits. Prerequisite: Philosophy 202 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 371. Philosophy of Science: Contemporary Issues.** Examines important developments and controversies in recent philosophy of science. Prerequisite: Philosophy 270 or consent of instructor. 3 hours or 1 unit.
- 375. The Philosophy of Social Science.** Same as Anthropology 329 and Sociology 325. A survey of philosophical problems encountered in the disciplines concerned with man and society, with particular emphasis on the extent to which questions and subject matter in these fields are amenable to scientific treatment. 3 hours or 1 unit.
- 377. Philosophy of Psychology.** A philosophical examination of the aims, methods, and structure of psychology, with special attention to such issues as the nature of explanations of behavior, the adequacy of behaviorism as a philosophy of psychology, and the place of the mind in psychological investigation. Prerequisite: Two courses in psychology, or consent of instructor. 3 hours or 1 unit.
- 401. Seminar in the History of Philosophy.** Study of selected major philosophers, movements, problems, or topics in the history of philosophy; see Timetable for current topics. 1 unit. May be repeated.
- 411. Seminar in Ethical Theory.** 1 unit. May be repeated.
- 412. Seminar in Social Philosophy.** A seminar designed to study special problems in social philosophy. See Timetable for current topics. 1 unit. May be repeated.
- 413. Logical Theory.** Logical syntax and semantics. Prerequisite: A course in logic or consent of instructor. 1 unit. May be repeated.
- 417. Seminar in the Philosophy of Science.** Various problems arising from specific studies in philosophy pertaining to science and vice versa. To be offered with varying topics. 1 unit. May be repeated.
- 420. Seminar in Semantics.** Same as Communications 420. Intensive study of important contemporary contributions in the fields of semantics, analytic philosophy, and the philosophy of language. Prerequisite: Graduate standing in philosophy or equivalent. 1 unit. May be repeated.
- 421. Seminar in Contemporary Problems.** Intensive study of selected problems or topics in contemporary philosophy. 1 unit. May be repeated.
- 423. Seminar in the Theory of Knowledge.** Selected topics and writings of major importance in the contemporary philosophy of knowledge. 1 unit. May be repeated.
- 425. Seminar in the Philosophy of Mind.** Selected topics from major writings in the philosophy of mind. 1 unit. May be repeated.
- 483. Individual Topics.** Individual study and oral and written reports on topics not covered in other courses. Topics and plan of study must be approved by the candidate's adviser and by the staff member who directs the work. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ to 2 units).
- 490. Directed Research.** Restricted to students satisfying requirements for the master's degree by writing a substantial essay. Normally taken for two units credit but may be taken for three units credit with consent of department Chair. 0 to 3 units.
- 499. Thesis Research.** 0 to 4 units.

PHOTOGRAPHY

(See Art and Design)

PHYSICS

Head of Department: A. C. Anderson

Department Office: 211 Loomis Laboratory of Physics, 1110 West Green, Urbana

- 101. General Physics (Mechanics, Heat, and Sound).** Lectures with demonstrations, recitations, and laboratory. For students in arts and sciences, architecture, agriculture, and veterinary medicine. Prerequisite: Trigonometry. 5 hours.
- 102. General Physics (Light, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in arts and sciences, architecture, agriculture, and veterinary medicine. Prerequisite: Physics 101. 5 hours.
- 106. General Physics (Mechanics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Mathematics 120; credit or concurrent registration in Mathematics 132. 4 hours.
- 107. General Physics (Heat, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 106; credit or concurrent registration in Mathematics 242. 4 hours.
- 108. General Physics (Wave Motion, Sound, Light, and Modern Physics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 107; credit or concurrent registration in Mathematics 242. 4 hours.
- 140. Practical Physics: How Things Work—A Course for Nonscientists.** A nonmathematical lecture-demonstration course for nonscience students, underscoring the generality and ubiquity of basic physical laws in understanding commonplace phenomena: musical instruments, photography, electric and electronic circuits, television, motors, engines, etc. 3 hours. No credit for students in the College of Engineering.
- 141. Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 140. Prerequisite: Credit or concurrent registration in Physics 140. 1 hour.
- 150. Physics and the Modern World: A Course for Nonscientists.** A nonmathematical lecture course attempting to bridge the two-culture gap; takes examples from modern physics: relativity, elementary particles, quantum theory, statistics, etc., and covers basic philosophical concepts in physics which pervade all human disciplines: model-making, dynamics, ensemble behavior, and symmetry. 3 hours.
- 151. Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 150. Prerequisite: Credit or concurrent registration in Physics 150. 1 hour.
- 180. Nuclear Weapons, Nuclear War, and Arms Control.** Same as Science, Technology, and Society 180. A beginner's course on the physics of nuclear weapons, nuclear weapon effects, delivery systems, and defenses against nuclear attack; nontechnical, but about technology. Designed to assist students in making informed judgments about nuclear armaments and arms control; includes presentation of current issues. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. Introductory Relativity.** Examines the consequences of Einstein's postulates for space and time; relativistic momentum and energy: $E = mc^2$; the equivalence principle, gravity, and the spacetime viewpoint of general relativity; the relativistic unity of electric and magnetic fields. Prerequisite: Concurrent registration in Physics 102 or 107. 2 hours.
- 302. Principles of Atmospheric Dynamics.** Same as Atmospheric Sciences 302. See Atmospheric Sciences 302.
- 303. Modern Experimental Physics, I.** Techniques and experiments in the physics of atoms, atomic nuclei, molecules, the solid state, and other areas of modern physical research. Prerequisite: Physics 333; concurrent registration in Physics 386. 3 to 5 hours, or $1/2$ to 1 unit. Students taking the course for the first time must register for 5 hours or 1 unit. Those repeating the course may do so for variable credit of 3 to 5 hours, or $1/2$ to 1 unit.

- 319. Space, Time, and Matter.** Same as Philosophy 319. A philosophical examination of some fundamental concepts and theories of the physical world, such as time, matter, causation, space, and geometry; interpretation of quantum theory. Graduate students write an additional paper. Prerequisite: Junior standing, one physical science course, and one of the following: Physics 108 or Philosophy 101, 270, or 317; alternatively, consent of instructor. 3 hours or 1 unit.
- 331. Intermediate Electricity and Mechanics.** Studies linear systems: electrostatics, electric circuits, mechanical oscillators; free and driven motion, a-c and transient behavior, linear response theory; filters, one-dimensional lattices, transition from discrete to continuous systems, strings, and transmission lines. Involves lectures, problems, and laboratory. Prerequisite: Two semesters of general physics, concurrent registration in Mathematics 341 or 345, and in Physics 108; or consent of instructor. 5 hours, or $3/4$ or 1 unit ($3/4$ unit without laboratory). No graduate credit given to physics majors.
- 332. Classical Mechanics.** Examines particle motion in two and three dimensions including planets and satellites, conservation laws for systems of particles, accelerated reference frames, rigid bodies in three dimensions, Newtonian gravitation, fluid flow, generalized coordinates, Lagrange's equations, normal modes, and phase space. Prerequisite: Physics 331, Mathematics 341 or 345, and concurrent registration in Mathematics 343; or consent of instructor. 4 hours or 1 unit.
- 333. Electromagnetic Fields.** Electrostatics, magnetostatics (including slowly varying currents); electromagnetic induction; energy and forces; Maxwell's equations; electromagnetic wave propagation, reflection and transmission; waveguides and cavities; radiation from dipoles and slow particles. Lectures, problems and laboratory. Prerequisite: Physics 331, Mathematics 341 or 345, and Mathematics 343. 5 hours, or $3/4$ or 1 unit ($3/4$ unit without laboratory).
- 343. Electronic Circuits, I.** The physics of semiconductor devices; theory and application of discrete and integrated devices in linear circuits; use of operational amplifiers and feedback; regulation, oscillators, and modulation; emphasizes practical experience. Lectures, problems, and laboratory. Prerequisite: Physics 331 or consent of instructor. 5 hours or 1 unit.
- 344. Electronic Circuits, II.** Continuation of Physics 343 with particular emphasis on nonlinear devices, switching circuits, digital logic, analog to digital and digital to analog conversion, and individual projects. Lectures, problems, and laboratory. Prerequisite: Physics 343 or consent of instructor. 5 hours or 1 unit.
- 346. Modern Physics for Nuclear Engineers.** Same as Nuclear Engineering 346. Those fundamentals of quantum theory, atomic structure, and nuclear behavior needed by students before taking advanced courses in nuclear engineering; basic information on radiation types, properties, and interactions. Prerequisite: Physics 108; and Mathematics 341 or 345; or equivalents. 3 hours or $3/4$ unit. Not available for graduate credit to nuclear engineering students.
- 361. Thermodynamics and Statistical Mechanics.** A course in statistical and thermal physics designed primarily for advanced undergraduates; topics include equilibrium thermodynamics, statistical mechanics, and kinetic theory of gases. A unified treatment is used in that the principles of heat and thermodynamics are discussed along with statistical postulates and the microscopic approach of introductory quantum mechanics. Prerequisite: Two 300-level courses in physics or consent of instructor. 4 hours or 1 unit. Credit may not be earned in both Physics 361 and Mechanical Engineering 301, Chemistry 342 and 344, and Metallurgical Engineering 420.
- 365. Introduction to Plasma Physics.** Physical concepts underlying the description of ionized gases; individual particle and continuum models; collision processes in plasmas; charged particle motion in electromagnetic fields; waves in cold plasmas; elementary treatment of collective plasma behavior; simple plasma instabilities; selected topics of current interest. Prerequisite: Electrical Engineering 350 or Physics 333, or consent of instructor. 4 hours or 1 unit.
- 371. Light.** Wave kinematics; geometrical optics; basic concepts, ray-tracing and matrix formalism, Gaussian imaging by thick lenses, stops, and apertures, and intensity re-

- lations; interference; interference spectroscopy and coherence; diffraction: Fresnel-Kirchhoff formulation, Fraunhofer case, Fresnel case, and holography; polarized light. Lectures, laboratory, and problems. Prerequisite: Physics 101 and 102, or Physics 106, 107, and 108; Mathematics 345; or consent of instructor. 4 hours, or $1/2$ or 1 unit.
- 382. Subatomic Physics.** A lecture and problem course surveying subatomic physics; includes the nature and properties of nuclei and elementary particles, symmetries, interactions, nuclear models, tools and techniques of experimental subatomic physics, and applications to power generation, astrophysics, chemistry, medicine, and biology. Prerequisite: Physics 383 or 386, or consent of instructor. 4 hours or 1 unit.
- 383. Atomic Physics and Quantum Theory.** Introduction to the basic concepts of quantum theory which underlie modern theories of the properties of materials; topics covered include elements of atomic and nuclear theory; kinetic theory and statistical mechanics; quantum theory and simple applications; atomic spectra and atomic structure; molecular structure and chemical binding. Lectures and problems. Prerequisite: General physics; general chemistry; Mathematics 345 or equivalent. 3 hours, or $3/4$ or 1 unit.
- 386. Atomic Physics and Quantum Mechanics, I.** Studies atomic phenomena integrated with an introduction to quantum theory; discussion of topics includes evidence for the atomic nature of matter and the properties of the Schrodinger equation, single particle solutions in one dimension, the hydrogen atom, perturbation theory, external fields, and atomic spectroscopy of outer electrons. Prerequisite: General physics; Mathematics 343 or 345, or consent of instructor. 4 hours or 1 unit.
- 387. Atomic Physics and Quantum Mechanics, II.** Continuation of Physics 386. Topics treated include identical particles, spectral hyperfine structure, magnetic properties of matter, atomic spectroscopy of inner electrons, high-energy photon effects, molecular binding and spectra, emission and absorption of light, and symmetry principles. Prerequisite: Physics 386. 4 hours or 1 unit.
- 389. Introduction to Solid State Physics.** Bonding and structure of crystals; energy bands in insulators, semiconductors, and metals; electrical conductivity; optical properties; lattice vibrations; elasticity; point defects; dislocations. Prerequisite: Junior standing in science or engineering, or equivalent. 4 hours or 1 unit.
- 397. Individual Study.** Individual study at an advanced level in a subject not covered by course offerings. Prerequisite: Upperclassman; consent of adviser and staff member who supervises the work. 1 to 4 hours, or $1/4$ to 1 unit.
- 398. Seminar on Special Topics in Modern Physics.** Lecture course on topics of current interest in physics. For advanced undergraduates or graduates. Subjects and prerequisites to be announced in the Timetable. 1 to 4 hours, or $1/4$ to 1 unit.
- 402. Theoretical Astrophysics.** Same as Astronomy 402. Application of physical principles to a broad selection of topics in astrophysics: fluid dynamics in an astrophysical context; equilibria and collapse of interstellar clouds; star formation; shock waves, ionization fronts, winds, and accretion and jets; stellar structure, evolution, and nucleosynthesis; white dwarfs, neutron stars, pulsars, and compact x-ray sources; dynamics of stellar systems and spiral structure; cosmic electrodynamics, including continuum radiation mechanisms, cosmic rays, and radio galaxies; cosmology; galaxy formation; and quasars. Emphasis on the underlying physics rather than on detailed factual description. Prerequisite: Physics 332, 333, 361, and 386; or consent of instructor. 1 unit.
- 404. Stellar Structure and Evolution.** Same as Astronomy 404. See Astronomy 404.
- 405. Diffuse Matter Astrophysics.** Same as Astronomy 405. See Astronomy 405.
- 406. High Energy Astrophysics.** Same as Astronomy 406. See Astronomy 406.
- 411. Special Functions and Boundary Value Problems in Physics.** Use of special functions in solving homogeneous partial differential equations of physics; emphasis on applications to topics such as electrostatics, wave guides and resonant cavities, vibrations of membranes, heat flow, and potential flow in fluids. Prerequisite: Mathematics 343 and 345, or equivalent. This course may be taken concurrently with Physics 413 or 414. $1/2$ unit.
- 412. Additional Techniques of Mathematical Physics.** Solution of inhomogeneous differential equations with particular emphasis on problems in electromagnetism; addi-

tional topics such as perturbation theory, variational methods, and integral equations; emphasis on application of the techniques to nonquantum physics problems. Prerequisite: Physics 411 or equivalent. This course may be taken concurrently with Physics 413 or Physics 414. $\frac{1}{2}$ unit.

- 413. Uses of Complex Variables in Physics.** A review of complex variable theory, with emphasis on calculations useful to physicists; integration, conformal mapping, Laplace and Fourier transforms, and additional topics of use in theoretical physics. Prerequisite: Undergraduate mathematics at the level of Mathematics 343 and 345; some previous exposure to complex variables helpful, but not required. $\frac{1}{2}$ unit.
- 414. Basics of Advanced Mechanics.** Fundamentals of classical Lagrangian and Hamiltonian mechanics, with emphasis on the relation between dynamical symmetries and constants of the motion; use of conservation laws to derive basic equations of fluid dynamics; discussion of some applications. Prerequisite: Mechanics at the level of Physics 332 or consent of instructor. $\frac{1}{2}$ unit.
- 415. Introduction to Continuum Mechanics.** Basic information on stress, strain, and waves in an elastic solid, the Euler and Navier Stokes equations, potential flow, vortex theory, viscous flows, gas dynamics, characteristics, and shock waves. Prerequisite: Concurrent registration in Physics 411 and 412, or equivalent. $\frac{1}{2}$ unit.
- 420. Nonlinear Dynamics.** A broad introduction to nonlinear dynamics of physical systems with varying degrees of complexity; surveys a variety of concepts associated with bifurcation phenomena, mappings, nonlinear oscillations, chaotic behavior, strange attractors, solitons, and topics of current interest. Prerequisite: Mathematics 343 or 345 or equivalent; Physics 332 or equivalent; or consent of instructor. 1 unit.
- 424. General Relativity and Cosmology.** Same as Astronomy 424 and Mathematics 460. Foundations of general relativity and applications to problems of astrophysics; includes gravitation as geometry, mathematical tools, Einstein's equations, relativistic stellar structure, black holes and gravitational collapse, cosmology, gravitational radiation, and experimental tests. Prerequisite: Physics 332, 411, 412, and 442, or equivalent; or consent of instructor. 1 unit.
- 430. Surface Physics.** Same as Metallurgical Engineering 430. See Metallurgical Engineering 430.
- 435. Theory of Semiconductors and Semiconductor Devices.** Same as Electrical Engineering 435. See Electrical Engineering 435.
- 442. Classical Electromagnetic Radiation.** A review of Maxwell's equations followed by a relativistic formulation of the electromagnetic field and the motion of charged particles; plane and guided waves; retarded potentials; radiation from simple antennas; radiation from accelerated charged particles; synchrotron radiation, bremsstrahlung, scattering, and further topics. Prerequisite: Physics 411 and 412, or equivalent; electromagnetism at the level of Physics 333; special relativity at the level of Physics 210. 1 unit.
- 450. Biomolecular Physics.** Same as Biochemistry 450 and Biophysics 450. Physical concepts governing the structure and function of biological macromolecules; general properties, spatial structure, energy levels, dynamics and functions, and relation to other complex physical systems such as glasses; recent research in biomolecular physics; physical techniques and concepts from theoretical physics emphasized. Designed for students without appreciable background in biology and chemistry. Prerequisite: Chemistry 102 or equivalent, Physics 383 or 387 or equivalent, or consent of instructor. 1 unit.
- 455. Reactor Theory, I.** Same as Nuclear Engineering 455. See Nuclear Engineering 455.
- 456. Reactor Theory, II.** Same as Nuclear Engineering 456. See Nuclear Engineering 456.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Theoretical and Applied Mechanics 459. See Mathematics 459.
- 462. Statistical Mechanics and Kinetic Theory.** Single-particle distribution functions; classical and quantum mechanical systems, Boltzmann equation, virial theorem, and equations of state for gases; formal theory: ensembles, identical particles, thermodynamics of simple systems, and distribution functions; nonequilibrium problems; con-

servation laws and hydrodynamic equations, sound waves, and transport coefficients; plasmas, normal Fermi fluid, superfluids, and systems with internal degrees of freedom. Prerequisite: Physics 361 and elementary quantum mechanics, or consent of instructor. 1 unit.

- 463. Liquid Helium and Superconductivity.** Emphasizes fundamental physical phenomena rather than detailed microscopic theory; normal Fermi liquids and normal liquid ^3He : equilibrium properties, kinetic equation, collective modes, and finite temperature effects; superfluid ^4He : equilibrium properties, two fluid model, Bogoliubov's microscopic model, condensates, and vortex lines; superconductivity: electrodynamic properties, Landau-Ginzburg theory, BCS theory, tunneling, Josephson effect, and superfluid ^3He . Prerequisite: Physics 462 and 481, or consent of instructor. 1 unit.
- 464. Phase Transitions.** Phenomenology of phase transitions, scaling, critical behavior, and multi-criticality; Landau theory of phase transitions; renormalization group methods, including lattice models and epsilon-expansion; numerical methods: critical dynamics; and selected additional topics. Prerequisite: Physics 462 or consent of instructor. 1 unit.
- 465. Plasma Physics.** Survey of plasma phenomena in nature and in the laboratory; physical description of plasma phenomena by the independent particle model, one- and two-fluid models, magnetohydrodynamic equations, and kinetic equations; applications to quantum plasmas; nonlinear effects and turbulence in plasmas; astrophysical and thermonuclear plasmas. Prerequisite: Physics 333 or equivalent, or consent of instructor. 1 unit.
- 470. Introduction to Nuclear and Particle Physics.** Nuclear systematics, nucleon-nucleon interaction, shell model, and single particle and collective excitations; hadron spectroscopy, hadronic quantum numbers, quark-parton model, and hadron dynamics; weak interactions. Prerequisite: Physics 480 and concurrent registration in Physics 481. 1 unit.
- 471. Nuclear Physics, I.** Systematics of stable nuclei and the nuclear potential; properties of odd- A nuclei; spherical single-particle shell model; residual interactions; collective states and deformed nuclei; summary of theory and experiment for low-lying states; momentum distribution of nucleons; fission. Prerequisite: Physics 470. 1 unit.
- 472. Nuclear Reactions.** Theory and observation of the interaction of electrons, photons, protons, neutrons, and heavier projectiles with nuclei; elastic and inelastic scattering and particle transfer; resonance reactions and fission; and exotic atoms, meson-nucleus interactions, and scattering. Prerequisite: Physics 382 and 481, or equivalent, or consent of instructor. 1 unit.
- 475. Particle Physics, I.** Basic calculations in elementary particle theory. Quantum electrodynamics, quantum chromodynamics, and the Glashow-Weinberg-Salam theory of weak and electromagnetic interactions as applied to the phenomenology of particle decays and high energy reactions. (Offered fall semester only.) Prerequisite: Physics 470; credit or concurrent registration in Physics 483 strongly recommended. In exceptional circumstances, Physics 470 may be taken concurrently. 1 unit.
- 476. Particle Physics, II.** Continuation of Physics 475. Current topics in particle theory; topics change from year to year. Typically treats three or four different subjects in depth. (Offered spring semester only.) Prerequisite: Physics 475, or consent of instructor. 1 unit. May be repeated as topics vary.
- 480. Quantum Mechanics, I.** A second course in quantum mechanics for students with a good background in wave mechanics and atomic and molecular structure. Operators, state vectors, and the formal structure of quantum theory; operator treatments of simple systems; angular momentum and vector addition coefficients; stationary state perturbation theory; introduction to scattering theory for particles without spin, partial wave analysis, and Born approximation; examples taken from atomic, nuclear, and elementary particle physics. Prerequisite: Senior-level atomic physics and quantum mechanics, or consent of instructor. 1 unit.
- 481. Quantum Mechanics, II.** Spin and identical particles, simple many-particle systems and elements of second-quantization theory; time-dependent processes, radiative transitions, and quantization of the electromagnetic field; scattering of particles with spin;

- polarization; introduction to the Klein-Gordon and Dirac equations, and properties of simple relativistic systems. Prerequisite: Physics 480 or consent of instructor. 1 unit.
- 483. General Field Theory.** Covers standard techniques of field theory as used by experimenters and theorists; relativistic quantum mechanics of a single particle; Lagrangian field theories, perturbation theory, and calculation of lowest-order processes; introduction to Feynman diagrams and higher order processes; examples taken from quantum electrodynamics, solid-state and elementary particle physics, and many-body theory. Prerequisite: Physics 481 or consent of instructor. 1 unit.
- 485. Advanced Field Theory.** Quantization and Feynman path integral; gauge theories and renormalization; renormalization group with applications to particle physics and critical phenomena; approximation methods and recent developments. Prerequisite: Physics 483 or consent of instructor. 1 unit.
- 486. The Constitution and Behavior of the Upper Atmosphere.** Same as Electrical Engineering 486. See Electrical Engineering 486.
- 489. Solid State Physics, I.** Crystalline perfection, free electron gas, screening, plasma oscillations, and dielectric response; Bloch electrons, Brillouin zones, and band structure; semiconductors, intrinsic and extrinsic, with applications; phonons, elasticity, and anharmonicity; ferromagnetism and second-order phase transitions; superconductivity. Prerequisite: Physics 361 or consent of instructor; and Physics 480. 1 unit.
- 490. Solid State Physics, II.** Hartree-Fock theory and electron-electron interactions; electron-phonon interactions; electron dynamics and transport; BCS theory of superconductivity; elastic properties; thermal properties due to anharmonicity; defects in solids. Prerequisite: Physics 481 and 489. 1 unit.
- 497. Individual Study.** Individual study in a subject not covered in course offerings may be arranged for credit by registration under this number. $\frac{1}{2}$ to 4 units.
- 498. Seminar on Special Topics in Modern Physics.** Lecture course in topics of current interest. Several subjects are announced in each Timetable. Among them are semiconductor physics, magnetic resonance, surface physics, lattice dynamics, band theory of solids, crystal imperfections, nuclear structure, field theory, elementary particle physics, advanced statistical mechanics, plasma theory, astrophysics, atmospheric physics, group theory and applications. Prerequisite: Determined for each offering. See Timetable. $\frac{1}{4}$ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

PHYSIOLOGY AND BIOPHYSICS

Head of Department: D. E. Buetow

Department Office: 524 Burrill Hall, 407 South Goodwin, Urbana

Biophysics

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Reading and Individual Topics.** Reading or laboratory work chosen in consultation with a departmental faculty sponsor. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours.
- 301. Introduction to Biophysics.** Review of the field of biophysics designed to introduce the student to types of biological problems currently under investigation. Prerequisite: 8 hours of physics. 3 hours or $\frac{3}{4}$ unit.
- 302. Fundamentals of Nervous Activity.** The quantitative basis of the generation and transmission of electrical signals within and between nerve cells; develops and discusses, with examples, the physical relationships describing resting potential, core conduction, excitation, and synaptic transmission. Meets during the first half of the spring semester. Prerequisite: One year of calculus and one year of college physics. 2 hours or $\frac{1}{2}$ unit.

- 312. Introduction to Radiobiology.** Nature and mechanisms of the biological consequences of low dose and chronic irradiation. Intended primarily for students in engineering and physical sciences. Prerequisite: Mathematics 242 or 245; 8 hours of physics; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 320. Molecular Biophysics.** Same as Biochemistry 320. Examines structure and function of biological macromolecules and supramolecular assemblies; uses various display techniques to describe the three dimensional nature of biological structure. Specific topics include: diffraction methods, protein structure and the molecular basis of enzyme catalysis, antibody structure and function, virus structure and assembly; membrane proteins, microtubules and other supramolecular assemblies, nucleic acid structure, protein-nucleic acid interactions. Prerequisite: Biochemistry 352 or Chemistry 346 or Physics 350, or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 332. Photosynthesis.** Same as Plant Biology 332. A comprehensive description of photosynthesis; topics include: the photosynthetic membranes, light absorption, electron and proton transfer, photophosphorylation, water oxidation, RUBP carboxylase/oxygenase, photorespiration, whole plant photosynthesis, translocation and herbicide action. Prerequisite: Plant Biology 330, Biochemistry 350, Biophysics 301, or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 354. Biological Energy Conversion.** Introduces and explores the major mechanisms of energy conversion in biology, with particular emphasis on respiratory and photosynthetic bioenergetics, and the physico-chemical tools required to describe these processes. Prerequisite: Biochemistry 350, and Chemistry 340 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 404. Physiological Measurements.** Same as Physiology 404. See Physiology 404.
- 406. Principles of Biophysical Measurements.** Lecture course designed to acquaint the student with physical methods useful in the solution of biological problems; topics covered include bioelectric measurements, including basic electronics; optical methods, including microscopy, spectrophotometry, and measurement of action spectra; use of high-energy radiations; tracer techniques; and acoustical techniques. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 410. Special Topics in Biophysics.** Advanced course/tutorials on topics of interest in biophysics, such as electrophysiology, radiation biology, bioenergetics, bioacoustics, protein structure, or the physics of muscular contraction. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 411. Seminar.** Survey of literature in one area of biophysics, with special emphasis on student reports. Prerequisite: Enrollment in the biophysics program or consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 414. Sensory Biophysics.** Advanced treatment of sensory systems which are approachable in detailed quantitative terms, with emphasis on the visual system; lectures scheduled during the first quarter of the spring semester. Normally carries $\frac{1}{4}$ unit credit; however, students may develop a particular topic introduced in the lectures into a term paper for an extra $\frac{1}{4}$ unit credit. Prerequisite: Biophysics 301, Physiology 301 or 403, or consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit. Students must consult the instructor before enrolling for $\frac{1}{2}$ unit.
- 415. Radiation Biophysics.** Consideration in quantitative terms of the mechanisms of the responses of molecules and cells to ionizing radiation; meets during the second quarter of the spring semester. Prerequisite: Graduate standing in biophysics, one year of physics beyond introductory physics, and Biophysics 301 or 312, or consent of instructor. $\frac{1}{4}$ unit.
- 424. Ultrasonic Biophysics.** Same as Bioengineering 424. Ultrasonic propagation in, and interaction with, biological media at macromolecular, cellular, and organismic levels of structure; meets during the first quarter of the spring semester in alternate years. Prerequisite: Graduate standing in biophysics or consent of instructor. $\frac{1}{4}$ unit.
- 426. Kinetic Models in Biophysics.** Techniques of constructing kinetic models to correlate data from biological systems; includes drawing implications of physical mechanisms from model behavior; and considers intensive treatment of excitable cell membrane as

an example of a modelled system. Meets during the second half of the spring semester in alternate years. Prerequisite: Cellular physiology and calculus. $\frac{1}{2}$ unit.

- 428. Cell Membranes.** Isolation and biochemical analysis; experimental membrane models Gouy-Chapman-Stern layers; equations of transport (diffusional, mediated, and active); phospholipid bilayers and protein subunits; and cell membrane synthesis (in vivo and in vitro). Meets during the second half of the spring semester in alternate years. Prerequisite: Biophysics 301 or Physiology 402; Biochemistry 350 or equivalent. $\frac{1}{2}$ unit.
- 436. Plant Biophysics.** Same as Plant Biology 436. See Plant Biology 436.
- 438. Bioenergetics of Photosynthesis.** Same as Plant Biology 438. Biophysical and biochemical mechanisms of green plant and/or bacterial photosynthesis; includes the role of membranes; and emphasizes energetic aspects of photosynthesis. Meets during the last half of the fall semester in alternate years. Prerequisite: One year each of college-level physics, chemistry, and biology; Biochemistry 350 or Biophysics 301; or consent of instructor. $\frac{1}{2}$ unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biochemistry and Chemistry 440. See Chemistry 440.
- 442. Biomedical Magnetic Resonance.** Principles of magnetic resonance and its application to biology and medicine; includes discussion of magnetic resonance imaging and spectroscopy of living systems. Meets in the fall semester of alternate years. Prerequisites: Introductory biology and physical chemistry. $\frac{3}{4}$ unit.
- 446. Bacterial Energetics.** Same as Microbiology 446. Describes and analyzes the principles of biological energy transduction using diverse examples from prokaryotic metabolism; includes fermentations, aerobic and anaerobic respiration, photosynthesis. Meets during the last half of the spring semester. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. $\frac{1}{2}$ unit.
- 450. Biomolecular Physics.** Same as Biochemistry 450 and Physics 450. See Physics 450.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Veterinary Biosciences and Animal Science 463. See Veterinary Biosciences 463.
- 475. Biophysics of Muscle.** Description and analysis of the fundamental physical processes underlying motility and contraction in living systems; surveys recent advances and assesses current status of relevant problems; meets during the second quarter of the fall semester in alternate years. Prerequisite: Chemistry 340 or 342, and Biochemistry 350. $\frac{1}{4}$ unit.
- 490. Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Topics covered include bioacoustics, electrophysiology, bioenergetics, cellular biophysics, dynamics of macromolecules, fluorescence spectroscopy, kinetics, mathematical biophysics, membrane biophysics, molecular biophysics, muscle biophysics, photosynthesis, protein-lipid interactions, radiation biophysics and oncology, senescence, thermoregulation, vision, protein structure. Prerequisite: Consent of department. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Research may be conducted in one of the areas listed below, subject to approval of the staff member concerned and the department in which the research is to be done: (a) bioacoustics; (b) biophysics of excitable membranes; (c) physical properties of lipids and membranes; (d) lipid biophysics, and model membranes; (e) photobiology and photosynthesis; (f) biophysics of muscular contraction; (g) radiobiology; (h) information theory and cybernetics; (i) ion transport and permeability; (j) macromolecular structure; (k) biophysical chemistry; (l) sensory biophysics. 0 to 4 units.

Physiology

- 101. Introduction to Human Physiology: Physical and Chemical Bases of Cell Function, Principles of Physiological Control Systems, Coordinated Body Functions.** Emphasizes those aspects especially illustrative of general principles of biology; designed for biological sciences general education requirement; especially suitable for coupling with an anthropology or psychology course. Prerequisite: High school chemistry strongly recommended. 3 hours. Credit will not be given for Physiology 101 and either Physiology 102 or 103.
- 102. Introduction to Human Physiology: Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Emphasizes those aspects which make physiology unique among the life sciences; designed for biological sciences general education requirement; especially suited for coupling with another course in biology. Prerequisite: A college course in biology or equivalent (for example, 3 hours credit or credit waiver via CLEP examination). 3 hours. Credit will not be given for Physiology 102 and either Physiology 101 or 103.
- 103. Introduction to Human Physiology: The Physical and Chemical Bases of Cellular Function, Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Prerequisite: High school chemistry strongly recommended. 4 hours. Credit will not be given for Physiology 103 and either Physiology 101 or 102.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Reading and Individual Topics Course.** Readings or laboratory work in fields chosen in consultation with a departmental faculty sponsor. Must be taken in partial fulfillment of departmental honors requirements. Prerequisite: A course in physiology; consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours.
- 292. Senior Thesis.** Research in physiology under the direction of a faculty sponsor in the Department of Physiology and Biophysics. A thesis, based on the research, must be submitted by the student and approved by the Physiology Undergraduate Honors Committee in order for him/her to be considered a candidate for graduation with distinction in physiology. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 8 hours.
- 295. Special Topics in General Physiology.** Selected topics in general physiology. Prerequisite: Credit or concurrent registration in Physiology 301; consent of instructor. 2 hours.
- 296. Special Topics in Animal Physiology.** Selected topics in animal physiology. Prerequisite: Credit or concurrent registration in Physiology 302; consent of instructor. 2 hours.
- 301. General Physiology.** A consideration from the standpoint of experimental biology of functions that are common to most eukaryotic cells. Prerequisite: Biology 111 or 251, or equivalent; one year each of college-level mathematics and physics; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
- 302. Animal Physiology.** Examines organ physiology of animals; primary emphasis is on the control systems underlying regulation of homeostasis in mammals, including human beings. Prerequisite: Biology 111 or 251, or equivalent; one year college physics; Mathematics 120; chemistry through organic. 3 hours or $\frac{3}{4}$ unit.
- 303. General Physiology Laboratory.** An introduction to experimentation with cellular functions common to most eukaryotic cells; emphasis on biochemical, radioactive tracer, electrical, and mechanical recording techniques. Prerequisite: Credit or concurrent registration in Physiology 301. 2 hours or $\frac{1}{4}$ unit.
- 304. Experimental Physiology Laboratory.** Introduction to problems and techniques for studying the physiology of organ systems. Prerequisite: Credit or concurrent registration in Physiology 302. 2 hours or $\frac{1}{4}$ unit.
- 305. Principles of Ergonomics.** Same as Industrial Engineering and Kinesiology 305. See Industrial Engineering 305.
- 312. Endocrinology.** Physiology and biochemistry of the endocrine system with special

reference to vertebrates. Prerequisite: Physiology 301 or a course in biochemistry. 3 hours or $\frac{3}{4}$ unit.

- 316. Integrative Neurophysiology.** Advanced studies of mechanisms of neuron network function in behavior; topics include: neural coding, motor pattern generation, mechanisms of plasticity in neural function, epilepsy, and neural models of motivation, habituation and arousal, choice, and learning. Prerequisite: Biophysics 302, Physiology 302, or Biology 303; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 331. General Radiobiology.** Response of multicellular organisms, cells, and macromolecules to ionizing radiations. Lectures, student reports, and discussions. Prerequisite: One year each of mathematics, physics, chemistry, and biology. 4 hours or 1 unit.
- 341. Comparative Physiology of Animals.** Emphasizes comparative aspects of the nervous system and nervous integration; ionic and osmotic regulation in fresh water and marine environments; gas exchange mechanisms; temperature adaptation and endocrine systems in both invertebrates and vertebrates. Prerequisite: Biology 111 or 251, or equivalent; one year of college-level physics; Math 120; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
- 401. Physiology of Systems and Organs.** Analysis of organization and function of vertebrate systems, which combines the viewpoints of traditional cellular, comparative, mammalian, and human physiology; nervous, circulatory, digestive, and excretory systems; and gross metabolism. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
- 402. Comparative and Adaptational Physiology.** The first half of the course deals with comparative mechanisms of adaptation to the environment, including homeostatic theory, osmotic and ionic regulation, respiration and metabolism, nutrition and digestion, and temperature relations; the second half concerns comparative behavioral physiology, including sense organs, mechanisms of motility (especially muscles), and central nervous integration. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
- 403. Cellular and Molecular Physiology.** Physicochemical analysis of cellular function and structure; consideration of the implications of the properties of cells for the physiology of multicellular animals. Students may enroll for the lecture series on physiology of cytoplasm and the nucleus, cell growth and division and cellular regulatory mechanisms, and/or for the lecture series on physiology of cell membranes, bioelectrics, and motility. Prerequisite: One year of college-level physics; chemistry including physical and biochemistry; an upper-division course in physiology; knowledge of calculus presumed. $\frac{1}{2}$ or 1 unit.
- 404. Physiological Measurements.** Same as Biophysics 404. Laboratories concerned with introducing at a graduate level current research techniques in the physiological and biophysical sciences; problem-oriented laboratories; students select up to four special topics representing different areas of physiology and biophysics, such as mammalian and human, molecular, cellular and radiation biology, comparative physiology, and biophysical measurements. Emphasis placed on ability to work independently, and students give written reports of their experiments. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 405. Neurochemistry.** Same as Psychology 405. See Psychology 405.
- 409. Faculty Research Topics.** Advanced seminars by the faculty on their current research activities. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 410. Special Topics in Physiology.** Advanced seminars on current topics of interest in physiology. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
- 412. Advanced Endocrinology.** Same as Animal Sciences and Veterinary Biosciences 412. Seminar, lectures, student reports, and discussions of recent advances in endocrinology. Prerequisite: Physiology 312; consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.

- 413. Cardiovascular Physiology.** Same as Veterinary Biosciences 413. See Veterinary Biosciences 413.
- 416. Neurophysiology Laboratory.** Neurophysiological techniques and experiments illustrating nerve membrane properties, synaptic action and plasticity, organization and pattern generation in motor systems, and sensory coding in visual and acoustic systems. Prerequisite: Credit or concurrent registration in Physiology 316 or consent of instructor. $\frac{1}{2}$ unit.
- 418. Neuroendocrinology.** Advanced studies on central nervous system/hormone interaction in vertebrates. Neuroanatomy and maturation of neuroendocrine control systems; production, biochemistry, and physiological effects of neurohormones; and neuroendocrine techniques. Prerequisite: Physiology 312 and one of the following: Physiology 316, 401, or 402; consent of instructor. $\frac{3}{4}$ unit.
- 420. Mammalian Physiology Seminar.** Current trends in mammalian physiology. Prerequisite: Physiology 401 and 402, or equivalent; consent of instructor. $\frac{1}{2}$ unit.
- 431. Advanced Reproductive Endocrinology.** Same as Animal Science 431 and Veterinary Biosciences 431. See Animal Science 431.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433 and Veterinary Biosciences 433. See Animal Science 433.
- 441. Advanced Comparative Physiology.** Seminar, lectures, student reports, and discussions. Topics rotate in three-year cycle: adaptational physiology, comparative neurophysiology, and comparative physiology of motile mechanisms. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 451. Advanced Cellular Physiology.** Seminar, lectures, student reports, and discussions. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 460. Human Pharmacology, I.** Studies the general principles of drug action and analyzes the actions of the major drug groups on biochemical and physiological processes. Prerequisite: Physiology 401; Biochemistry 350; consent of instructor. 1 unit.
- 461. Human Pharmacology, II.** Continuation of Physiology 460. Prerequisite: Physiology 460. 1 unit.
- 472. Human Physiology Seminar.** Topics of current emphasis in human physiology. Prerequisite: Two semesters of advanced physiology; one semester of biochemistry; consent of instructor. $\frac{1}{2}$ unit.
- 490. Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Prerequisite: Approval of department. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Research may be conducted under supervision of the thesis advisor in the following areas: (a) cellular and molecular physiology; (b) comparative physiology; (c) mammalian physiology; (d) human anatomy and human physiology; (e) endocrinology; (f) neurophysiology; (g) radiobiology; and (h) environmental and stress physiology. 0 to 4 units.

PLANT BIOLOGY

Head of Department: T. L. Phillips

Department Office: 289 Morrill Hall, 505 South Goodwin, Urbana

- 100. Plant Biology.** Basic principles of growth and form, physiology, genetics, evolution, and ecology in plant biology. 4 hours. Students may not receive credit for both Plant Biology 100 and 102.
- 102. Plants, Environment, and Man.** Designed primarily to give the nonscience student an introduction to plants, their role in the environment, and their relation to man. Discussions and demonstrations emphasize practical aspects of plant biology and science as they relate to man. 3 hours. Students may not receive credit for both Plant Biology 100 and 102.

- 234. Form and Function in Flowering Plants.** Lecture course on the physiological and morphological attributes that underlie the biosynthesis, growth, and reproduction of flowering plants in relation to the environment. Prerequisite: Plant Biology 100 or 102, or a year of biology; Chemistry 102. 3 hours. (Counts for advanced hours in LAS.)
- 260. Systematics of Flowering Plants.** Introduces the principles and methods of the identification, naming, classification, systematics, and evolution of flowering plants; includes a survey of selected flowering plant families with information on their interrelationships. Field trips are given as part of the laboratories. Prerequisite: Plant Biology 100; or Biology 100, 101, or 111; or consent of the instructor. 4 hours. (Counts for advanced hours in LAS.)
- 263. Plants and Their Uses by Man.** A consideration of the plants which are useful or harmful to man: their origins and history, botanical relationships, chemical constituents which make them economically important, and their roles in prehistoric and modern cultures and civilizations. Prerequisite: Plant Biology 100 or 102, or Biology 110. 3 hours.
- 290. Individual Topics.** For juniors and seniors who wish to study individual problems and topics not assigned in other courses. Prerequisite: Ten hours of advanced work in plant biology or another biological science; junior or senior standing. 2 to 5 hours. May be repeated to a maximum of 5 hours. (Counts for advanced hours in LAS.)
- 292. Senior Thesis.** Independent research for seniors in plant biology; prerequisite for graduation with distinction in plant biology and recommended for students intending graduate study. A thesis must be submitted for credit to be received, but graduation with distinction is not an automatic result of enrollment in Plant Biology 292. Will substitute for Plant Biology 290 in fulfilling independent study requirement. Prerequisite: Candidacy for degree with distinction in plant biology. 2 to 5 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 304. Evolutionary Survey of the Plant Kingdom.** Lecture and laboratory course dealing with the structure, reproduction, and evolution of representative algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. Prerequisite: Plant Biology 100; or Biology 101, 111, or 251; or consent of instructor. 4 hours or 1 unit.
- 320. The Biology of Bryophytes.** Study of mosses, liverworts, and hornworts with emphasis on problems unique to bryophytes and the use of bryophytes as experimental systems for broader botanical problems; topics include the systematics, anatomy, development, physiology, genetics, ecology, and evolution of bryophytes; and lecture, laboratory, and two or three field trips. Offered in alternate years. Prerequisite: One year of plant biology, or one year of biology plus consent of instructor. 4 hours or 1 unit.
- 325. Paleobotany.** Same as Geology 325. Structure, phylogeny, and geological distribution of representative fossil plants. Two or three field trips. Prerequisite: Plant Biology 100, or Biology 100 or 101; Geology 101 or 107; or consent of instructor. 5 hours or 1 unit.
- 330. Plant Physiology.** Same as Agronomy 330. General course concerned with plant functions, including water relations, mineral nutrition, metabolism, growth, and reproduction. Prerequisite: Chemistry 131; Plant Biology 100 or Biology 103, 111, or 251. 3 hours or $\frac{3}{4}$ unit.
- 332. Photosynthesis.** Same as Biophysics 332. See Biophysics 332.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Horticulture 333. A laboratory course in plant physiology; a supplement to Plant Biology 330 which serves the needs of those interested in acquiring familiarity with techniques of experimental plant physiology. Prerequisite: Credit or concurrent registration in Plant Biology 330 or equivalent. 4 hours or 1 unit.
- 335. Plant Development.** Mechanisms underlying plant development: cytodifferentiation and the cell cycle, regulation of gene expression, induction, determination, morphogenesis, and pattern formation. Prerequisite: Introductory courses in biochemistry, biology, or plant biology, and calculus. 4 hours or 1 unit.
- 338. Plant Molecular Biology.** Same as Biochemistry 338. Presents the basic concepts of plant gene expression, the structure and expression of the three plant genomes, and

- special topics on plant vectors, plant viruses, and transposable elements. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 339. Experimental Techniques in Plant Molecular Biology.** A laboratory course in plant molecular biology supplementing Plant Biology 338 with techniques of plant organelle isolation, DNA extraction, cell culture and recombinant DNA techniques. Prerequisite: Plant Biology 338 or equivalent; or consent of instructor. 4 hours or 1 unit.
- 341. Field Ecology.** Study of plant communities in various sections of North America during spring vacation or intersession. Trips rotate on a three- to five-year basis. Outdoor cooking and camping; transportation in University cars. Prerequisite: One of the following: Plant Biology 260, 366, or 381; consent of instructor. 1 hour or $\frac{1}{4}$ unit. May be repeated to a maximum of 3 hours or $\frac{3}{4}$ unit.
- 345. Plant Anatomy.** Lecture and laboratory course dealing with the structural characteristics of mature and developing cells, tissues, and organs of vascular plants, with special emphasis on the vegetative part of flowering plants. Prerequisite: One year of plant biology or equivalent, or consent of instructor. 4 hours or 1 unit.
- 351. Viruses.** Same as Microbiology 351. See Microbiology 351.
- 363. Plant Products.** Lectures on the natural products of plants, with emphasis on relevant compounds of ecological, pharmacological, toxicological, and economic interest. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 366. Field Botany.** Identification and classification of native and naturalized flowering plants of eastern North America. Prerequisite: Plant Biology 100 or consent of instructor. 5 hours or 1 unit. Offered in the summer session only.
- 372. General Mycology.** Structure, classification, and identification of fungi, including those of economic importance. Prerequisite: One year of plant biology, entomology, microbiology, or biology; or consent of instructor. 4 hours or 1 unit.
- 381. Plant Ecology.** Principles of ecology exemplified by vegetation and environments of Illinois. Prerequisite: Plant Biology 260 or equivalent. 5 hours or 1 unit.
- 410. Discussions in Plant Biology.** All graduate students in plant biology, except those with conflicting teaching assignments, are required to register in and attend the general seminar. No credit given except to those students presenting the results of their Ph.D. thesis research. 0 or $\frac{1}{4}$ unit.
- 413. Discussions in Plant Physiology.** $\frac{1}{4}$ unit.
- 414. Discussions in Plant Morphology and Taxonomy.** $\frac{1}{4}$ unit.
- 418. Discussions in Plant Ecology and Plant Geography.** Developments in ecology and plant geography, with emphasis on one special division. Prerequisite: Graduate standing in plant biology, entomology, geography, or biology. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 419. Discussions in Photosynthesis and Related Topics.** Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 424. Plant Biochemistry.** Same as Agronomy and Horticulture 424. See Agronomy 424.
- 436. Plant Biophysics.** Same as Biophysics 436. Biophysical processes in higher and lower plants; emphasizes a quantitative approach to the cellular and subcellular phenomena underlying the structure/function relationships and energetic requirements of plants. Half semester only. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. $\frac{1}{2}$ unit.
- 438. Bioenergetics of Photosynthesis.** Same as Biophysics 438. See Biophysics 438.
- 442. Environmental Plant Physiology.** Same as Agronomy 442. Lecture course dealing with the interaction of plants and environment at the level of the whole organism, extending to the cell and the community; emphasis on heat and mass transfer, plant and soil potentials, and effects of light on growth. Prerequisite: Chemistry 131; general physics; general or plant physiology; consent of instructor. 1 unit.
- 462. Origin of Variation in Plants.** Same as Agronomy 462. See Agronomy 462.
- 471. Advanced Mycology: Special Groups.** The several classes of fungi and their activities are considered in successive semesters. Special groups within these classes may be selected for concentrated study, depending upon the student's interest in mycology. Prerequisite: Plant Biology 372 or consent of instructor. $\frac{1}{2}$ unit.

- 472. Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Pathology 472. Identifies and classifies ascomycetes and fungi imperfecti emphasizing relationships between sexual and asexual forms; laboratory provides experience in collection, culturing and isolation, and identification. Prerequisite: Plant Biology 372 or equivalent. $\frac{1}{2}$ unit.
- 488. Plant Pigments.** Same as Horticulture 488. See Horticulture 488.
- 490. Advanced Studies in Plant Biology.** Not more than 1 unit may be applied toward the Graduate College master's degree requirement of 3 units of course work at the 400-level. Work may be taken in the following areas: (a) ecology; (b) evolution and systematics; (c) molecular biology and genetics; (d) physiology; and (e) ultrastructure. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Individual work under supervision of members of the staff in their respective fields. 0 to 4 units.

PLANT PATHOLOGY

Head of Department: R. E. Ford

Department Office: N-519 Turner Hall, 1102 South Goodwin, Urbana

- 204. Introductory Plant Pathology.** Concepts relating to causal agents of representative plant diseases, symptoms, and diagnosis, modes of infection and spread, effects of environment on disease development, and methods of control; designed for students in other departments which require or recommend an introductory plant pathology course; lecture and laboratory-discussion. Prerequisite: Plant Biology 100 or equivalent. 3 hours.
- 300. Special Problems.** For students desiring to study specific problems not assigned in other courses. Prerequisite: For undergraduates only, a minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. Specific approval of the associate dean in advance of registration is required for a second and/or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 301. Principles of Plant Pathology.** Basic principles concerning the nature, cause, development and control of plant diseases; intensive study of important diseases and their causal agents; designed for graduate students in plant pathology; lecture and discussion. Prerequisite: An introductory course in plant biology and consent of instructor. 4 hours or 1 unit. Students may not receive credit for both Plant Pathology 204 and 301.
- 305. Principles of Plant Disease Control.** Basic concepts of chemical, cultural, physical, regulatory, and biological methods for the management of plant diseases. Prerequisite: Plant Pathology 204 or 301; a course in organic chemistry. 3 hours or $\frac{3}{4}$ unit.
- 308. Plant Disease Diagnosis.** Field and laboratory techniques in plant disease diagnosis and appraisal; identification of diseases of small grains, turf, corn, soybeans, forage crops, vegetables, fruit, forest and shade trees, and ornamentals, both on field trips and in laboratory exercises. Prerequisite: Plant Pathology 204, or equivalent. 2 hours or $\frac{1}{2}$ unit. Offered during summer session only.
- 311. Diseases of Herbaceous Ornamentals.** One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of herbaceous ornamental plants. Offered in the second or third five weeks of spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 312. Diseases of Urban Trees.** Same as Forestry 312. One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, causal agents, effects of environment on disease development, and control of diseases of urban trees. Offered

- in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 313. Diseases of Shrubs.** One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of shrubs. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 314. Diseases of Forest Trees.** Same as Forestry 314. One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of forest trees. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 315. Diseases of Turfgrasses.** One of a series of 5-week courses to complement Plant Pathology 204. Symptoms, diagnosis, modes of infection and spread, effects of environment on disease development, and control of diseases of turfgrasses. Offered in the second or third five weeks of the spring semester. Prerequisite: Credit or concurrent registration in Plant Pathology 204. 1 hour or $\frac{1}{4}$ unit.
- 377. Diseases of Field Crops.** Same as Agronomy 377. Studies the symptoms of major field crop diseases, life histories of causal organisms, and methods of control. Lecture and laboratory. Prerequisite: Plant Pathology 204 or 301. 3 hours or $\frac{3}{4}$ unit.
- 401. Plant Pathogenic Fungi.** Studies pathogenic fungi and their roles in disease cycles in vascular plants; morphology, classification, life histories, ecology and evolution; methods for identification. Prerequisite: Plant Biology 372. 1 unit. Offered in alternate years.
- 402. Phytobacteriology.** Studies pathogenic bacteria and their role in plant disease; history, morphology, reproduction, identification, and classification; emphasizes arrival, invasion, symptoms, and control. Prerequisite: Plant Pathology 301. $\frac{3}{4}$ unit. Offered in alternate years.
- 403. Plant Nematology.** Comprehensive study of plant-feeding nematodes with emphasis on economically important groups; nematode morphology, identification, classification, developmental biology, ecology, and host-parasite relationships; interaction with fungi, bacteria, and viruses in plant disease development; experimental and diagnostic techniques; symptomatology and control. Prerequisite: Plant Pathology 204 or 301; an introductory course in animal biology. 1 unit. Offered in alternate years.
- 404. Plant Virology.** Comprehensive study of plant viruses and virus diseases; includes symptomatology, structure, transmission, characterization, purification, classification, assay methods, replication, epidemiology, and control. Prerequisite: Plant Pathology 301 and Biochemistry 350. 1 unit. Offered in alternate years.
- 406. Genetics of Plant-Pathogen Interactions.** The genetics and expression of resistance in plants to fungi, bacteria, viruses, nematodes, and other pathogens; variation and genetic systems in pathogens with particular emphasis on pathogenicity; complementary genetic systems; and theory and practice of breeding disease-resistant plants. Lecture and discussion. Prerequisite: Plant Pathology 204 or 301; and Agronomy 323 or Genetics and Development 210; or equivalent. 1 unit. Offered in alternate years.
- 407. Physiology and Biochemistry of Plant-Parasite Interactions.** Current concepts on physiological and biochemical bases of plant diseases; mechanisms of infection and disease development; theories of resistance and susceptibility; and interrelationships of physiological and biochemical activities that occur during the interaction of plants and their parasites. Prerequisite: One course each in plant pathology, biochemistry, and plant physiology, or consent of instructor. $\frac{1}{2}$ unit. Offered in alternate years.
- 408. Plant Disease Epidemiology.** Fundamental concepts and principles of plant disease epidemics; includes pathometry, crop loss assessment, pathogen and host dynamics, quantification of pathosystem components, pathosystem management, disease forecasting, and decision analysis. Prerequisite: Plant Pathology 301 and Agronomy 440, or equivalent. 1 unit. Offered in alternate years.
- 417. Plant Pathology Seminar.** Current research, literature, and other topics pertaining to plant pathology and related fields. $\frac{1}{4}$ unit.

- 431. Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Horticulture 431. See Biology 431.
- 432. Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Horticulture 432. See Biology 432.
- 433. Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Horticulture 433. See Biology 433.
- 434. Regulation of Plant Development and Reproduction.** Same as Agronomy, Biology, Forestry, and Horticulture 434. See Biology 434.
- 472. Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Biology 472. See Plant Biology 472.
- 499. Thesis Research.** Individual study and basic and/or applied research related to plant disease; required of all students working toward the Master of Science or Doctor of Philosophy in plant pathology. 0 to 4 units.

POLITICAL SCIENCE

Head of Department: G. T. Yu

Department Office: 361 Lincoln Hall, 702 South Wright, Urbana

- 100. Introduction to Political Science.** Survey of major concepts and approaches employed in political science. 3 hours.
- 102. Political Science Orientation.** Lectures designed to acquaint the political science concentrator/major with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to political science students. Recommended for freshmen in political science. No credit.
- 150. American Government: Organization and Powers.** Historical development and organization of national, state, and local governments; the federal system; national and state constitutions; civil and political rights; party system; and nature, structure, powers, and procedure of legislative, executive, and judicial departments in state and nation. 3 hours.
- 198. Freshman Seminar.** Current topics in political science in the context of the scope and method of political science. Participants are required to do independent library research and present a report on a topic of their choice which is related to the subject of the seminar. Prerequisite: Consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Sociology 222. See African Studies 222.
- 235. Women in Politics.** Same as Women's Studies 235. An introduction to the political status and roles of women. Topics include women's political socialization, voting behavior, and political participation; feminist and anti-feminist politics; and contemporary legislative and public policy issues, such as educational equity, equal rights legislation, and health care delivery for women. 3 hours.
- 240. Introduction to Comparative Politics.** Basic concepts and principles of political analysis from a comparative perspective. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 241. The Emerging Nations.** An introductory comparative consideration of the patterns of political development and of the policies and problems of the emerging nations of Asia, Africa, and Latin America; emphasis on the special characteristics of countries beginning their independent nationhood and the effects of these characteristics on the political systems of these lands and their role in the community of nations. Prerequisite: Three hours of political science or consent of instructor. 3 hours.
- 250. Introduction to Public Policy.** Surveys the policy process including adoption, implementation, and evaluation; each student prepares a research paper; topics include reviews of substantive policy issues such as crime, energy, environment, poverty, foreign

- policy, civil liberties, or economic regulation. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 260. Introduction to Political Theory.** The nature, structure, and purposes of political theory; uses major works on the problems of political order, obedience, justice, liberty, and representation to distinguish and clarify different theoretical approaches; designed to be an introduction to ideas, not a historical survey. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 270. Introduction to Political Research.** Principles of empirical research in political science; emphasizes definition of research problems, principles and practices of measurement, use of data as evidence, and data analysis; data-based analysis is conducted in the Social Science Quantitative Laboratory. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 280. Introduction to International Relations.** The structure and processes of international relations, trends in international politics, and the future of the international system in a setting of conflict and crisis. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 281. Introduction to International Security and Arms Control.** An introduction designed for all students to major issues of arms control, disarmament and international security. The military, socio-economic, and political effects of nuclear and conventional weapons, military strategy, the ethics of modern warfare, nuclear proliferation, and regional security issues will be studied. 3 hours.
- 290. Individual Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of faculty member supervising the work; and approval of the department head. 1 to 4 hours. May be repeated.
- 292. Senior Thesis in International Relations.** Prerequisite: Written consent of instructor; senior standing; field of concentration in Political Science, studying international relations. 3 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Prerequisite: Written consent of instructor; open only to seniors whose field of concentration is political science and who have a general University average of at least 4.0. 2 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
- 295. Special Topics in Contemporary Issues and Problems.** Study of a contemporary problem in public policy, domestic or international. See Timetable for current topics. Prerequisite: Sophomore standing, 3 hours of political science, or consent of instructor. 3 hours. May be repeated for credit.
- 296. Special Topics in Political Science.** Selected reading and research in political science. See Timetable for current topics. Prerequisite: Junior or senior standing; 6 hours of political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 297. (Counts for advanced hours in LAS.)
- 297. Honors Seminar.** Research, reading, and discussion in selected topics and works in literature of political science. Prerequisite: Senior standing; 18 hours of political science; 4.5 grade point average in political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 296. (Counts for advanced hours in LAS.)
- 299. Government Internship.** Selected Government Internship participants together with faculty sponsor develop a program of study and research related to internship assignment. Consult departmental undergraduate advisor. Prerequisite: Junior standing; 4.0 grade average for most internships; Political Science 150 and one 300-level political science American government course; acceptance by faculty sponsor. 0 to 6 hours. May be repeated to a maximum of 12 hours.
- 300. Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Social Science 300. Examination of performance-oriented approaches to administration of public sector organizations; private sector accountability principles applied to governmental agencies; means of improving the performance of

- governmental agencies; corporate social responsibility; public policy implications of computer usage and individual privacy; and actual cases reviewed and discussed. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 305. Municipal Government.** Growth of cities; their legal status; and municipal politics and organization in the United States. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 306. Municipal Problems.** Municipal administration in the United States; administrative organization; personnel problems; financial problems; city planning and housing; police and fire administration; public health; and public utilities. Prerequisite: Senior standing, or junior standing with Political Science 305 or Economics 101, or 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 312. State Government.** The states in the federal system; state constitutions and problems of revision; organization, powers, and functions of the legislative, administrative, and judicial branches of state government; state functions; reorganization problems in the states; state-local relations; and state finance, trends, and prospects. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 314. The Presidency.** Determinants and growth of presidential influence; presidential decision making; the president's role in the formulation and implementation of public policy; the president and constituencies; and the president's roles as legislator, party leader, and chief executive. Prerequisite: Political Science 100 or 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 315. Legislatures and Legislation.** The legislative function in government; structure and organization of American legislatures (national, state, and local); party organization in legislatures; legislative procedure; pressure groups and lobbying; relation of legislature to other branches of government; and problems of legislative reorganization. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 317. The American Federal System.** The nature, justification, and problems of federalism; coordination of governmental efforts by contract, subsidies, and grants; and comparison of federal systems. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Government and the Economic Order.** Interplay of political and economic phenomena at various domestic, foreign, and international levels and applicability of certain generalized models. Prerequisite: Any two courses in political science or a combination of political science and economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 322. Politics and the Media.** Same as Communications 322. See Communications 322.
- 326. American Political Parties.** Organization and operation of the American party system; relations between national, state, and local organizations; state and national committees; the convention systems; the primary; and campaign methods and finance. Prerequisite: Political Science 150 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 327. Black Political Participation in the American Political Process.** Same as Afro-American Studies 327. Exposes students to the variety of literature on black people in American politics; political participation is the major theme. Since black and white scholars address themselves to the study of political behavior of blacks, it is necessary to compare not only their views but also to discuss the underlined message, or meaning, of their work to understanding American politics in general. Prerequisite: Political Science 150, or 6 hours of social science, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 328. An Introduction to the Study of Political Behavior.** An analysis of the interrelations of political attitudes and public formation; special attention to the substantive areas of voting behavior, political leadership, and the rise of political mass movements; and also a review of the literature on democratic and authoritarian personality types. Prerequisite: Political Science 150 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Electoral Behavior.** Study of the social and psychological motivations behind the individual voting decision, with special emphasis on the relationships between the voting decision and social stability. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 331. British Government.** Nature of the British Constitution; the Crown, Ministry, and Cabinet; Parliament and elections; the party system; law and the courts; local govern-

ment; and the British Commonwealth. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 332. African Independence and Underdevelopment: 1945 to the Present.** Same as History 385. See History 385.
- 333. Southern Africa: Race and Power.** Same as African Studies 325 and History 325. See African Studies 325.
- 335. Government and Politics of the Soviet Union.** Evolution, structure, and functioning of the Soviet system of government; the theories, structure, and functioning of the Communist party of the Soviet Union. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Governments and Politics in Western Continental Europe.** An analysis of the major governmental systems of continental Europe; the evolution, structure, and functioning of the political institutions of France, Germany, Italy, Spain, Switzerland, and the Scandinavian countries as illustrations of multiparty and dictatorial types of governments. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Government and Politics of China.** Same as Asian Studies 337. An introduction to the governments and politics of modern China. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 338. Governments and Politics in the Middle East.** Same as Asian Studies 338. An analysis of the transformation of Middle Eastern society from Morocco to Iran, as case studies in political modernization; study of politics of the area with special reference to causes and character of modernization, role of leadership, ideologies and institutions, methods and theories for analyzing political systems undergoing fundamental transformation, and implications for U.S. policy. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 339. Islam and Society in the Modern Middle East and North Africa.** Same as Religious Studies 308. See Religious Studies 308.
- 340. The German Political System.** Structures and processes of postwar German politics, with primary emphasis on West Germany; special attention to foreign policy formulation and problems (particularly defense), the Berlin issue, reunification, and relations with Eastern Europe. Knowledge of German helpful but not necessary. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 342. Government and Politics in Latin America.** A survey of the origin and development of Latin American political institutions; systems of government; public administrative systems; party government; and international policies of Latin American governments. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 343. Political Systems and Structures of Latin American Countries.** The political process, generally of selected Latin American countries at different levels of political development; stress on the interaction between political infrastructure and more formal agencies of government; and may include cross-national comparison of the function of such factors as political culture, party system, bureaucracy, or the military establishment. Prerequisite: Political Science 342 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 346. Comparative Communist Systems: Eastern Europe.** Analysis of the origins of modern communism and the development of its doctrines; applications of these doctrines in the practices of ruling Communist parties; emphasis on alternates between European and non-European Communist systems, depending on course instructor. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 347. Governments and Politics of Southeast Asia.** Same as Asian Studies 347. Comparative analysis of the political development of the countries of Southeast Asia, the lands to the east of India and south of China; emphasis on the differing approaches to the governing of man and the formation of public policy to be found in these countries; and consideration of economic, social, historical, and geographical influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 348. Government and Politics of Japan. Same as Asian Studies 348.** Introduction to the government and politics of modern Japan. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 349. Governments and Politics of South Asia. Same as Asian Studies 349.** A comparative analysis of the political development of India, Pakistan, Ceylon, and the lesser lands of South Asia; emphasis on the differing approaches to the governing of man and the formation of public policy to be found in these countries; and consideration of economic, social, historical, and geographical influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 350. Law and Society.** An introductory study from a social science perspective of the nature of law, law makers, and law appliers; the causes or inputs determining law; and the effects or outputs which law in general produces. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 351. American Constitutional System.** Judicial interpretation of constitution; separation of governmental powers; relation of state and national governments; control of interstate commerce; and jurisdiction of courts. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. The Judicial Process.** A systematic analysis of legal, evidentiary, environmental, and personal factors that influence judicial decision making, with particular emphasis on the application of the scientific method to the study of judicial behavior. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. The Constitution and Civil Liberties.** Study of free speech, loyalty in a democratic state, citizenship, freedom of religion, rights of persons accused of crime, and government's responsibility to protect persons from racial and religious discrimination; and special attention to the role of law and judges. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. Public Administration and the Judicial Process.** The scope of administrative powers and their relation to private rights; a comparison of the processes of decision in administrative agencies and in the courts; the interests served by each; the impact of judicial review of administrative decisions upon administrative procedure and policy; the constitutional and statutory bases of review; and the legal accountability of public officers versus political accountability. Prerequisite: Political Science 305, 351, or 361, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. Human Rights.** Same as Sociology 357. See Sociology 357.
- 358. Politics of Crime and the Criminal Process.** Same as Sociology 358. Examination of crime as a political issue and as a social problem; includes political aspects of law enforcement, the nature of the judicial process in criminal cases, and criminal justice reform; and emphasizes the legal system at the local level. Prerequisite: Political Science 150 and junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 359. Contemporary Supreme Court Policy Making.** Studies how the modern Supreme Court has resolved major issues in American constitutional politics. Prerequisite: Consent of instructor; Political Science 351 or 355 or 358. 3 hours or 1 unit.
- 361. Introduction to Public Administration.** Development of administrative organization; administration and the executive, legislature, and judiciary; principles of organization, including line and staff relationships; the staff services of finance and personnel; and formal and informal control. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 362. Administrative Organization and Policy Development.** Dynamics of policy formulation in public administrative agencies; current developments in organizational theory and their significance for public administration; origin of public administrative organizations; interpersonal behavior; large-scale organizations and centralization; external support and opposition; and policy formation and problems of compliance. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 363. Comparative Administration.** Study of modern bureaucratic organization by means of the comparative method; special reference to the bureaucracies of various countries

in different stages of industrialization; and the cultural bases of administrative behavior. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 366. Tools of Public Management.** A critical survey of the tools of analysis available to overhead functions of public management in key areas of decision; emphasis on personnel administration and manpower utilization; budgetary processes and fiscal controls; and several methods of administrative analysis: organizational studies, procedures engineering, information processing, and operations research. Prerequisite: Political Science 361 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 370. Selected Topics on Women and Politics.** Same as Women's Studies 370. Variable topics relating to the political roles and status of women, emphasizing the areas of comparative politics, political theory, political behavior, and international politics. See Timetable for current topics. Prerequisite: Political Science 235 or consent of instructor. 3 hours or 1 unit. May be repeated once for credit.
- 371. World International Organization.** General development and basic principles of world organization; principles, structure, methods, and actual operation of international governmental institutions; and special attention to the United Nations and related agencies and to their evolution from the League of Nations system. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 372. Issues in West European Foreign and Security Policy, I.** Examines the ways in which the West European political system is being structured, the major foreign and security issues that face it, and the collective efforts of the European states to solve them. Prerequisite: Junior standing. Political Science 280 is desirable, but not required. 3 hours or 1 unit.
- 373. Issues in West European Foreign and Security Policy, II.** Examines the ways in which the West European political system is being structured, the major foreign and security issues that face it, and the collective efforts of the European states to solve them. Course is conducted in one of the West European languages (e.g., French, German) and supplements Political Science 372. Prerequisite: Concurrent registration in Political Science 372; junior standing; ability to use the relevant European language for coursework (completion of three years of college level foreign language). Completion of Political Science 280 is desirable, but not required. 2 hours or $\frac{1}{2}$ unit.
- 375. Politics of the Global Economy.** Examines the interaction between politics and economics; locates their ideologies and practices in the context of international economic relations. Considers such topics as international trade, the global monetary order, multinational corporations, economic aid relationships, and food and energy politics. Prerequisite: Political Science 240 or 280. 3 hours or 1 unit.
- 377. International Communications.** Same as Communications 377. An interdisciplinary approach to international communications; its structure and content; the role of international communications in conflict and conflict resolution; the semantics of international communication; the technical and economic aspects of international mass communications; and government-industry relations in communications. Prerequisite: Political Science 280 or 6 hours of social science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 380. Comparative Foreign Policies.** An analysis of the formulation and substance of the foreign policies of select nations of the world. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 381. American Foreign Relations.** Participation in international affairs; presidential initiative; development and organization of the Department of State; diplomatic intercourse; consular service; treaty-making power; and development of foreign policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 382. Contemporary American Foreign Policies.** Study of the major foreign policy decisions currently confronting the United States government: analysis of background, principal issues, and alternative actions; formulation of policies. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 383. Soviet Foreign Policy.** Survey of Soviet foreign policy from 1917 to the present, with emphasis upon the forces shaping this policy; special attention to the interplay of

ideology and national interest in policy formulation. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 384. International Relations.** Examination of contemporary international systems in terms of the types of actors and their goals, various structures of power, and the mechanisms of allocating resources and containing conflict. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 387. National Security Policy.** Examination of the organization and formulation of current American defense policy; the theory and practice of deterrence, with special reference to American and Soviet military strategy; and the problems of disarmament and arms control. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 388. The Military and Politics.** The role of the military in national and international policies, with special attention given to theories of war and peace, civil-military relations, the military and the political development of Western and non-Western states, and the nonmilitary uses of the military. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 389. Chinese Foreign Policy.** Same as Asian Studies 385. An analysis of the formulation, substance, and conduct of Chinese foreign policy, with emphasis on the period since 1949; special attention to the forces shaping Chinese policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 390. Methods of Political Analysis.** Presentation of the analytic processes in the development of concepts, hypothesis, and theories; discussion of the derivation, formulation, and specification of research problems to be related to basic methodologies and modes of analysis; and applications to political science. Prerequisite: Political Science 270, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 391. Topics in non-Western Political Thought.** Considers political thought outside of the Greco-Roman, European, and North American tradition; each semester focuses on the political thought of a specific region. Despite the geographical inaccuracy, Latin America may be included under "non-Western" as it is in the LAS definition of the non-Western General Education requirement. 3 hours or 1 unit. May be repeated as topics vary.
- 392. Socialist Political Theory.** Origins, development, and recent modifications of socialist theory from the late eighteenth century to the present; examination of each contribution in terms of its goals, efficacy, and subsequent influence; and discussion including Rousseau, Hegel, the Utopians, Marx and Engels, Anarcho-syndicalists, Lenin, Luxemburg, Trotsky, Mao, Guevara, and Garaudy. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 393. Classical Political Theory.** A consideration of major works of Greek and Roman political theory, and especially of their relevance to modern political analysis and action. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 395. Modern Political Theory.** A critical analysis of political theories from the sixteenth century to the present; focus on the development of such concepts as the nature of man, the role of the state, justice, legitimacy, obligation, individual rights, equality, and mechanisms of maintenance and change. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 396. Contemporary Political Theory.** Major tendencies in Western political theory since 1850; conservatism and constitutionalism; the religious interpretation of the state and economic institutions; Marxism, socialism, and communism; and antidemocratic thought and totalitarian regimes. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 397. American Political Theory.** Survey of American political thought from colonial times to the present. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 398. Theory and Practice of Democratic Government.** Theories of the nature and conditions of democracy; comparison and analysis of contemporary democratic institutions. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 400. Selected Topics in Political Theory.** Reading, analysis, and discussion of selected topics of political theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 401. History of Political Theories.** Reading and analysis of the leading political thinkers from the Greeks to the middle of the seventeenth century. 1 unit.
- 402. History of Political Theories.** Readings and analysis of the leading political thinkers from the middle of the seventeenth century to the present. 1 unit.
- 406. Municipal Administration.** Position of cities in American governmental systems; governmental interrelationships; powers; services; and current municipal problems. 1 unit.
- 420. Formation of Public Policy.** Same as Labor and Industrial Relations 420. An examination of the institutional and dynamic forces that shape the making of policy and its administration in the United States; separation of powers; pressure groups; administrative and legislative procedures, and judicial activity. 1 unit.
- 423. Proseminar in American Politics.** An intensive analysis of major institutions and processes of American politics (national, state, and local); research on selected topics in American government. 1 unit.
- 428. Multivariate Analysis for Political Scientists.** Applied use of extended analysis of variance; multiple classification analysis; factor and small-space analysis; causal analysis; multiple regression, and selected topics for research. Prerequisite: Sociology 387 and Political Science 497, or consent of instructor. 1 unit.
- 430. Proseminar in Comparative Politics.** Comparative political analysis in the context of the evolution of the social sciences and modern political science, with emphasis on theories of political action and their function in contemporary comparative studies. This course is designed as an introduction to area-oriented seminars and generally is a prerequisite for them. 1 unit.
- 440. Comparative Politics and the Political Process.** The comparative study of selected national political systems or of specific institutional forces that influence the making and application of public policy in several countries. The countries studied and the legal and extralegal political agencies considered vary according to the person conducting the seminar. 1 unit. May be repeated to a maximum of 3 units.
- 450. Contemporary Governmental Problems.** Special problems of current importance designed especially for students majoring in political science. 1 unit. May be repeated to a maximum of 3 units.
- 453. Law, Policy, and Social Science.** The application of social science research techniques to improving legal procedure and legal substance; emphasis on constitutional law and other public law subjects, but also consideration of other fields of law. 1 unit.
- 460. Organizational Sciences. I.** Same as Business Administration 410. Psychology 453, and Sociology 456. See Business Administration 410.
- 465. Problems in Administrative Management.** Analysis of methods of applying administrative principle and procedures to operating problems in government agencies, such as methods of administrative coordination and control, intergovernmental cooperation, legislative-administrative relations, the organization of regulatory functions, and review of administrative decisions. Prerequisite: Political Science 361 or consent of instructor. 1 unit.
- 466. Current Administrative Theory.** A discussion of some recent trends in administrative opinion and practice on such questions as agency structure and functional activities; field and regional organization and relations; the role and functions of the executive; the process of decision making; the relations of line and staff activities, the communication and execution of policies and programs; and employee relations. 1 unit.
- 469. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations, Social Work, and Administration, Higher, and Continuing Education 497. See Labor and Industrial Relations 497.
- 480. Scope and Theory in International Relations.** Deals with the field of international relations, its relationship to political science and the other social sciences; treats the development of the field by examining major theories and approaches that have char-

- acterized it in the past, but with emphasis on contemporary theories and concepts. 1 unit.
- 481. Methodology in International Relations.** Deals with major research methodologies in contemporary international relations; includes case studies, aggregate data, content analysis, survey research, gaming and simulations, and causal modelling; and presumes knowledge of basic international relations theory. Prerequisite: Political Science 480. 1 unit.
- 484. International Relations: Special Problems in Theory and Research.** Advanced seminar on special topics in international relations. Prerequisite: Political Science 480 or 481, or consent of instructor. 1 unit. May be repeated under different instructors for a maximum of 3 units.
- 490. Proseminar in Political Behavior, I.** Interdisciplinary approaches to the analysis of political behavior; formation of opinions, interests, roles, and personality; applications of organization theory to political institutions; applications of conflict and bargaining theory to political processes; and systematic studies of the distribution of values. 1 unit.
- 491. Proseminar in Political Behavior, II.** Continuation of Political Science 490. Prerequisite: Political Science 490. 1 unit.
- 492. Problems of Explanation in Social Science.** Special topics in the methodology of social sciences, especially theory formation and theory testing. 1 unit.
- 493. Research in Selected Topics.** Research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 3 units.
- 495. The Philosophy of Political Science.** Definitions of the scope and subject matter of political science; methodological issues in political science; major conceptions of methodology as embodied in current leading studies of politics; and the present state of research in political science. 1 unit.
- 496. Political Concepts: Formulation and Measurement.** Indicates the relevance of certain research techniques for answering questions of concern in political science; indicates the range of tools available to the student; and includes discussion of problems in concept formation. Current methods of concept measurement are presented to the student in the context of political research problems. Prerequisite: Consent of instructor. 1 unit.
- 497. Research Design and Techniques.** Introduction to problems of research design, data collection, data analysis and interpretation, sampling, and some simple measures of statistical association and significance. Prerequisite: Political Science 496. 1 unit.
- 498. The Logic of Political Inquiry: Selected Topics.** Application of analytic principles and procedures developed in Political Science 495 to such topics as patterns of explanation; current theoretical perspectives; group theory, functionalism, systems theory, decision making, simulation, etc; the logic of judicial decisions; and justifications of political ideologies. This list is not exhaustive, nor will all of these topics be included each semester. Prerequisite: Political Science 495. 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

PRINTMAKING

(See Art and Design)

PSYCHOLOGY

Head of Department: E. Donchin

Department Office: 308 Psychology Building, 902 South Sixth, Champaign

- 100. Introduction to Psychology.** Study of human behavior with special reference to perception, learning, memory, thinking, emotional life, and individual differences in intelligence, aptitude, and personality; emphasis on the scientific nature of psychological investigations; and discussion of research methods and the relation of their results to daily life and everyday problems. Lectures, discussions, and five hours of participation as a subject in psychological experiments. Not open to students electing Psychology 103 or 105. 4 hours.
- 102. Psychology Orientation.** Lectures designed to acquaint the psychology concentrator with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to psychology students. Recommended for freshmen in psychology. No credit.
- 103. Introduction to Experimental Psychology.** Surveys basic topics in experimental psychology; emphasizes perception, learning, memory, motivation, emotion, cognition, language development, and decision-making. Uses simple laboratory experiments to investigate these topics. Not open to students electing Psychology 100 or 105. 4 hours.
- 105. Elements of Psychology.** Description and explanation of the psychological principles of everyday living, with emphasis on how behavior is motivated, how individuals learn intelligent behavior, personality, and applications of psychology to various social issues. Lectures, discussions, and five hours of participation as a subject in psychological experiments. This course may be substituted for Psychology 100 when the latter is listed as a prerequisite or a recommended elective. For placement purposes, enrollment is limited to students whose ACT composite score is 21 and below. Not open to students electing Psychology 100 or 103. 4 hours.
- 158. Personal and Social Implications of Machines.** Examines human interaction with modern machines; topics include a comparison of the capabilities of humans and machines, effects of automation, characteristics of good machines and workplaces, selection and training of effective users of machines, and research, including new machines, for handicapped populations. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Introduction to Social Psychology.** Systematic study of social factors in individual and group behavior; attention to social perception, motivation, and learning; attitudes, norms, and social influence processes; the development and dynamics of groups; and the effects of social and cultural factors on the individual. Credit is not given for both Psychology 201 and Sociology 201. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 205. Individual Differences in Intelligence.** Discussion of the nature of psychological tests; theories of intelligence; the nature-nurture problem in human abilities; sex, socioeconomic, and race differences; testing and social policies; and policy implications of individual and group differences. Lecture and discussion. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
- 210. The Brain and the Mind.** A survey of current knowledge and speculation regarding the brain's role in perception, motivation, sexual behavior, thinking, memory, and learning, based upon human clinical data and research in animal models. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
- 211. Techniques of Biological Psychology.** Introduction to research techniques used in the physiological study of mental processes; includes recording "brain waves," behavioral analysis of drug and lesion effects, anatomy of the brain, hormones and behavior, and related topics. Prerequisite: Credit or concurrent registration in Psychology 210, or consent of instructor. 2 or 3 hours.
- 214. Introduction to Aging.** Same as Human Development and Family Ecology 214. See Human Development and Family Ecology 214.
- 216. Child Psychology.** Study of the psychological development of the child. Prerequisite: Psychology 100, 103, or 105. 3 hours.

- 217. Comparative Development.** Survey of phylogenetic and ontogenetic development of behavior. The first part of the course considers the comparative psychology of representative phyla, with special emphasis on the development of sensorimotor coordination, motivation, and learning. The second half of the course is concerned with development of behavior in the individual organism, with most attention devoted to behavioral changes during the life span of vertebrate organisms. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 224. Cognitive Psychology.** Introduction to the psychological study of human information processing and memory; acquisition, retrieval, and forgetting; and general knowledge, concepts, reasoning, and related issues in cognition. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 230. Perception and Sensory Processes.** Survey of the experimental psychology of sensory and perceptual processes and behavior; emphasis on the contribution of behavior science to understanding subjective experience of the physical and social environment. Prerequisite: An introductory course in psychology, physiology, or animal biology. 3 hours.
- 231. Research Methods in Experimental Psychology.** Studies experimental laboratory methods as related to applied and basic psychological questions; material includes: research methodology, scientific problem solving, literature search, scientific writing, experimental design, basic data analysis, and research laboratory experience. Prerequisite: Psychology 100, 103, or 105. 4 hours.
- 233. Descriptive Statistics.** Descriptive statistics, including measures of central tendency and dispersion, correlation, probability, transformations, and basic distribution theory; basic principles of sampling and research design. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 3 hours. Students may not receive credit for Psychology 233 and Psychology 235, Economics 171 or 172, Sociology 185 or 385, Statistics 100 or Educational Psychology 390. (Offered by correspondence only.)
- 234. Inferential Statistics.** Inferential statistics, including sampling distributions estimation, hypothesis testing, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 233. 2 or 3 hours. Students who have earned credit in Economics 171 or 173, Statistics 100, Sociology 185, or Educational Psychology 390 receive 2 hours credit in Psychology 234. Students may not receive credit for both Psychology 234 and 235. (Offered by correspondence only.)
- 235. Introduction to Statistics.** Development of skill and understanding in the application of statistical methods to problems in psychological research; topics include descriptive statistics, probability, estimation, basic inferential methods, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 2 or 5 hours. Students who have earned credit in Economics 171, 172, or 173, Statistics 100, Sociology 185 or 385, or Educational Psychology 390 receive 2 hours credit in Psychology 235. Students may not receive credit for both Psychology 235 and either Psychology 233 or 234.
- 238. Abnormal Psychology.** Conceptions and facts about disordered behavior, including psychoses, neuroses, and other patterns of psychological disturbance. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 239. Community Psychology.** Redefines human and social problems and the implications for social programs and policies; reviews the historical antecedents, conceptual models, strategies and tactics of social and community programs; and employs examples from selected social systems (e.g., criminal justice, education, employment, and mental health). Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 245. Industrial Organizational Psychology.** A systematic study of the application of psychological methods and principles in business and industry; emphasis on personnel

- selection and factors influencing efficiency. Prerequisite: Psychology 100, 103, or 105; credit or concurrent registration in a statistics course. 3 hours.
- 246. Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 248. Psychology of Learning and Memory.** Survey of basic phenomena in learning and memory emphasizing experimental data from animal and human research. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 250. Psychology of Personality.** The study of personality from various points of view: biological, experimental, social, and humanistic; surveys theory and empirical research in the study of personality. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 258. Human Factors in Human-Machine Systems.** Same as Industrial Engineering 248. Examines equipment and training variables that influence the human operator in human-machine systems; includes the nature of human-machine systems, the capabilities of humans and machines, and simulation for design decision; and research and principles for the design and use of symbolic and pictorial displays, control systems, and simulators for training. Prerequisite: Psychology 100, 103, or 105; or junior standing. 3 hours.
- 260. American Sign Language.** Same as Linguistics and Speech and Hearing Science 260. A beginning course in American Sign Language (ASL), the language developed and used by the deaf community of North America; consists of a preparatory phase to attune students to communication in the manual-visual mode, followed by instruction and extensive practice in basic sign vocabulary, sentence structure, elementary conversation, and the literature of the ASL community. 3 hours.
- 290. Special Topics.** Supervised participation in research and scholarly activities usually as an assistant to an investigator. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours.
- 291. Honors Individual Study.** Prerequisite: Junior standing; admission to psychology honors program. 2 to 4 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Planning, researching, and writing of an undergraduate honors thesis, under supervision of a faculty member, on a problem of appropriate scope and character. Prerequisite: Psychology 297. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 294. Individual Topics.** Supervised independent investigation of special topics in psychology; requires a written report with a final copy submitted for departmental records. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours. (Counts for advanced hours in LAS.)
- 297. Junior Honors Seminar.** Seminar on experimental methods and contemporary psychological research. Prerequisite: Junior standing and admission to departmental honors program. 0 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Honors Seminar.** Continuation of Psychology 297. Prerequisite: Psychology 297. 0 to 4 hours. (Counts for advanced hours in LAS.)
- 300. Psychology for Medical Students and Health Professionals.** An advanced treatment of psychological concepts with an emphasis on their interaction with medicine. Topics include: perception, learning, memory, thinking, emotions, and individual differences; psychological theories and data relevant to the analysis of illness and disease; decision making and medical problem solving. Prerequisite: 12 hours of psychology and a 4.0 grade point average; and senior, graduate, or professional standing; or consent of instructor. 3 hours or 1 unit.
- 301. The Computer as a Laboratory Instrument.** The computer as a control device in bio-behavioral experiments; data acquisition using computer-controlled devices; and includes introduction to computer architecture and application language programming, study of recent experimental literature for which the computer was an indispensable tool, and practicum utilizing laboratory computers available at the Department of

- Psychology. Prerequisite: Computer Science 103 or equivalent; two 200-level psychology courses or consent of instructor. 4 hours or 1 unit.
- 306. Statistical Methods, I.** Techniques in applied statistics used in psychological research, including simple linear regression, partial and multiple correlation, and nonparametric methods; thorough review of statistical estimation and significance tests; emphasizes applied statistics and statistical computing. Introduces experimental design; one-way ANOVA. Prerequisite: Twelve hours in psychology and Psychology 235, or equivalent. 4 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
- 307. Statistical Methods, II.** Continuation of Psychology 306. Experimental design, including Latin Squares, factorials, and nested designs; expected Mean Squares, Analysis of Covariance; emphasizes the general linear model; introduces multivariate methods, such as factor analysis, scaling, classification, and clustering. Discrete multivariate analysis—multiway contingency tables. Prerequisite: Psychology 306. 4 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
- 311. Laboratory in Physiological Psychology.** Research on classical and current problems; emphasis on the nervous and endocrine systems in information processing and in the regulation of behavioral adaptation; and examples from sensation, perception, motivation, emotion, and learning. Laboratory. Prerequisite: Psychology 211. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 313. Drugs and Behavior.** Behavioral and physiological effects of chemicals either used therapeutically to treat psychological disorders or that may be abused for their psychotropic effects; emphasizes mechanisms and models for the study of drug action. Prerequisite: Psychology 210, Ecology, Ethology, and Evolution 353, or Biology 303; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Brain, Learning, and Memory.** Conveys a knowledge of current research on the physiological bases of learning and memory; considers a wide range of topics from molecular (e.g., cellular morphological and functional plasticity) to relatively molar (e.g., effects of clinical and experimental brain damage on learning and memory processes). Prerequisite: Psychology 210 or Biology 303; or Psychology 248 or 348; or consent of instructor. 3 hours or 1 unit.
- 315. Human Neuropsychology.** Surveys how the neurological substrate of the human brain governs and influences cognition; biological bases of language, memory, spatial processing, and emotion; principles of brain organization, localization of function and individual differences; includes developmental and clinical issues. Prerequisite: Psychology 210 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 318. Psychology of the Infant.** Early infant behavior, emphasizing critical evaluation of the various research techniques; prenatal and perinatal influences, ontogeny of psychological processes, environmental determinants, and infant assessment. Prerequisite: Psychology 216. 3 hours or 1 unit.
- 319. Day Care Practicum.** Same as Human Development and Family Ecology 319. Application of psychological theory in day care settings; supervised experiences focusing on the relation between aspects of child development and the planning and carrying out of effective day care programs. Typical sections offered include experience with infants, preschool, handicapped, hospitalized, and maltreated children. Prerequisite: Psychology 216 or Human Development and Family Ecology 105; Human Development and Family Ecology 202; acceptance into the Development Child Care Program; consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated.
- 320. Principles of Psychophysiology.** Theoretical and practical aspects of human psychophysiology; measurement techniques and the application of psychophysiological principles to problems in developmental, clinical, social, and experimental psychology. Prerequisite: Psychology 234 or 235, 6 hours of psychology, and an introductory course in physiology. 3 hours or 1 unit.
- 323. Language Acquisition.** Same as Linguistics 323 and Communications 323. Survey of theory and research on the acquisition of language, concentrating on the acquisition of a first language by the young child. Prerequisite: 6 hours of psychology or linguistics above the 100-level, or consent of instructor. 3 hours or 1 unit.

- 324. Psychology of Thinking.** Survey of problems, experimental methods, and research findings in human thinking; emphasis on concept formation, problem solving and decision making, and creativity. Prerequisite: Psychology 235. 3 hours or 1 unit.
- 325. Psychology of Language.** Survey of theory and research in the psychology of language; topics include relation of linguistics and psychology, language development, and influence of language on perception, memory, and thought. Prerequisite: 6 hours of psychology or consent of instructor. 3 hours or 1 unit. Credit not given for both Psychology 325 and Linguistics 325.
- 326. Motivation and Emotion.** The nature and development of emotion, attitude, and motive, and the role of these processes in social adjustment. Prerequisite: 6 hours of psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Human-Computer Interaction Laboratory.** Same as Industrial Engineering 329. Examines basic concepts, methodology, and critical skills needed in conducting research, evaluating and designing human-computer interfaces. Laboratory includes performing experiments in human-computer interaction. Prerequisite: Psychology 224, 258, or 356; and a course in computer science; or consent of instructor. 4 hours or 1 unit.
- 330. Current Topics in Experimental Psychology.** Discusses current research problems in experimental psychology; students perform a detailed research project on a current research problem in experimental psychology. Prerequisite: Psychology 231 and 235, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 331. Advanced Experimental Laboratory Methods.** A lecture-laboratory course concentrating on perception, cognition, learning, and performance; includes psychophysical procedures, workload assessment, reaction time measurement, skill acquisition, problem solving, computerized testing, statistical evaluation, and scientific writing. Prerequisite: Psychology 231 and 235, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Research Methods in Social Psychology: Laboratory Methods.** Same as Sociology 332. Lecture and laboratory in the methods and techniques of social psychological research in laboratory settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235 or Sociology 184 and 185. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 333. Research Methods in Social Psychology: Natural Settings.** Methods and techniques of social psychological research in natural settings. Students formulate and carry out research problems using procedures appropriate for research in natural settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235, or Sociology 185. 4 hours or 1 unit.
- 335. Mathematical Formulations in Psychological Theory.** Illustration of mathematical formulations by studying quantitative treatments of various psychological processes; emphasis on learning theory, psychophysical laws, and other selected topics; and the development of simple mathematical tools as required. Prerequisite: Elementary statistics of probability, elementary calculus, and 6 hours of psychology, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Clinical Psychology.** Survey of methods in clinical psychology; description, demonstration, and critical review of procedures used by clinical psychologists in the analysis and modification of disordered behavior. Prerequisite: Psychology 238. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Behavior Modification.** Introduction to the principles and application of behavior modification; includes methods of behavioral assessment, positive and negative reinforcement, punishment and extinction, token economics, programmed instruction, and desensitization; and emphasizes establishing behavioral objectives in the modification of child and adult clinical problems. Prerequisite: Psychology 248. 3 hours or 1 unit.
- 340. Community Projects.** Principles of psychology applied to service problems in the community; students serve as nonprofessional mental health workers in supervised experiences in schools, hospitals, and other nontraditional settings. Prerequisite: Psychology 100 and 239; junior or senior standing; and consent of instructor. 4 hours or 1 unit.
- 341. Advanced Community Projects.** Advanced discussion and practicum on principles of psychology which may supplement mental health and other human services in a

community. Students serve as nonprofessional mental health workers in supervised experiences in school hospitals and other nontraditional settings. Prerequisite: Psychology 340 and consent of instructor. 4 hours or 1 unit.

- 342. Behavior-Genetic Analysis.** Same as Anthropology 342 and Ecology, Ethology, and Evolution 350. Concepts, methods, and problems in the analysis of relations between genetic systems and animal behavior. Prerequisite: Anthropology 240 or Genetics and Development 106 or 210. 3 hours or $\frac{3}{4}$ unit.
- 343. Hormones and Behavior.** Same as Ecology, Ethology, and Evolution 353. See Ecology, Ethology, and Evolution 353.
- 345. Laboratory in Comparative Psychology.** Animal behavior with particular reference to the behavior of vertebrates. Prerequisite: 6 hours of psychology and an introductory course in biology, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 347. Behavior Genetics Laboratory.** Same as Anthropology 337 and Ecology, Ethology, and Evolution 352. Examination of the relations between genetic mechanisms, population structure, and individual differences in behavior; laboratory work on techniques of behavior study and genetic analysis. Prerequisite: Concurrent registration in Psychology 342. 2 hours or $\frac{1}{2}$ unit.
- 348. Theories of Learning.** A critical analysis of selected theories of learning; consideration of problems of theory construction in the context of past controversies in learning as well as recent theories of animal and human learning. Prerequisite: Psychology 248 or Educational Psychology 211. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 349. Social Psychology of Sport.** Same as Kinesiology 347. See Kinesiology 347.
- 350. Laboratory in Personality.** The study of personality emphasizing active participation in designing, conducting, analyzing, and presenting of research; lectures concern the practical aspects of research methodology and the philosophy of personality research; and laboratory involves conducting original research in small groups. Prerequisite: Psychology 235 or equivalent; and Psychology 250 or consent of instructor. 4 hours or 1 unit.
- 352. Attitude Theory and Change.** Same as Communications 352 and Sociology 352. Comprehensive analysis of theories of attitude acquisition, organization, and change; emphasis on attitude change through communication and effects of persuasive communication on public opinion. Prerequisite: Psychology 201 or Sociology 201, or a comparable course of introduction to social psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 353. Social Perception.** Analysis of theory and research on problems related to the manner in which persons judge themselves and others on the basis of information received; topics include impression formation integration, determinants of interpersonal attractions, and attribution processes. Prerequisite: Psychology 201 and 235, or graduate standing, or consent of instructor. 3 hours or 1 unit.
- 354. Small Group Behavior.** The nature of interpersonal transactions; theories and methods for their investigation; and consideration of both individual and social determinants of such transactions. Prerequisite: Psychology 201. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. Industrial Social Psychology.** Same as Labor and Industrial Relations 355. Social psychological research and theory applied to industrial problems; emphasis on interaction and communication theory, role theory, leadership theory, motivational and perceptual theory, and group structure theory as an aid in understanding and analyzing industrial problems. Prerequisite: Psychology 201 or 357. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. Human Performance and Engineering Psychology.** Human capabilities and limitations in processing information; models and theories of signal detection, stimulus analysis, short-term memory, choice reaction time, decision-making, attention, and motor performance are evaluated with respect to experimental data; emphasizes theory, although implications for design of man-machine systems are considered. Prerequisite: Psychology 100, 103, or 105 or consent of instructor. 3 hours or 1 unit.
- 357. Psychology of Industrial Relations.** Same as Labor and Industrial Relations 357. An analysis, in terms of the behavior of individuals, of the causes and possible solutions of industrial conflict. Offered in the special interest of industrial relations, commerce, and engineering students. Prerequisite: Psychology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 358. Psychology and Law: Social and Cognitive Factors.** Surveys topics in psychology and law with particular emphasis on contributions from social and cognitive psychology; reviews research and theory on behavior in the courtroom and other legal settings. Prerequisite: 6 hours of psychology, including Psychology 201 or its equivalent; or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 359. The Social Psychology of Organization.** Same as Sociology 359. Analysis of the interrelationships between social and psychological factors, and organizational structure and process; emphasis on sources, consequences, and modes of resolution of intra-individual, intraorganizational, and interorganizational conflict. Prerequisite: Psychology 201. 3 hours or 1 unit.
- 360. Modern Viewpoints in Psychology.** Examines modern behaviorism, psychoanalysis, and cognitive psychology, viewed as conceptions of man, styles of theorizing and investigative strategies; critically evaluates the more influential theories and research. Prerequisite: 6 hours of psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 362. Cognitive Development.** Survey of theory and research on the development of problem-solving skills, memorial and metamemorial processes, logical thinking, and language. Prerequisite: Psychology 216 and 235. 3 hours or 1 unit.
- 363. Laboratory in Developmental Psychology.** Experience in designing, carrying out, and reporting an original research project. Prerequisite: Psychology 216 and 235, or equivalent. 4 hours or 1 unit.
- 365. Personality and Social Development.** Same as Educational Psychology 315. Major theories of personality and social development, with attention to processes of social learning, individual differences in personality development, and outcomes of social development; applications to school, home, and other field settings. Prerequisite: Psychology 216 or Educational Psychology 236, or equivalent. 3 hours or 1 unit.
- 368. Psychology and Law: Civil Liberties and Constitutional Issues in the Mental Health, Educational, and Criminal Justice Systems.** Examines relationship of the administrative, civil, and criminal justice systems to educational and mental health institutions; individual rights, social issues, and psychological well being. Prerequisite: 6 hours of social science. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 371. The Psychology of Voting Behavior.** An application of psychological methods and theories to the study of political behavior; attention to research methods and to content problems in voting behavior and national security policy. Prerequisite: 6 hours beyond 100-level courses in psychology, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 372. Environmental Psychology.** Same as Environmental Studies 372. See Environmental Studies 372.
- 373. Theory and Method in the Cross-Cultural Study of Individual Social Behavior.** Same as Anthropology 373. Centers on cross-cultural study of substantive areas such as personality, motivation, socialization, interpersonal behavior, psychological environments, cognition and cognitive development, ethnocentrism and stereotypes, and visual perception; emphasis on methodological limitations and contributions of cross-cultural study; and discussion of current problems and research. Prerequisite: 6 hours of psychology or anthropology, or consent of instructor. 3 hours or 1 unit.
- 375. Personnel Psychology.** Introduces problems and research relevant to personnel issues in organizations. Topics include: individual differences; selection of personnel; test theory; performance appraisal; equal employment opportunity legislation, regulation, and litigation; assessing bias in selection. Prerequisite: Psychology 235 or equivalent, and either Psychology 245 or Business Administration 351. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 380. Introduction to Mental Health Programs.** Historical foundations, schema for classification of mental health delivery systems, contemporary treatment strategies, ethical and legal issues, and alternatives to institutional treatment; includes field trips to a variety of treatment facilities. Prerequisite: Credit or concurrent registration in Psychology 336 and 337. 3 hours or 1 unit.
- 381. Beginning Practicum in Mental Health.** Didactic instruction and supervised practicum experience in a community treatment agency; self-report, observational, and physiological approaches to client assessment; and lecture-discussion and direct agency experience each week. Prerequisite: Psychology 380. 4 hours or 1 unit.

- 382. Issues in Mental Health Work, I.** Basic behavioral principles useful in formulating, carrying out, and evaluating a treatment plan; focuses on the training of nonprofessionals (e.g., parents) or staff members in treatment roles. Prerequisite: Psychology 381 and concurrent registration in Psychology 383. 2 hours or 1/2 unit.
- 383. Advanced Practicum in Mental Health, I.** Supervised practicum experiences in a community agency which correspond to didactic material presented in the companion course, Psychology 382. Prerequisite: Concurrent registration in Psychology 382. 4 hours or 1 unit.
- 384. Issues in Mental Health Work, II.** Procedural alternatives to the operant approaches presented in Psychology 382 and 383; students are encouraged to focus their interests on a particular client population; and lecture-discussion with individualized reading programs. Prerequisite: Concurrent registration in Psychology 385. 2 hours or 1/2 unit.
- 385. Advanced Practicum in Mental Health, II.** Supervised practicum experiences in a community agency corresponding to didactic material presented in the companion course, Psychology 384; twelve-hour-per-week assignments reflect student interests in specific population. Prerequisite: Psychology 382 and 383, and concurrent registration in Psychology 384. 4 hours or 1 unit.
- 390. Laboratory in Psychological Measurement and Test Development.** The measurement of human behavior in psychological studies; the construction and use of psychological tests; introduction to tests of intelligence, achievement, personality, and interest; and practice in test construction, administration, and validation. Lectures and laboratory. Prerequisite: A knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1 unit.
- 396. Seminar in Psychology.** Special topics in the field of psychology. Prerequisite: Junior standing and consent of instructor. 2 to 4 hours, or 1/2 to 1 unit. May be repeated to a maximum of 12 hours or 3 units.

Note: The prerequisites stated below apply to graduate majors in psychology. Students minoring in psychology may, by special permission of instructors, enroll in certain of these courses without having met all the prerequisites.

- 402. Systematic Psychology.** Analysis of methodological problems, including forms and roles of models and theories, status of unobservable organismic events, validation of measures and manipulations, possible forms of laws, forms of data language, and status of private reports; evaluation of the approaches to these problems provided by several varieties of behaviorism, standard and omnitheoretic views in the philosophy of science, and network methods. Prerequisite: 12 hours of psychology. 1 unit.
- 405. Neurochemistry.** Same as Physiology 405. The fundamentals of neurochemistry and topics of current interest; detailed study of chemical transmission, including metabolism, neuroanatomical distribution, pharmacology, and functions of neurotransmitters. Lecture-seminar. Prerequisite: Biochemistry 350, Psychology 210 or 407, or consent of instructor. 3/4 unit.
- 406. Psychological Scaling: Unidimensional Methods.** Same as Sociology 406. Measurement of psychological values; centrally concerned with how subjective values of multiple physical dimensions combine to produce unidimensional subjective values; and includes conjoint and functional measurement theory and methods, theoretical models of judgment and the analysis of empirical structures, and applications of scaling models to problems in social, personality, perception, and cognitive psychology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. 1 unit.
- 408. Design of Experiments in Psychology.** Advanced experimental designs in psychological research; special methods of data analysis. Prerequisite: Psychology 307. 1 unit.
- 409. Psychological Scaling: Multidimensional Methods.** Same as Sociology 409. Basic scaling theory; metric, non-metric, and individual differences multidimensional scaling models and methodology, emphasizing underlying assumptions and interpretation; and applications of scaling methods to measurement problems in social and personality

psychology, perception, cognition, and sociology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. Psychology 406 is recommended but not required. 1 unit.

- 410. Advances in Psychobiology: Introduction for Graduate Students.** Deals with the relevance of biological psychology to the subdisciplines of psychology; topics include current theory and treatment of psychosis, neuropsychology of movement disorders, human memory models and the brain, hormones and sexuality, biorhythms in normal and abnormal behavior, physiology of sensing and perceiving, selective attention, and others. Prerequisite: Psychology 210 or consent of instructor. $\frac{1}{2}$ to 1 unit. Consent of instructor is required for more than $\frac{1}{2}$ unit (e.g., $\frac{3}{4}$ or 1 unit).
- 411. Advanced Physiological Psychology.** Detailed examination of the physiological mechanisms in behavior; emphasis on research methodology and contemporary literature in the physiology of motivation, learning, perception, and emotion; and includes laboratory demonstrations and problems. Prerequisite: 12 hours of psychology, including Psychology 311 or equivalent. $\frac{1}{2}$ or 1 unit.
- 414. Neurotoxicology.** Same as Environmental Studies 414 and Veterinary Biosciences 414. See Veterinary Biosciences 414.
- 415. Experimental Sensory Psychology.** A systematic study of sensory processes, including vision, audition, gustation, olfaction, and somesthesia; emphasis on experimental methods, research findings, and theory. Prerequisite: 12 hours of psychology, including a laboratory course in experimental psychology. 1 unit.
- 416. Perception.** Systematic study of methods and research findings in the field of human perception, together with an evaluation of theoretical interpretations. Prerequisite: 12 hours of psychology. 1 unit.
- 417. Experimental Psychology of Learning, I: Basic Processes.** Study of experimental investigation of basic learning processes; emphasis on the nature of the problems, experimental procedures, and theoretical significance. Prerequisite: 12 hours of psychology. 1 unit.
- 418. Experimental Psychology of Learning, II: Human Learning.** Data and theories of verbal learning; verbal mediators and their functions in learning and retention; transfer of training; short-term and long-term memory; and conceptualizations of the forgetting process. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
- 422. Models of Human Memory.** Detailed examination and comparison of human memory models. Emphasis on understanding the central aspects of 5-8 recent models and their similarities and differences. Prerequisite: Psychology 224, 324, and 418, or consent of instructor. 1 unit.
- 423. Problem Solving and Cognitive Skill Acquisition.** Selected topics in how people solve problems and learn cognitive skills. A broad range of empirical findings will be discussed, along with psychological and computational accounts. Prerequisite: Psychology 324 or consent of instructor. 1 unit.
- 424. Developmental Psycholinguistics.** Same as Communications and Linguistics 424. Examination of empirical and theoretical literature on the acquisition of language; emphasis on universal patterns in the acquisition of a first language and on a consideration of explanations, both psychological and linguistic, for these patterns. Prerequisite: Linguistics 325, Psychology 325 or 362, or consent of instructor. 1 unit.
- 425. Psycholinguistics.** Same as Communications 425 and Linguistics 425. A critical survey of methods and theories in the psychological study of the communication process; emphasis on linguistic, information-theory, and learning-theory approaches; psycholinguistic analysis of language decoding and encoding; and the development and measurement of symbolic processes, including meaning. Prerequisite: Consent of instructor. 1 unit.
- 427. Engineering Psychology.** Experimental psychology applied to the study of man-machine systems; considers research issues, methodological matters, and principles of design and training in terms of contemporary aircraft, highway, industrial, and health-care systems. Prerequisite: Psychology 258 or 356, or consent of instructor. 1 unit.
- 428. Cognitive Determinants of Behavior.** Theoretical and experimental analyses of the

role of decision processes and causal attributions in the control of behavior; examines a variety of subparadigms from several areas of psychology. Prerequisite: 12 hours of psychology. 1 unit.

429. Second Language Acquisition and Bilingualism. Same as Linguistics 429. See Linguistics 429.

430. Foundations of Industrial-Organizational Psychology. Same as Labor and Industrial Relations 430. Theoretical and empirical foundations of various content areas in industrial-organizational psychology; sample topics include employee selection and placement, training, human factors engineering, work motivation, employee attitudes, leadership, and organizational theory. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.

431. Psychological Measurement in Industry. Application of psychometric methods and the finding of differential psychology to the selection, classification, and performance evaluation of industrial personnel. Prerequisite: Psychology 307 or equivalent. 1 unit.

432. Introduction to Clinical Psychology Practicum. Supervised practice in mental health delivery services; includes assessment and modification of problem behaviors in short-term treatment programs and beginning experience in school and community consultation; and emphasizes the development of skills in interviewing, conceptualization of problem behaviors, report writing, and effective staff interactions. Prerequisite: First-year graduate standing in clinical psychology and credit or concurrent registration in Psychology 438. 1 unit.

433. Internship in Industrial/Organization Psychology. Supervised practice in organizational practice and research, implementation of programs, evaluation, feedback of survey results, applied assessments, assistance in EAP programs, and development of personnel guidelines, emphasizes applications of principles and procedures. Offered in special interest of graduate students in I/O psychology program. Prerequisite: Graduate standing in Psychology, credit or concurrent registration in Psychology 430, and consent of instructor. 1 unit.

435. Motivation and Morale in Industry. Same as Labor and Industrial Relations 435. Concepts and methods in the study of motivation of employees; determinants of employee attitudes and job satisfaction; and modification of attitudes and morale. Prerequisite: 4 units of graduate credit in psychology or consent of instructor. 1 unit.

436. Mathematical Models in Psychology. Recent developments in mathematical models in psychology; special emphasis on human learning, higher processes, and modern psychophysics. Prerequisite: One year of calculus and Psychology 306 and 307, or consent of instructor. $\frac{1}{2}$ or 1 unit.

438. Introduction to Clinical Psychology, I. Introduction to clinical psychology as a science and profession. Considers psychodynamic, behavioral, and community perspectives; emphasizes the conceptual foundations of each approach. Required of all entering graduate students in clinical psychology. Prerequisite: Consent of instructor required for all students not admitted to graduate program in clinical psychology. 1 unit.

439. Introduction to Clinical Psychology, II. Considers critical issues in the assessment and study of psychological and social dysfunction, as manifested in adult psychopathology, childhood disorders, and community problems. Required of all entering graduate students in clinical psychology. Prerequisite: Credit or concurrent registration in Psychology 438; consent of instructor required for students not admitted to graduate program in clinical psychology. 1 unit.

441. Personality and Behavior Dynamics. Theory and research in personality, emphasizing personality as individual differences among persons and personality as attributed to persons by others; explores the measurement, antecedents, and consequences of such differences and attributions. Prerequisite: 12 hours of psychology. $\frac{1}{2}$ or 1 unit.

443. Clinical Assessment. Instruction and practice in the administration and interpretation of individual tests of general intelligence, special abilities, and achievement. Prerequisite: 12 hours of psychology, including Psychology 390 or equivalent; Psychology 432 and 439. 1 unit.

445. Strategies of Clinical Intervention. A critical survey of issues, principles, practice,

- and research related to modifying human behavior; covers psychotherapeutic and somatic approaches; symptomatic relief and personality-restructuring; goal-orientations; and individual family, group, milieu, and preventive community intervention. Prerequisite: Concurrent registration in Psychology 447 strongly recommended. 1 unit.
- 446. Laboratories in Clinical Psychology.** Intensive practice in techniques of clinical assessment and behavior modification with emphasis on recent innovations; small sections of the course formed according to the specialized interests of students and staff. Prerequisite: Psychology 432 and 445, or consent of instructor. $\frac{1}{2}$ to 1 unit.
- 447. Internship.** Supervised field experience in clinical psychology. Prerequisite: Consent of instructor. 0 to 4 units.
- 450. Community Psychology and Social System Change.** Intensive examination of the historical antecedents, conceptual models, strategic tactics, and evaluation methods of planned social and ecological change; focuses on the role of the community psychologist in such endeavors; and reviews interventions in several social systems, such as criminal justice education, employment, and mental health. Prerequisite: Psychology 239 or equivalent; graduate standing in psychology or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 451. Theory and Method in Social Psychology, I.** First of two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
- 452. Theory and Method in Social Psychology, II.** Second of a two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Each student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
- 453. Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Sociology 456. See Business Administration 410.
- 454. Psychology and the Legal Process.** Analyzes selected topics in the application of psychological methods and theory to legal issues and problems. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 456. Attitude Measurement and Behavioral Prediction.** Same as Communications 456. Comprehensive examination of the theory and method of attitude measurement and its implications for behavioral prediction; emphasis on the attitude concept and the validity of behavioral criteria. Prerequisite: Consent of instructor. 1 unit.
- 457. Theory and Research in Organizational Psychology.** Theory and research on the psychological processes involving the demands of organizations on the behavior of individuals; emphasis on the processes of power, authority, influence, leadership, communications, decision making, and organizational change. Prerequisite: Psychology 455 or consent of instructor. 1 unit.
- 458. Advanced Problems in Attitude Research.** Intensive analyses of recent developments in attitude theory and research; emphasis on the attitude-behavior relationship; and examination of theories of attitude and attitude change with respect to their utility in predicting and changing social behavior. Prerequisite: Consent of instructor. 1 unit.
- 459. Advanced Problems in Research on Groups.** Intensive examination of current research and theory on structure, process, and performance of groups; critical examination of recent research and theoretical literature; and development of research designs for related issues in the field. Prerequisite: Consent of instructor. 1 unit.
- 460. Motivation and Personality Development in Children.** Theory, method, and research on the interaction of motivational, personality, and learning processes and development in children; emphasis on experimental studies and a social learning theory approach. Class projects involve some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
- 462. Human Abilities.** Analysis of individual differences in human abilities, including historical background, measurement methodology, and functional correlates of abilities;

consideration of the use of ability measures in both experimental and applied research. Prerequisite: Psychology 307 or equivalent. 1 unit.

- 463. Research Methods in Clinical Psychology and Personality.** The logical analysis of clinical inferences and their role in research; problems and methods in the investigation of the development, dynamics, and structure of personality; and research in psychotherapy. Prerequisite: Psychology 306. 1 unit.
- 464. Advanced Problems in the Study of Individual Social Behavior.** An intensive examination of current research into one or more of the following areas: social perception and cognition, social motivation, social learning, and environmental factors in social behavior; critical examination of recent research and theoretical literature, and development of research designs for selected current issues. Prerequisite: Consent of instructor. 1 unit.
- 467. Personality Assessment.** Methods and theory in the quantitative assessment of personality; review of research findings and trends. Prerequisite: Psychology 307 or equivalent. 1 unit.
- 468. Contemporary Behavior Theory.** Analysis of contemporary issues in animal and human learning; specific topics vary. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 1 unit.
- 469. Cognitive Development.** Examination of laboratory investigations of cognitive development in children; emphasis on current theories of cognition and language; and class projects involving some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
- 470. Principles and Methods of Teaching Psychology.** Designed for graduate students in psychology; areas considered include developing course objectives and content; developing and presenting teaching-learning situations; evaluating the attainment of course objectives; advising and counseling students; ethics in teaching; and research problems on the teaching of psychology. Prerequisite: Second-year graduate standing in psychology or consent of instructor. 0 to 1 unit.
- 483. Psychology of Speech and Hearing Disorders, I.** Same as Speech and Hearing Science 483. See Speech and Hearing Science 483.
- 484. Psychology of Speech and Hearing Disorders, II.** Same as Speech and Hearing Science 484. See Speech and Hearing Science 484.
- 485. The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Sociology 485. See Business Administration 435.
- 486. Multivariate Correlational Techniques in Educational Research.** Same as Educational Psychology 485. See Educational Psychology 485.
- 489. Doctor of Psychology Report.** Limited to students pursuing the Psy.D. degree. Prerequisite: Credit or concurrent registration in Psychology 447. 0 to 4 units (summer session, 0 to 2 units). May be repeated.
- 490. Individual Research.** For graduate students who wish to conduct research on special problems not included in graduate theses. Prerequisite: Consent of instructor. 0 to 4 units.
- 492. Psychology of Learning and Instruction.** Same as Educational Psychology 492. See Educational Psychology 492.
- 493. Seminar.** Discussion of current topics in their historical setting, with special emphasis on research problems. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 0 to 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Educational Psychology 494 and Sociology 494. Examines the principal methods of descriptive and inferential statistics used in the analysis of multiple measurements, emphasizing linear transformations, multiple regression, principal components, multivariate analysis of variance, canonical correlation and variates, discriminant functions and variates, and conventional procedures of factor analysis; involves both theory and applications. Prerequisite: Psychology 307 or Educational Psychology 496; consent of instructor. 1 unit.
- 495. Theories of Measurement.** Same as Educational Psychology 495. See Educational Psychology 495.
- 499. Thesis Research.** 0 to 4 units.

RADIO AND TELEVISION

Acting Head of Department: J. W. Carey

Department Office: 119 Gregory Hall, 810 South Wright, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 291. Special Problems.** Special projects, research, and independent reading in radio and television for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of department. 2 or 3 hours.
- 368. Legal and Policy Issues in Telecommunications.** Same as Communications 368. See Communications 368.
- 450. Special Problems in Television.** Project work for advanced students in specific areas of television, including news, advertising, directing, writing, etc. Prerequisite: A television course in the area of specialization; consent of department. $\frac{1}{2}$ to 3 units. A maximum of 3 units permitted toward degree.
- 462. Seminar in Radio and Television.** Same as Communications 462. Studies the performance of radio and television in terms of content, government and industry controls, social responsibility, economic bases, and psychological and social effects. Prerequisite: Consent of department. 1 unit.
- 463. World Broadcasting.** Same as Communications 463. Studies the broadcast systems used by the nations of the world; alternative and mixed systems; international organizations, agreements, exchanges, and problems; broadcasts to and from other countries; implications of such new developments as satellites; and mass and nonmass uses. Prerequisite: Consent of department. 1 unit.
- 490. Special Topics in Radio and Television.** Prerequisite: Consent of department. $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** Prerequisite: Graduate standing in radio and television. 1 or 2 units.

REHABILITATION EDUCATION

Director of Division: J. Larsen, Jr.

Division Office: 105 Rehabilitation Education Center, 1207 South Oak, Champaign

- 151. Prescribed Exercise.** Prescribed exercises adapted to individual needs, capacities, and interests: open to paraplegic, permanently disabled, and individuals with significant temporary disabilities who will require long term rehabilitation. 1 hour.
- 206. Working With the Disabled, I.** Same as Biology 206. Designed primarily for a select group of students who serve as live-in student-staff aides to the severely physically disabled students living in the Beckwith Living Center. Supervised experience in identifying the individual needs of the disabled, recognizing the variance of disabilities, and administering the activities of daily living. Prerequisite: Biology 110 or Physiology 103, or consent of instructor. 3 hours.
- 207. Working With the Disabled, II.** Same as Biology 207. Designed primarily for a select group of students who serve as live-in student-staff aides to the severely physically disabled students living in the Beckwith Living Center. Experience in identifying the individual needs of the disabled, recognizing the variance of disabilities, and administering the activities of daily living; a continuation of the laboratory experience in Rehabilitation 206, augmented by a paper. Prerequisite: Rehabilitation 206 or consent of instructor. 3 hours.
- 241. Beginning Manual Communication.** Introduction to study of hearing impairment; beginning theory and practice of American Sign Language and Signed English from a rehabilitation perspective. Prerequisite: Junior standing or consent of instructor.
- 301. Introduction to Rehabilitation.** Orientation to general field of rehabilitation; includes foundations, resources, assessment, counseling, and placement. 4 hours, or 1 unit.
- 302. Medical Aspects of Disability.** Examination of the scope of medical disabilities, their

- implications, complications, and management. Prerequisite: Biology 111 and Anatomical Sciences 234; or consent of instructor. 4 hours, or 1 unit.
- 340. Introduction to Sensory Impairments.** Introduces sensory impairments (i.e., vision and hearing) from a rehabilitation perspective. Prerequisite: Biology 111 or equivalent; Psychology 100 or equivalent; Rehabilitation Education 301. 4 hours, or 1 unit.
- 342. Advanced Manual Communication.** The study of functional and philosophical issues relative to hearing impairment and deafness; advanced theory related to manual communication and its applications in rehabilitation settings, as well as experience signing and reading sign. Prerequisite: Rehabilitation Education 241, or consent of instructor. 4 hours, or 1 unit.
- 344. Introduction to Adaptive Technologies for the Disabled.** Introduction and orientation to available adaptive technologies, their applications to various disability groups, and current research and field testing. Prerequisite: Rehabilitation Education 301; Rehabilitation Education 302, or consent of instructor. 4 hours, or 1 unit.
- 381. Rehabilitation Practicum.** Practical experience in the major areas of rehabilitation; discussion/laboratory sections cover the areas of physical therapy, occupational therapy, sensory impairment, recreational therapy, activities of daily living, counseling, and medical services. Prerequisite: Rehabilitation 301 and consent of instructor. 1 unit.
- 401. Research Methods in Rehabilitation.** Examines methods and techniques of conducting and evaluating rehabilitation research; experimental and survey designs and procedures; data collection and current directions of rehabilitation research. Prerequisite: Rehabilitation 301, Educational Psychology 390, and consent of instructor. 1 unit.
- 437. Introduction to Neuropsychological Testing for Rehabilitation Counselors.** Use by rehabilitation counselors of the Halstead-Reitan Neuropsychological Test Battery and other related tests; particular emphasis on understanding test reports and useful applications for neuropsychological testing in terms of rehabilitation clients. Prerequisite: Rehabilitation 301; consent of instructor. 1 unit.
- 491. Seminar in Rehabilitation.** Discussions, reviews, and appraisals as special topics in the field of rehabilitation. Prerequisite: Consent of instructor. 0 to 1/4 unit. May be repeated to a maximum of 1 unit.
- 493. Special Problems in Rehabilitation.** Independent research on special projects. Open only to majors. Prerequisite: Rehabilitation Education 301; consent of instructor. 1/2 unit. May be repeated to a maximum of 2 units.
- 494. Special Topics.** Lecture course on topics of current interest; specific subject matter announced in Timetable. Prerequisite: Will be determined for each topic and will be indicated in Timetable; Rehabilitation 301; consent of instructor. 1/2 to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Preparation of thesis in rehabilitation. Prerequisite: Satisfactory standing in the master's program. 0 to 2 units. May be repeated to a maximum of 2 units.

RELIGIOUS STUDIES

Director of Program: G. G. Porton

Office: 3014 Foreign Languages Building, 707 South Mathews, Urbana

- 101. The Bible as Literature.** Same as English 114. Themes and literary genres in the Bible, emphasizing content important in Western culture. 3 hours.
- 102. Religion and Science.** Same as History 147 and Sociology 102. A study of changes brought about by the rise of modern science; focuses on historical conflicts (e.g., Copernicus and Darwin) and theological reflection regarding the significance of natural and social sciences for religious belief and practice. 3 hours.
- 104. Asian Mythology.** Same as Asian Studies 104. An introductory survey of the mythologies of India, China, and Japan. 3 hours.

106. **Archaeology and the Bible.** Examination of archaeological evidence, especially from Syria-Palestine, and discussion of its use in the interpretation of Biblical literature. 3 hours.
110. **World Religions.** Same as Philosophy 110. See Philosophy 110.
111. **Elementary Greek, I.** Same as Greek 101. See Greek 101.
112. **Elementary Greek, II.** Same as Greek 102. See Greek 102.
120. **A History of Judaism.** Examines the social, political, economic, and intellectual history of the Jews from Abraham to the present-day, with particular attention to Jewish thought and society. 3 hours.
121. **Christianity: An Introduction.** Typological and historical approaches to major forms of Christianity: Eastern Orthodoxy, Catholicism, and Protestantism. 3 hours.
122. **History of East Asian Religions.** Same as Asian Studies 122. Introduction to East Asian religious traditions from classical to modern times; emphasizes the ideas of Confucianism, Taoism, Shinto, and Buddhism in China and Japan and their historical interactions. 3 hours.
123. **Islam: An Introduction.** History of Islamic thought from the time of Muhammad to the present, including the prophethood of Muhammad, the Qur'an, theology and law, mysticism and philosophy, sectarian movements, modernism and legal reform, and contemporary resurgence. 3 hours.
125. **War, Religion, and Society.** Examines the implications of religious and secular moral theories for our views of war, including nuclear war, and nuclear deterrence; gives attention to the religious and secular underpinnings of just war theory and pacifism, to nuclear strategy, and weaponry, to the positions of contemporary religious and secular groups on the morality of current policies and to conflicts over scarce resources. Serves as an introduction to religious ethics. 3 hours.
130. **Jewish Practices: A Religio-historical Approach.** The major festivals and life-cycle rituals of Judaism; focuses on sacred time, interaction of external and internal factors producing change and conservatism, relationship of ritual and theology, and the thematic development inherent in the rituals. 3 hours.
132. **Zen.** Same as Asian Studies 132. Introduces the history, teachings, and practice of Zen Buddhism in China and Japan. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Classical and Koine Greek Prose.** Same as Greek 201. See Greek 201.
201. **Hebrew Bible in English.** Analyzes the critical issues in the interpretation of the literature of the Hebrew Bible/Old Testament; surveys the history and religion of Ancient Israel with special reference to Israel's setting in the ancient Near East. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
202. **New Testament in English.** Analyzes the literature of the New Testament in its social and religious setting, with special reference to the ministry and teaching of Jesus, the emergence of the church as a sect within ancient Judaism, and the development of Christian institutions in the Graeco-Roman world. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
204. **The Gospels.** Same as Greek 204. See Greek 204.
205. **Introduction to Classical Hebrew, I.** Same as Hebrew 205. See Hebrew 205.
206. **Introduction to Classical Hebrew, II.** Same as Hebrew 206. See Hebrew 206.
210. **Biblical Prose.** Same as Hebrew 210. See Hebrew 210.
221. **American Judaism.** Forms of Judaism in America: Reform, Conservative, Reconstructionist, Orthodox, and Hasidic Judaism; the American rabbi; Zionism in American Jewish communal life; national Jewish organizations; the American synagogue; and the secular Jew. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as History 224. See History 224.
228. **Social Theories of Religion.** Same as Sociology 228. See Sociology 228.
229. **Sociology of Religion.** Same as Sociology 229. See Sociology 229.
230. **Philosophy of Religion: Introduction.** Same as Philosophy 230. See Philosophy 230.

- 232. Ancient Greek Sanctuaries.** Same as History of Art 218 and Classical Civilization 232. See Classical Civilization 232.
- 237. Ancient Greek Religion.** Same as Classical Civilization 237. See Classical Civilization 237.
- 242. The Holocaust: Religious Responses.** The theoretical foundation for ideas of national and racial superiority which attended the holocaust and responses to this phenomenon by major Jewish and Christian thinkers, including Rubenstein, Buber, Fackenheim, Berkowitz, Reuther, and Wiesel. 3 hours.
- 260. Mystics and Saints in Islam.** Examines mystical concepts and practices in Islam through the ages, through the lives and writings of important mystics and Sufi holy men and women, as well as the integration of mysticism and the Sufi Orders into Muslim society and Islamic orthodoxy. No knowledge of Islam or foreign language is required. 3 hours.
- 268. Religious Rebellions and Messianic Movements in History.** Same as History 268. See History 268.
- 283. Jewish Sacred Literature.** Same as Comparative Literature and English 283. Literary study of the major post-biblical sacred texts of Judaism; includes readings in translation from Mishnah, Tosefta, Talmudim, midrashim, piyyutim, and mystical treatises. Emphasizes nature, history, function, and development of literary patterns and forms and the relationships between form and content in these texts. 3 hours.
- 284. Jewish Experience in Literature.** Same as Comparative Literature and English 284. See English 284.
- 286. Introduction to Hinduism.** Elements of Hindu thought and practice; selected topics presented in historical order and in the context of Indian cultural history (including the present). 3 hours.
- 287. Introduction to Buddhism.** Same as Asian Studies 287. A thematic approach to the history of Buddhism from its origin in India to its spread throughout China and Japan; explores how the doctrinal and social development of Buddhism in East Asia is related to the process of cultural adaptation. 3 hours.
- 288. Religion in Asian Society.** Same as Asian Studies 288 and Sociology 288. See Asian Studies 288.
- 289. Comparative Muslim Societies.** Same as Anthropology 289 and History 289. Examination and comparison of the commonalities that unite over 800 million Muslims with special attention on the Qur'an, judgement, hajj, hijra, education, contemporary communications, and the experience of Muslim minorities in non-Muslim societies. 3 hours.
- 290. Independent Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of staff member supervising the work. 2 to 6 hours. May be repeated.
- 293. Honors Senior Thesis.** Two-semester research project. Prerequisite: Senior concentrators in religious studies who are eligible for graduating with distinction from the program. 3 hours. Must be taken for two semesters for a total of 6 hours. (Counts for advanced hours in LAS.)
- 294. Topics in Religious Thought.** Topics in contemporary theological problems. 3 hours.
- 295. Topics in Asian Religions.** Same as Asian Studies 295. Topics in Hinduism, Buddhism, Taoism, and other Asian religious traditions. Prerequisite: Sophomore standing or consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours.
- 296. Special Topics in the History of Judaism.** 3 hours. May be repeated for a maximum of 6 hours.
- 298. Special Topics in Biblical Interpretation.** Detailed interpretation of selected books of the Bible. 3 hours.
- 301. Introductory Coptic, I.** Same as Coptic 301 and Linguistics 314. See Coptic 301.
- 302. Introductory Coptic, II.** Same as Coptic 302 and Linguistics 315. See Coptic 302.
- 304. Medieval Civilization.** Same as History 304. See History 304.
- 305. The Age of the Renaissance.** Same as History 305. See History 305.

- 306. The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as History 306. See History 306.
- 307. Islam and the Near and Middle East from Mohammed to 1258.** Same as History 307. See History 307.
- 308. Islam and Society in the Modern Middle East and North Africa.** Same as Political Science 339. Examines the role of Islam in contemporary politics, the contemporary resurgence of Islam, and the articulation of Islamic approaches to the new economic order, nationalism, and the changing role of women. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 311. Hebrew Poetry.** Same as Hebrew 311. See Hebrew 311.
- 312. Readings in Sanskrit, I.** Same as Sanskrit 303. See Sanskrit 303.
- 313. Readings in Sanskrit, II.** Same as Sanskrit 304. See Sanskrit 304.
- 328. Sociology of Asian Religions.** Same as Asian Studies and Sociology 328. See Sociology 328.
- 340. The Formation of Christian Thought.** Study of major developments in early Christian thought (first four centuries) through discussion of primary texts in translation. Prerequisite: Religious Studies 201 and 202, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Martin Luther.** Same as German 341. See German 341.
- 342. History of Early Judaism.** The history of Judaism from Ezra to the rise of Islam: Hellenism and Judaism, varieties of Judaism, Palestinian Judaism and its documents, Babylonian Judaism, the rabbis, and popular Jewish culture. Prerequisite: Credit in one course in religious studies at the 200- or 300-level, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 343. Ancient Near Eastern Cultures.** Examines the literature and religious practice of the great civilizations of the Near East, particularly the Sumerian, Assyro-Babylonian, Egyptian, Canaanite and Hittite cultures. Prerequisite: Religious Studies 201 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 362. Philosophy of Religion.** Same as Philosophy 324. See Philosophy 324.
- 363. Religion in Anthropological Perspective.** Same as Anthropology 363. See Anthropology 363.
- 381. American Intellectual and Cultural History to 1865.** Same as History 371. See History 371.
- 382. American Intellectual and Cultural History since 1859.** Same as History 372. See History 372.
- 384. Buddhist Meditation.** Same as Asian Studies 380. Examines classical systems of Buddhist meditation and their relation to Buddhist psychology and world view. Prerequisite: Religious Studies 287, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 388. History and Thought of Chinese Buddhism.** Survey of the history of Chinese Buddhism since its introduction; analysis of Buddhological trends and styles; and the sociocultural milieu of Chinese Buddhism and its place in the total history of ideas and lifestyles. Prerequisite: Religious Studies 287 and 288, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 400. Contemporary Study of Religion, I.** Investigates seminal books and articles in the study of religion from a variety of disciplinary perspectives. 1 unit.
- 401. Contemporary Study of Religion, II.** Investigates seminal books and articles in the study of religion from a variety of disciplinary perspectives. 1 unit.
- 430. Proseminar: Religious Studies.** Systematic investigation of issues, resources, and modes of inquiry in the major areas of the study of Bible, Asian religions, or religious thought; topics vary according to the needs of the graduate students. Prerequisite: Consent of instructor. $\frac{3}{4}$ unit. May be repeated as topics vary.
- 440. Seminar in Religious Studies.** Research in special problems in the study of Bible, Asian religions, or religious thought; topics vary according to the needs of the graduate students. Prerequisite: Consent of instructor. 1 unit. May be repeated as topics vary.
- 480. Readings in Religious Literature.** Readings in primary texts in original languages which are relevant to Biblical studies, Asian religions, or religious thought. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.

- 490. Independent Study.** Special topics not treated in regularly scheduled courses; for graduates. Prerequisite: Evidence of adequate preparation for such study and consent of staff member supervising the work. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units. May be repeated.

RHETORIC AND COMPOSITION

(See English)

SCULPTURE

(See Art and Design)

SCIENCE, TECHNOLOGY, AND SOCIETY

Director of Program: D. Alpert

Department Office: 912 $\frac{1}{2}$ West Illinois, Room 201, Urbana

- 180. Nuclear Weapons, Nuclear War, and Arms Control.** Same as Physics 180. See Physics 180.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Technology and Human Values.** Same as Philosophy 275. Interaction of technologies and human values, goals, and beliefs; social and individual decision making and responsibilities concerning the applications of technologies; evaluation and constructive criticism of particular technologies and the assessment of benefits and harms. Prerequisite: Rhetoric 105 or equivalent. 3 hours.
- 202. Management and Control of Technology.** A survey of models, methods, and techniques used in the public and private sectors for the planning, assessment, and regulation of technology. Includes a semester-long project in modeling the impacts, costs, risks, and benefits of a specific technological innovation, with special attention to the role of assumptions and implicit values. 3 hours.
- 260. Science and Technology in Contemporary Literature.** Same as Comparative Literature 260. Discusses the "Two Cultures" controversy and the literary response to the infusion of science and technology into modern life. 3 hours.
- 301. Sociology of Scientific Knowledge.** Same as Sociology 366. See Sociology 366.

SECONDARY EDUCATION

Acting Chairperson of Department: A. Madsen

Department Office: 395 Education Building, 1310 South Sixth, Champaign

- 101. Introduction to the Teaching of Secondary School Subjects.** A survey of recent developments in the teaching of secondary school subjects; assesses standard and new programs; and explores research and empirical evidence as they relate to effective teaching of secondary school subjects. Special sections are provided in English, mathematics, science, social studies, speech, and computer science. Experiences in school settings are provided in Secondary Education 219. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 209. Preliminary Field Experience in Secondary Teaching.** To be taken during the sophomore year by continuing students at the University of Illinois in secondary ed-

education curricula of English, mathematics, science, social studies, and speech. For students transferring into these programs at the 60 or near 60-hour level from other colleges, universities, or junior colleges, the course may be taken during the first semester of their work on this campus. Includes at least 8 hours of visitation in public school classrooms, at least one microteaching lesson in the Teaching Techniques Laboratory, and one or more conferences with an advisor in teacher education. Students amass up to 10 hours of early field experiences toward the required total of 100 hours. 0 hours.

- 219. Field Experience in Secondary Teaching.** Offered in conjunction with Secondary Education 101 in the secondary teacher education program in English, mathematics, science, social studies, speech, and computer science. Meets in subject area discussion sections one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in a school for at least two hours per week for the entire semester. Students amass at least 32 hours of early field experiences toward the required total of 100 hours. Prerequisite: Concurrent registration in Secondary Education 101. 0 to 2 hours.
- 229. Field Experience in Secondary Education.** Offered in conjunction with Secondary Education 240 for students in secondary teacher education programs adopting this means of fulfilling early field experience requirements. Meets in discussion sections paralleling Secondary Education 240 sections for one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in school and community settings for at least two hours per week for the entire semester, thereby amassing at least 32 hours of early field experiences toward the required total of 100 hours. Registration is required in secondary teacher education programs adopting this means of fulfilling early field experiences requirements. Prerequisite: Concurrent registration in Secondary Education 240. 0 to 2 hours.
- 239. Microteaching: Practice in Teaching Techniques.** Instruction and practice in basic teaching techniques; consideration of both teacher-centered and learner-centered techniques; systematic examination of each technique in terms of basic descriptive and evaluative procedures; and application of techniques to specific instructional situations. Students amass 32 hours of early field experiences (laboratory component) toward the required total of 100 hours. Prerequisite: Junior standing. 2 hours.
- 240. Secondary Education in the United States.** Provides each specialized educational worker with a common orientation to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Experiences in school settings, required in some curricula, are provided in Secondary Education 229. Prerequisite: Secondary Education 101; Psychology 100; concurrent registration in Educational Policy Studies 201. 2 hours.
- 241. Techniques of Teaching in the Secondary Schools.** Methods of teaching specific subject matter fields in the secondary school; special sections provided in the usual high school subjects. Prerequisite: Educational Policy Studies 201; Secondary Education 240; concurrent registration in Educational Practice 242; consent of instructor. This course meets only during the first eight weeks of the semester. 3 to 5 hours.
- 247. Teaching of Speech.** Same as Speech Communication 247. A study of methods and materials used in teaching speech in the high school. Prerequisite: Senior standing; 3.5 grade-point average. 3 hours.
- 249. Independent Study.** Permits study of problems not considered in other courses; for students who excel in self-direction and intellectual curiosity. Prerequisite: Upper-classman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 or 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 317. Computer-Assisted Instruction.** Same as Computer Science 317. Computer-assisted

instruction (CAI) and its relation to classroom teaching; the teacher's role in development, management, and criticism of CAI lessons; treatment of topics including instructional capabilities of CAI systems, instructional programming, and the design of CAI lessons. Prerequisite: 100 level Computer Science course, or Computer Science 400, or consent of instructor. 4 hours or 1 unit.

- 327. Alternative Approaches to Classroom Instruction.** Improvement of classroom instruction through a study of alternative approaches to teaching with emphasis on demonstration teaching and the development of skill in observing and analyzing teaching. Prerequisite: Secondary Education 241 and Educational Psychology 211, or equivalents; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Fundamentals of Reading Techniques.** Same as Elementary and Early Childhood Education 370. See Elementary and Early Childhood Education 370.
- 338. Teaching of Reading in Grades Four Through Twelve.** Developmental reading programs beyond the primary grades; factors related to reading speed and comprehension; vocabulary development, specific comprehension skills, study skills, and reading interests and tastes. Prerequisite: Elementary and Early Childhood Education 336 or Educational Psychology 211; junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Audio-Visual Communication.** Same as Elementary and Early Childhood Education 354. See Elementary and Early Childhood Education 354.
- 356. The Computer and Mathematics Education.** Examines the role of the computer as an instructional tool in the secondary school mathematics classroom; reviews curricular materials and develops sample classroom projects in computer mathematics; analyzes computational problems and develops algorithms for their solution; and includes iteration, Monte Carlo methods, and simulation. Prerequisite: Computer Science 101 or 400, or consent of instructor. 4 hours or 1 unit.
- 359. Workshop and Laboratory in Curriculum and Methodology.** Teaches practitioner-oriented skills in specialized areas of secondary education not covered in the basic certification courses. Prerequisite: Secondary Education 241 or equivalent or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 399. Issues and Developments in Secondary Education.** A seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 417. Theory and Design of Instructional Simulations.** Introduces theory and design of interactive simulations for teaching decision making in schooling/training situations; includes introduction to models of simulation, a process of simulation construction, identification and interpretation of learning outcomes, computer implementation of selected simulations. Prerequisite: Secondary Education 317; Computer Science 300 or equivalent. 1 unit.
- 433. Clinical Supervision of Instruction.** Same as Administration, Higher, and Continuing Education 433. Designed for persons concerned with supervision of classroom instruction. Principally concerned with strategies for helping teachers realize their full professional potential; considers techniques of classroom observation, analysis of observations, and interaction skills; and uses video, audio, and printed protocols to develop observation and analytic skills, and role playing techniques to foster interaction skills. Prerequisite: Practice teaching. 1 unit.
- 435. Interventions Used in Programs of Teacher Education.** Considers several teacher education programs, including conventional, humanistic, reinforcement, technical skills, and teacher competencies programs, in terms of selection and retention of candidates, professional preparation, general education and governance. Prerequisite: Satisfaction of college foundations requirements (Educational Psychology 311 and 312, and two $\frac{1}{2}$ unit courses in social and philosophical foundations within Educational Policy Studies). 1 unit.
- 438. Curriculum Research.** Reviews the principle methodologies used in research on curriculum problems; emphasizes subject-analytical, large-scale survey, experimental, case

methods, and clinical studies; emphasizes the conceptual and practical problems in such research. Prerequisite: Education 400 or equivalent. 1 unit.

- 439. Fundamentals of Curriculum Development.** Examines a variety of definitions of curriculum developments; readings reflect current theories and research related to substantive issues in the field; how learning is influenced by stated goals of education, cultural background of the learners, structure of the school setting, competencies of teachers, psychological characteristics of the learners, and means of measuring student achievement. 1 unit.
- 441. Linguistic and Logical Analysis of Teaching.** An analysis of teaching from the standpoint of semantic and logical factors; discussion of topics such as theories of meaning, definition, explanation, and justification as employed by a teacher. 1 unit.
- 448. Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Vocational and Technical Education 448. See Administration, Higher, and Continuing Education 448.
- 449. Independent Study.** Offers opportunity and challenge of self-directed, independent study; that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by advisor and the department chairman prior to enrollment. 1/2 or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 456. Problems and Trends in Specialized Fields of Secondary Education.** An intensive examination of problems and trends in the subject fields of the secondary school. Sections are usually offered in the following areas: English language and literature, mathematics, physical and biological sciences, social studies, and computer-assisted instruction. 1 unit.
- 483. Seminar in Literary Criticism and the Teaching of English.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
- 490. Seminar for Advanced Students of Education.** Intensive examination of theoretical and policy issues in secondary education. Sections are usually offered in the following areas: curriculum policy and research, teacher education, English language and literature, mathematics, physical and biological sciences, social studies, music, and instructional applications of computers. Prerequisite: Admission to doctoral study in secondary education. 0 to 1 unit. May be repeated to a maximum of 2 units.
- 491. Field Study and Thesis Seminar.** Explores the identification and evaluation of research topics and problems in secondary education. Prerequisite: Admission to doctoral study. 1 to 2 units. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

SLAVIC LANGUAGES AND LITERATURES

(Including Bulgarian, Czech, Polish, Russian, Serbo-Croatian, Slavic, and Ukrainian)

Head of Department: M. Friedberg

Department Office: 3042 Foreign Languages Building, 707 South Main Street, Urbana

Bulgarian

- 381. Structure of Modern Bulgarian.** Analysis of the sound system and grammar of the contemporary Bulgarian language. Prerequisite: Russian 211 or 214 or equivalent. 3 hours or 1 1/2 unit.
- 382. Readings in Bulgarian Literature.** Reading, analysis, and discussion of selected excerpts from Bulgarian literature, scientific prose, and the press. Prerequisite: Bulgarian 381 or consent of department. 3 hours or 1 1/2 unit.

Czech

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 383. The Structure of Modern Czech.** Analysis of the sound system and grammar of the contemporary Czech language with some reference to its historical development. Prerequisite: Knowledge of another Slavic language, preferably Russian, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 384. Readings in Czech.** Reading and analysis of selected texts. Prerequisite: Czech 383 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Polish

- 101. Elementary Polish, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no prior work in Polish. 4 hours.
- 102. Elementary Polish, II.** Continuation of Polish 101. Prerequisite: Polish 101. 4 hours.
- 103. Intermediate Polish, I.** Grammar review, conversation practice, written exercises, and selected readings. Prerequisite: Polish 102 or equivalent. 4 hours.
- 104. Intermediate Polish, II.** Continuation of Polish 103. Prerequisite: Polish 103. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 345. Polish Literature in Translation, I.** Same as Comparative Literature 335. A critical survey, in translation, of Polish literature from the Middle Ages to the end of the nineteenth century; special attention given to the works in their cultural context. 3 hours or 1 unit.
- 346. Polish Literature in Translation, II.** Same as Comparative Literature 336. A critical study, in translation, of modern Polish fiction, drama, poetry and essay, from Young Poland to the "New Wave"; their contribution to literary styles and genres in Poland and abroad; special emphasis on Wyspianski, Witkiewicz, and Gombrowicz. 3 hours or 1 unit.
- 385. The Structure of Modern Polish.** Analysis of the sound system and grammar of the contemporary Polish language. Prerequisite: Knowledge of another Slavic language or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 386. Readings in Polish.** Reading and analysis of selected texts. Prerequisite: Polish 385 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Russian

Courses taught in Russian are 211, 212, 213, 214, 215, 216, 303, 304, 313, and 314.

- 101. First-Year Russian, I.** Oral-aural practice and elements of grammar, reading, and writing. For students who have no credit in Russian. 4 hours. Students may not receive credit for both Russian 101 and 121.
- 102. First-Year Russian, II.** Continuation of Russian 101. Oral-aural practice and elements of grammar, reading, and writing. Prerequisite: Russian 101. 4 hours.
- 103. Second-Year Russian, I.** Oral-aural practice, systematic functional grammar, reading, and writing. Prerequisite: Russian 102 or equivalent. 4 hours.
- 104. Second-Year Russian, II.** Systematic review of the structure of Russian covered in Russian 101-103 through class lectures, drills, and homework exercises. Prerequisite: Russian 103. 4 hours.
- 111. Intensive First-Year Russian.** Accelerated course; covers material of Russian 101 and 102 in one semester. Allows for more efficient scheduling, more effective drilling, and quicker mastery of basic grammar and vocabulary. 8 hours.
- 112. Intensive Second-Year Russian.** Accelerated course; covers material of Russian 103 and 104 in one semester. Allows for more efficient scheduling, more effective drilling,

and quicker mastery of intermediate grammar and vocabulary. Prerequisite: Russian 102 or 111. 8 hours.

113. **Russian Civilization Through Literature.** The civilization of pre-Soviet Russia as reflected in Russian literature of the time. 3 hours.
114. **Soviet Society Through Literature.** The political, cultural, social and economic realities of the Soviet Union as reflected in Soviet literature. 3 hours.
115. **Russian Masterpieces in Translation, I.** Introduction to major works from the medieval period to 1880 in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
116. **Russian Masterpieces in Translation, II.** Introduction to major works from 1880 to the present in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
119. **Introduction to Russian and Soviet Film.** Survey of major films, film makers, and trends from Tolstoi adaptations through the revolutionary Eisenstein to current satire. Weekly film screenings. No knowledge of Russian required. 2 hours.
121. **Beginning Russian for Reading.** Survey of all grammar and basic vocabulary in one semester, in preparation for the reading of Russian prose in Russian 200. No emphasis on speaking or writing; all exercises and tests are from Russian to English. 3 hours. Students may not receive credit for both Russian 121 and 101.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Intermediate Reading and Translation.** Development of rapid reading comprehension and vocabulary acquisition; includes unadapted non-fiction texts in various humanities and science fields. Class discussion entirely in English. Prerequisite: Russian 104 or 121. 3 hours.
211. **Russian Conversation, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 104 or consent of instructor. 3 hours.
212. **Russian Conversation, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 211 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
213. **Russian Composition, I.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 104 or consent of instructor. 3 hours.
214. **Russian Composition, II.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 213 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
215. **Introduction to Russian Literature, I.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours.
216. **Introduction to Russian Literature, II.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
222. **Dostoevsky and Tolstoy.** Same as Comparative Literature 248. The art and thought of Russia's two greatest novelists; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
225. **Soviet Russian Literature.** Same as Comparative Literature 249. Major works since 1917 by Mayakovsky, Babel, Olesha, Bulgakov, Sholokhov, and others; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
270. **Parateaching.** Same as French, German, Latin, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Spanish 279. See Humanities 279.
280. **Teachers Course.** An introduction to the problems of the teaching of Russian and a study of textbooks. Prerequisite: Three years of college Russian or equivalent. 4 hours.

- 290. Readings in Russian.** Individual topics or projects chosen in consultation with a Slavic Department representative. Prerequisite: Russian 104 or equivalent proficiency. 1 to 4 hours. May be repeated to a maximum of 8 hours.
- 293. Honors Senior Thesis.** Intended primarily for candidates for honors in Russian but open to other seniors. Prerequisite: Senior standing. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
- 303. Advanced Reading and Conversation, I.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Three years of college-level Russian. 3 hours or $\frac{1}{2}$ unit.
- 304. Advanced Reading and Conversation, II.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Russian 303 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 307. Structure of Russian.** The syntax and morphology of modern Russian. Prerequisite: Russian 214 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 308. Russian Phonetics and Pronunciation.** Study of the Russian sound system; training in the improvement of pronunciation and intonation. Prerequisite: Russian 212 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 313. Advanced Composition and Usage, I.** Practice in advanced composition and study of advanced problems of grammatical structure; emphasis on morphological categories in Russian grammar. Prerequisite: Three years of college Russian, including Russian 214, or consent of department. 3 hours or $\frac{1}{2}$ unit.
- 314. Advanced Composition and Usage, II.** Further practice in advanced composition and study of advanced problems of grammatical structure; emphasis on syntax, usage, and style. Prerequisite: Russian 313 or consent of department. 3 hours or $\frac{1}{2}$ unit.
- 315. Nineteenth-Century Literature in Translation.** Same as Comparative Literature 337. A study of major Russian writers from Pushkin through Chekhov; no knowledge of Russian required. 3 hours or $\frac{3}{4}$ unit.
- 317. Twentieth-Century Literature in Translation.** Same as Comparative Literature 338. A study of major Russian writers from 1900 to the present; no knowledge of Russian required. 3 hours or $\frac{3}{4}$ unit.
- 324. Russian Modernism.** Same as Comparative Literature 357. Representative works of the period 1880 to 1917, with emphasis on Chekhov, Gorky, and Blok; readings for nonconcentrators and class discussions in English. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 335. Russian Drama.** Same as Comparative Literature 368. Historical survey of Russian dramatists and their works, from the origins in folk and liturgical playlets through classicism, Gogol, Ostrovsky, Chekhov, and Stanislavsky to Meierhold and the Soviet drama. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 337. Nineteenth Century Russian Poetry.** A study of major Russian poets and their works from Zhukovsky through the end of the nineteenth century. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
- 338. Twentieth Century Russian Poetry.** A study of major Russian poets and their works from Blok to the present. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
- 360. Studies in Russian Literature and Society.** Same as Comparative Literature 340. The role of Russian literature in the social, political, and intellectual life of Russia from the 1840s to the present. Prerequisite: Junior standing. 3 hours or $\frac{3}{4}$ unit.
- 370. Nabokov and the Emigre Literature.** Same as Comparative Literature 370. Twentieth-century non-Soviet Russian authors, including Nabokov, Bunin, Tsveltaeva, Gippius, and Adamovich; no knowledge of Russian required. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 375. Russian Literary Translation.** Theory and practice of literary translation in Russia from the eighteenth century to the present; "literal" versus "creative" translation; and practical work in translation into English of various Russian literary texts. Prerequisite: Russian 214 or 216, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 400. Beginning Russian for Graduate Students.** Basic grammar and vocabulary; introduction to the reading of Russian texts in the sciences and the humanities. Designed

for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. 4 hours. No graduate credit.

- 401. Readings in Russian for Graduate Students.** Reading and translation of general and individually specialized materials, to increase speed, accuracy, and vocabulary; designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. Prerequisite: Russian 400 or equivalent. 3 hours or 0 units.
- 406. Russian Morphology.** Survey of the various parts of speech of modern standard literary Russian with special emphasis on the nominal and verbal systems. 1 unit.
- 408. Russian Phonology.** Same as Linguistics 408. The sound pattern of Russian in its synchronic and diachronic aspects. Prerequisite: Consent of instructor. 1 unit.
- 410. Old Russian Literature.** Reading and analysis of texts with historical and literary commentary. Prerequisite: Slavic 405. 1 unit.
- 412. Literature of the Eighteenth Century.** Reading of texts; historical and literary background of the period. 1 unit.
- 414. Pushkin.** The age of Pushkin; Pushkin's works in historical and comparative perspective; textual criticism, linguistic and structural analysis, intellectual interpretation, and aesthetic evaluation. 1 unit.
- 415. Dostoevsky.** Same as Comparative Literature 415. Dostoevsky: historical background, textual analysis, structure, philosophy, artistic evaluation, and influence on French, English, American, and German literatures. 1 unit.
- 416. The Early Realists: Turgenev, Aksakov and Goncharov.** Intensive study of the three representative nineteenth century Russian novelists; aspects considered include historical perspective, textual criticism, structural analysis, and aesthetic evolution. 1 unit.
- 417. History of the Russian Language.** Historical grammar, origin, and development of the literary language. Prerequisite: Slavic 405 or consent of instructor. 1 unit.
- 419. Tolstoy.** Same as Comparative Literature 419. Tolstoy: historical background, textual analysis, structure, philosophy, aesthetic evaluation, and influence on French, English, American, and German literatures. 1 unit.
- 420. Chekhov.** Same as Comparative Literature 420. Chekhov: historical background, textual criticism, structural analysis, philosophy, artistic evaluation, and interrelationship with English, French, German, Scandinavian, and American literatures. 1 unit.
- 424. Gogol.** Historical background, textual criticism, structural analysis, philosophy and ideology, and aesthetic evaluation. 1 unit.
- 463. College Teaching of Foreign Languages.** Same as English as a Second Language, French, German, and Spanish 463. See French 463.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, French, German, and Spanish 481. See French 481.

Serbo-Croatian

- 101. Basic Serbo-Croatian, I.** Oral and written work on pronunciation, grammar, and vocabulary. For students with no previous study of Serbo-Croatian. 4 hours.
- 102. Basic Serbo-Croatian, II.** Continuation of Serbo-Croatian 101. Prerequisite: Serbo-Croatian 101 or equivalent proficiency. 4 hours.
- 103. Intermediate Serbo-Croatian, I.** Completion of Grammar; written and oral exercises aimed at active command of the language. Prerequisite: Serbo-Croatian 102 or equivalent proficiency. 4 hours.
- 104. Intermediate Serbo-Croatian, II.** Selected readings in Serbo-Croatian literature and culture. Prerequisite: Serbo-Croatian 103 or equivalent proficiency. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 392. Structure of Modern Serbo-Croatian.** Analysis of the sound system and grammar of the contemporary Serbo-Croatian language. Prerequisite: Knowledge of another Slavic language or consent of department. 3 hours or $\frac{3}{4}$ unit.

- 393. Readings in Serbo-Croatian.** Reading and analysis of selected texts. Prerequisite: Serbo-Croatian 392 or consent of department. 3 hours or $\frac{3}{4}$ unit.

Slavic

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 319. Russian and East European Cinema.** Same as Communications and Speech Communication 319. Artistic, literary, and social aspects of cinema history, particularly Russian, Czech, Polish, and Yugoslav. No reading knowledge of Russian is required, except for Department of Slavic Languages and Literatures concentrators. 3 hours or $\frac{3}{4}$ unit.
- 380. Introduction to Slavic Linguistics.** Same as Linguistics 380. The development of Common Slavic from Indo-European and its relationship to contemporary Slavic languages. Prerequisite: Reading knowledge of one Slavic language. 3 hours or $\frac{3}{4}$ unit.
- 381. Introduction to Study and Research in Slavic Languages and Literatures.** Introduction to methods and resources for study and research in Slavic languages, Russian literature, and Russian language teaching. 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, and Spanish 382, and Linguistics 386. See Humanities 382.
- 387. Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Speech Communication 387. See English 387.
- 405. Old Church Slavonic.** Analysis of grammar and reading of texts. Prerequisite: Slavic 380 or consent of instructor. 1 unit.
- 425. Seminar in Slavic Literature.** Selected subjects in Russian and Slavic prose, poetry, drama, and literary criticism. Topics vary. 1 unit. May be repeated to a maximum of 3 units.
- 460. Seminar in Slavic Linguistics.** Selected topics in the analysis of Slavic languages. Prerequisite: Slavic 380. 1 unit. May be repeated to a maximum of 3 units.
- 491. Individual Topics.** Prerequisite: Graduate standing with a major or minor in Russian; consent of department. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

Ukrainian

- 101. Basic Ukrainian, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no previous study of Ukrainian. 4 hours.
- 102. Basic Ukrainian, II.** Continuation of Ukrainian 101. Prerequisite: Ukrainian 101 or equivalent proficiency. 4 hours.
- 103. Intermediate Ukrainian, I.** Completion of grammar, oral drills, and written exercises. Prerequisite: Ukrainian 102 or equivalent. 4 hours.
- 104. Intermediate Ukrainian, II.** Selected readings in contemporary Ukrainian literature. Prerequisite: Ukrainian 103 or equivalent. 4 hours.
- 118. Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 398. Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours or $\frac{3}{4}$ unit.

SOCIAL SCIENCE

Office: College of Liberal Arts and Sciences

Office Address: 294 Lincoln Hall, 702 South Wright, Urbana

300. Socio-Economic Management as Public Policy. Same as Accountancy, Business Administration and Political Science 300. See Political Science 300

SOCIAL WORK

Dean of School: D. S. Sanders

School Office: 1207 West Oregon, Urbana

100. Contemporary Social Work. A broad survey of the field of social welfare; introduction to social services, social welfare organizations, major social problems and target population groups, and the methods employed in service to individuals, groups, and communities; and includes the range of personnel and skills in social work agencies, and the means of education and training for social work. 3 hours.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

290. Honors Seminar. Lectures, student presentations, and discussions on selected topics in social work. Prerequisite: Twelve hours in social work courses; senior standing; 4.0 grade-point average in social work courses; and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.

298. Practice Seminar. Critical examination of the application of knowledge to social work practice; emphasis on reciprocal relationships between personal problems and needs, social environment, agency services, and helping methods; and consideration of new trends in practice and empirical knowledge. Prerequisite: Social work major; consent of undergraduate field instruction coordinator; concurrent registration in Social Work 299. 3 hours.

299. Field Instruction. The student is assigned to field instructors for learning experiences in social agencies and communities; experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele and communities. Prerequisite: Social work major; consent of undergraduate field instruction coordinator. 4 to 12 hours.

300. Methods of Social Work Intervention, I. Examination of the methods of social work intervention (casework, group work, and community organization) utilized in various social work agencies and social welfare settings; emphasis on understanding of the values, knowledge, principles, and processes of social work practice. Prerequisite: Admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.

301. Methods of Social Work Intervention, II. An introduction to social work practice in groups, organizations, and communities; emphasizes understanding the values, principles, and processes of social work practice as well as developing skills for service delivery to groups, organizations, and communities. Prerequisite: Social Work 300; admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.

303. Delivery of Health Care: Problems and Perspectives. Same as Health and Safety Studies 303. The wide range of factors—ecological, social, cultural, medical, organizational, economic, and political—which influence health care in a complex nation like the United States; attention to perspectives from various fields of study. Prerequisite: Junior standing and consent of instructor. 3 hours or 1 unit.

310. Social Welfare Policy and Services, I. Critical study of the income maintenance system in the United States as a response to the problems of inequality of opportunity and income, poverty, and income security; consideration of alternative approaches with discussion of the social worker's role in the system. 3 hours or 1 unit.

311. Social Services Policy and Services, II. Critical evaluation of social policy and

services in selected problem areas; includes the process of social policy analysis, current issues in funding and monitoring of personal social services, and strategies for dealing effectively with social problems. Prerequisite: Credit or concurrent registration in Social Work 310. 3 hours or 1 unit.

- 313. Social Services for Health and Rehabilitation.** The psychological and sociological impact of illness and disability on the individual, the family, and the community, emphasizing the social worker's role in medical and rehabilitation settings. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 314. Social Services in Mental Health and Retardation.** Examination of comprehensive community mental health services as they evolve from definitions of the problems and changes in federal and state social policy; the concept of normalization and its criteria for program evaluation; and changing roles of mental health professionals, paraprofessionals, and consumers in policy making and service delivery. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 315. Social Work Services for the Aged.** The social needs of older people in the context of developing services and income transfer benefits; identifies major issues in social service delivery; and reviews methods of intervention on behalf of older people in terms of both skill required and policy implications. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 316. Social Services for Children and Families.** Child and family welfare policies and practice in relation to social services which support, supplement, or substitute for parental care of children; practice and policy issues in relation to the state's responsibility for guardianship, juvenile court, employment of children and young persons, and regulation of child-care facilities; and consideration of trends and issues in family and child welfare planning. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 318. Special Problems.** A small group seminar for independent study of a topic or topics of special interest in the field of social welfare; emphasis on examination and discussion of significant and current social welfare issues and problems. Prerequisite: Credit or concurrent registration in Social Work 300; consent of instructor. 3 hours or 1 unit.
- 319. Social Work and the Public School.** Social work services in schools as a process in school-community-pupil relations; focuses on the school as a social system; and includes education as a continuum from preschool to adulthood, financing and other major problem areas, sociolegal issues which affect equality of education and pupil welfare, and some current educational innovations. Prerequisite: Graduate standing in social work or consent of instructor. 3 hours or 1 unit.
- 327. Research Methods in Social Work Practice.** Objectives of research pertaining to social work practice; design of experiments; measurement and methods of collecting data; design of questionnaires and schedules; methods of data analysis including statistical hypothesis testing and applications of inferential techniques; interpretation of results; and preparation of reports. Prerequisite: An introductory course in statistics and admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
- 345. Family Planning and Population Policy.** Same as Health and Safety Studies and Sociology 345. Background information for professionals involved in the field of family planning; includes historical and current trends in developing and developed nations, with emphasis on the United States; and examines family planning and population policies, and programs and contraceptive methods as related to service delivery and to professional roles. Prerequisite: 6 hours in the social sciences, or consent of instructor. 3 hours or 1 unit.
- 346. Sexism: Social Service and Social Welfare.** Same as Women's Studies 346. Explores and analyzes the effects of sexism on individual behavior and operations of societal institutions, especially as it affects professionals in their work with women; includes emphasis on sex roles and human behavior, analysis of the psychological perspective on women, woman's place in the economic and political spheres with special emphasis on social work practice, social welfare laws and policies, minority women, and women as educators, students, counselors and clients. 3 hours or 1 unit.

- 351. Human Behavior and Social Environment, I.** Current research and theory concerning the environmental influences on individual behavior; the family, small group, community, and and social organization and the social and cultural causes and effects of discrimination. The social work practice context of each unit of content is a central focus. Prerequisite: Admission to B.S.W. or M.S.W. program and a course in human development. 3 hours or 1 unit.
- 400. Comparative Analysis of Approaches to Casework.** Systematic and critical examination of selected approaches, conceptualizations, procedures, and techniques in casework theory and practice; includes the employment of a framework for the analysis and assessment of the various approaches, study of research related to process and outcome, and identification of practice issues. Prerequisite: Social Work 300. 1 unit.
- 401. Comparative Approaches to Social Group Work Practice.** Social work practice theory in social group work through comparative study of various practice approaches; includes the utilization of the group work method in contemporary social work practice, practice principles, and the use of group process. Prerequisite: Social Work 300. 1 unit.
- 402. Comparative Approaches in Community Organization Practice.** Principles and methods which characterize identifiable approaches used in community organization practice at neighborhood, community, state, and other levels. Prerequisite: Graduate standing in social work; Social Work 300 or consent of instructor. 1 unit.
- 404. Seminar and Practicum in Clinical Group Work.** Exploration of concepts and issues related to integrity and encounter groups, self-help groups, and group psychotherapy; provides experience in an intensive encounter based on a structured, contractual integrity group; and emphasizes development of self-awareness, interpersonal skill, and leadership in facilitating clinical groups. Prerequisite: Social Work 401 or equivalent. 1 unit.
- 405. Behavior Modification in Social Work.** Examination of conceptual ideas about behavior modification and their usefulness in working with clinical problems of concern to the social worker; focuses on intervention with individuals and families and the application of behavioral principles in working with groups, institutions, and communities; and emphasizes the development of a systematic approach for applying behavior modification principles in actual practice situations. Prerequisite: Social Work 300. 1 unit.
- 407. Intervention Strategies for Institutional Change.** Generic social work strategies used for institutional change, emphasizing problems and issues in the public schools. Prerequisite: Social Work 319 or consent of instructor. 1 unit.
- 420. Social Welfare Planning.** Examination of the interactional, interpersonal, and political aspects of social welfare planning in a variety of settings and under a number of auspices; formulation of models for social welfare planning. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 426. Social Welfare Administration.** Principles and process of administration and management of social welfare organizations, including review of organization theory, policy formulation, agency structure and staff organization, and budgeting. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 427. Service Accounting in Social Welfare.** Examines different types of services, to whom they are provided at what costs and with what results; within a systems perspective, considers methods of describing, reporting, and measuring client and target population characteristics, services, and resources; and includes allocation of scarce resources among competing demands and practice in specific methods. Prerequisite: Social Work 327 or equivalent. 1 unit.
- 428. Family Therapy Seminar and Practicum.** The principles, issues, and practices of family therapy; examines and compares major theoretical concepts; and enables students to learn how to do family therapy by studying theory and applying it in an actual practice experience. Prerequisite: Social Work 400 or consent of instructor. 1 unit.
- 431. Practice in Organizational Settings.** Critical analysis of social work practice: the agency's target population and clientele, task environment, structure, functions, task definitions, monitoring and planning mechanisms; methods of service delivery; ethical

and legal considerations in service delivery; and the impact of racism, ethnocentrism, and sexism on social work practice. Prerequisite: Concurrent registration in Social Work 468. 1 unit.

- 432. Practice Evaluation.** Evaluation of social work practice: defining practice problems; operationalizing goals and objectives; developing hypotheses; designing evaluation plans to test hypotheses; describing interventions; collecting, analyzing, and interpreting data; and presenting results. Students complete an evaluation of some aspect of their own practice or their agency's program. Prerequisite: Social Work 431; concurrent registration in Social Work 469. 1 unit.
- 435. Supervision/Consultation/Staff Development.** The philosophy, objectives, principles, and methods of social work supervision, consultation, and training for staff development; analysis of similarities and differences in roles, knowledge, and skills required with emphasis on the teaching-learning-evaluating components; and issues arising from agency setting, changing legislation and program provisions, and relationships to social welfare administration. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
- 439. Theory of Social Work Interventions.** Presents theory for social work interventions with individuals, families, groups, and communities and organizations; critically analyzes different theoretical frameworks for such interventions; and examines the conceptual links between theory, process, outcome, and evaluations. Prerequisite: Social Work 400, 401, and 402. 1 unit.
- 452. Human Growth and Behavior and the Social Environment, II: Psychosocial Disorders.** Interrelationship of physical, emotional, learning, and social aspects of behavior disorders, and implications for the patient, family, and community; psychopathology, including neuroses, psychoses, character disorders, organic conditions, psychophysiologic disorders, and mental retardation; and diagnosis and treatment methods, including psychotherapy, somatic and drug therapies, and social work. Prerequisite: Social Work 351 or equivalent. 1 unit.
- 461. Special Studies in Social Work, I.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. $1/2$ to 2 units.
- 462. Special Studies in Social Work, II.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. $1/2$ to 2 units.
- 468. Field Instruction, II.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Consent of instructor. 1 to 2 units.
- 469. Field Instruction, III.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Social Work 468. 1 to 2 units.
- 484. National Social Welfare Policy, I.** Analyzes alternative concepts of social policy, the policy formulation process, and constraints on policy development in the United States; examines approaches to assessment of social policies. 1 unit.
- 485. National Social Welfare Policy, II.** Emphasis on the case approach within the context of basic political and governmental processes which influence the development, enactment, and application of national policy; analytical study of the background, legislative history, amendments, judicial interpretations, and operation of major national acts comprising our national social welfare policy, or bearing directly on social welfare such as the Social Security Act, the Employment Act, the Civil Rights Acts, and the Economic Opportunity Act. Prerequisite: Social Work 484 or consent of instructor. $1/2$ to 2 units.
- 489. Social Work and the Law.** Legal procedures and issues of special relevance to social work practice; includes legal provisions related to poverty, family development and crises, racial and ethnic minorities, institutionalized persons, crime and delinquency,

legal authority of social agencies, and regulation of the profession. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.

- 491. Research Seminar.** Seminar for students preparing research projects, either in groups or individually; experience in the application of research methods to current social work problems. Prerequisite: Social Work 327 or equivalent. 1 to 2 units.
- 492. Seminar on Models for Directed Change.** Same as Sociology 492. See Sociology 492.
- 493. Seminar: Design of Social Work Research.** Issues and problems in social work research; includes proof and verification, generalizability, and use of scaling and of judgments; and design of original research study. Prerequisite: Admission to Ph.D. program and Social Work 327, or consent of instructor. 1 unit.
- 497. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Administration, Higher, and Continuing Education 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. Thesis Research.** Research and writing of doctoral thesis. 0 to 4 units.

SOCIOLOGY

Head of Department: J. R. Kluegel

Department Office: 326 Lincoln Hall, 702 South Wright, Urbana

- 100. Introduction to Sociology.** Examination of how societies grow and change; reciprocal effects of economic, political, community, familial, and scientific institutions on each other and on individual life changes; and social conflict, problems of bureaucratic growth and planned and unplanned social change. 3 hours.
- 102. Religion and Science.** Same as History 147 and Religious Studies 102. See Religious Studies 102.
- 131. Social Problems.** Origin of problems; consequences of ameliorative strategies. Typical topics include crime, mental illness, drug use, suicide, sexual behavior, violence, and intergroup conflict. 3 hours.
- 145. Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Ecology 145 and Women's Studies 112. See Women's Studies 112.
- 185. Introduction to Social Statistics.** Same as Geography 185. A first course in social statistics for students without mathematics beyond the high school level; topics include the role of statistics in social science inquiry, measures of central tendency and dispersion, simple correlation techniques, contingency analysis, and introduction to statistical inference. 3 hours. Students may not receive credit for Sociology 185 if they have already received credit for an equivalent college level introductory statistics course.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Introduction to Sociological Theory.** Analysis of such classical theorists as Marx, Weber, Durkheim, and Mead and such contemporary theorists as Parsons, Merton, and Blau. 3 hours.
- 201. Introduction to Social Psychology.** The social context of individual and interpersonal behavior. Observation, experimental and survey studies of: socialization; language acquisition and use; sources and changes of self concept; social interaction; emotions; coordination of interpersonal behavior; individual and interpersonal aggression, violence, and control; and adoption or rejection of innovations through social networks. 3 hours. Credit is not given for both Sociology 201 and Psychology 201.
- 205. Young Children with Special Needs.** Same as Human Development and Family Ecology 205. Examines family and personal problems of children, birth to five years, with special needs owing to mental and physical handicaps, hospitalization, abuse, and emotional disturbance; studies social environmental effects on the classification of such children; parental needs; program development. 3 hours.
- 206. Political Sociology.** A study of power relations within and between the state, bu-

reauracy, community, social classes, and elites in the United States and other countries. 3 hours.

- 208. Collective Political Violence.** The study of the causes, processes, and effects of collective violence, particularly of riots, coups, and revolution. 3 hours. (Counts for advanced hours in LAS.)
- 210. The Industrializing Third World.** Explores the development of industrial Third World societies. Particular attention to the state as agent of development, socio-economic structures, labor and social movements, and dependent relationships with the world economy. Case studies from Africa, Asia, and Latin America. 3 hours.
- 218. Technology and Society.** Examines the social and cultural origins of modern technology and technological innovation; the effects of technology and its change on society. Topics include the impact of technology on beliefs and values, accommodation and resistance to change, and technology and the Third World. 3 hours.
- 219. Comparative Study of Societies.** Theories of the development and interdependence of social, economic, and political institutions; consequences of change. 3 hours.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Political Science 222. See African Studies 222.
- 223. Social Stratification.** Inequities in power, prestige, income, privilege, and lifestyles in the United States and other countries; class and status as determinants of group interests, ideologies, and interaction; and effects of social change and mobility. 3 hours.
- 224. Women in Society.** Same as Women's Studies 224. Examines the place of women in society; how society shapes women's opportunities, behavior, values, power, roles, and well-being; how women, in turn, shape social changes in the home and at work. 3 hours.
- 225. Racial and Cultural Minorities.** A sociological and social-psychological analysis of minority groups; illustrative material drawn from representative racial, ethnic, and status groups. 3 hours.
- 226. Ethnicity in America.** Presents theories of ethnicity: assimilation-Melting Pot, pluralism, competition-conflict. Examines relationships among groups, accommodation among groups as a challenge in national unification, group versus national identification, methods of studying ethnicity, comparisons between United States and other multi-ethnic societies, and immigration as a social problem and policy issue. 3 hours.
- 229. Sociology of Religion.** Same as Religious Studies 229. The functions of religious institutions in societies; religious leaders and leadership; religious groups in American society; and adaptations of religious institutions to modern needs and conditions. 3 hours.
- 231. Juvenile Delinquency.** Historical change in definitions of delinquency, its causes and control; gangs; the juvenile justice system; treatment of offenders; and preventive programs. 3 hours.
- 240. Crowds, Social Movements, and Violence.** Crowd formation and participation; recurring forms of individual and social behavior in crowds; routine and problematic crowd dispersal; social movement origins and participation; growth and organization; strategies, tactics, and consequences for participants and society; origins and consequences of racial, prison, sports and festival riots, and of violent confrontations between protest movements and the police. 3 hours.
- 241. Alcohol and Society.** Examines social psychology of alcohol use, patterning and abuse; etiology and epidemiology of alcoholism; politics of social control and treatment; history of prohibition, reform movements, social and cultural comparisons. 3 hours.
- 242. Family Violence.** Same as Human Development and Family Ecology 242. Examines the sociology of conjugal and intrafamily violence from comparative, historical, and social psychological perspectives; abuse of family members; the violent situation; interpersonal violence. 3 hours.
- 243. Social Perspectives on the Family.** Examines the societal forces shaping aspects of stable and changing family relations in the U.S. and other countries; focuses on social-structural factors affecting marriage, divorce, co-habitation, child-bearing, the division of work and authority, and other features of life. 3 hours.

- 246. Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 246. See Ecology, Ethology, and Evolution 246.
- 249. Sport and Modern Society.** Same as Kinesiology 249. See Kinesiology 249.
- 251. Social Aspects of Mass Communications.** Same as Communications and Journalism 251. See Journalism 251.
- 259. Organizations.** Conflict, communication, coordination, and leadership in the bureaucracies that characterize modern society; relations of individuals, organizations, and society; how organizations are intended to work and how they do work, emphasizing business firms, unions, schools, public agencies, hospitals, and prisons. 3 hours. Credit is not given for both Sociology 259 and 322.
- 260. Work and Occupations.** The meaning of work and leisure in modern society; job satisfaction, alienation, and the work ethic; occupational conflicts over money, status, and authority; impact of occupational segregation by sex and race on earnings, unemployment, and politics; job and career mobility; and improvement of work life and leisure. 3 hours.
- 264. Introduction to Medical Sociology.** The sociology of health and illness behavior and the social structure of systems which deliver health care services; includes social constraints on illness, the illness role, medical organizations and professions, and the application of the illness model to deviant forms of behavior. 3 hours.
- 265. Contemporary Korean Society.** Same as Asian Studies 265. See Asian Studies 265.
- 270. Population Issues.** Same as Rural Sociology 270. Examines the current world population situation; the historical and current patterns of birth, death, migration, marriage, contraception, and abortion; and the world food and energy resources, crowding, and problems of overpopulation. 3 hours.
- 275. Community.** Structure and function of communities in mass society; ecological and social psychological perspectives; social networks; ethnographic case studies of small towns and neighborhoods; and community types. 3 hours.
- 276. Cities and Suburbs.** Metropolitan communities in modern society; neighborhoods, suburbs, ghettos, and slums as subcommunities; demographic, ecological, and technological aspects of urban change; and urban social networks. 3 hours.
- 277. Rural Social Change.** Same as Rural Sociology 277. See Rural Sociology 277.
- 281. Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185 or equivalent. 3 hours.
- 288. Religion in Asian Society.** Same as Asian Studies 288 and Religious Studies 288. See Asian Studies 288.
- 290. Individual Study.** Individual study or research project. Prerequisite: Six hours of sociology; written consent of instructor on form available in 326 Lincoln Hall. 1 to 6 hours. May be repeated.
- 291. Honors Individual Study.** Prerequisite: Open only to seniors in the sociology field of concentration who are eligible for departmental distinction; written consent of instructor on form available in 326 Lincoln Hall. 3 hours.
- 293. Honors Senior Thesis.** Open only to seniors in the sociology field of concentration who are eligible for departmental distinction. Prerequisite: Sociology 291 and written consent of instructor on form available in 342 Lincoln Hall. 3 hours. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Prerequisite: Sociology 100 and consent of instructor. 3 hours. May be repeated as topics vary.
- 301. European Working-Class History: 1750 to the Present.** Same as History 301 and Labor and Industrial Relations 301. See History 301.
- 302. Sex Roles.** Same as Human Development and Family Ecology 302 and Women's Studies 302. Examines social institutions that affect sex differences in power and prestige, especially market labor, household labor, and fertility; social, emotional, and cognitive developmental differences over the life span. Prerequisite: Sociology 100 or

- Human Development and Family Ecology 105; or 6 hours of anthropology, geography, political science, or sociology. 3 hours or 1 unit.
- 303. Thought and Society in Modern Europe, 1789-Present.** Same as History 345. See History 345.
- 304. Thought and Society in Early Modern Europe, 1513-1789.** Same as History 346. See History 346.
- 315. Sociology of Education.** Same as Educational Policy Studies 315. See Educational Policy Studies 315.
- 317. Sociology of Law.** Social origins and consequences of law and legal process, emphasizing problems of legal change and structure and function of legal sanctions. Law and law-like phenomena in primitive and modern societies. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 318. Industry and Society.** Same as Labor and Industrial Relations 318. Selected problems in industrialization and technological change, labor force, meanings of work, the factory as a work place, corporate organization and corporate society, and alienation and authority. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 320. Social Roles.** Contemporary role theory and related concepts such as social status and social interaction; age, sex, vocational, social class, and other role types; applications of this theory to the study of the socialization process and personal adjustment; and the analysis of critical group situations and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Family and Kinship in Industrialized Societies.** Mate selection, marriage and consensual unions, separation and divorce, interaction and authority patterns, family crisis and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 324. Penology.** History of punishment and treatment of offenders; social organization of prison life, male and female inmate cultures, prison race relations, and violence; reform, parole, community correctional facilities, and effectiveness of treatment. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 325. The Philosophy of Social Science.** Same as Anthropology 329 and Philosophy 375. See Philosophy 375.
- 327. Japanese Society.** Same as Asian Studies 303. The institutions of contemporary Japan and their historical roots; the Japanese approach to modernization and development and social change; and implications of the Japanese experience for applied social change in developing areas and for social science theory and methodology. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science or sociology. 3 hours or 1 unit.
- 331. Criminology.** Nature and extent of crime; past and present theories of crime causation; criminal behavior in the United States and its relation to personal, structural, and cultural conditions. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Research Methods in Social Psychology: Laboratory Methods.** Same as Psychology 332. See Psychology 332.
- 333. Mental Health in Social Context.** Mental health issues from organizational, demographic, and social-psychological perspectives; emphasizes the sociological implications of mental problems, the organization of treatment and confinement, and the role of the therapist. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Social Causes of Health and Illness.** Examines social correlates of illness (e.g., heart disease, cancer, obesity, alcoholism), methods of social epidemiology, stressors in the social environment, and factors that lessen the impact of stress. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety studies, psychology, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 339. The Organization of Health Care.** Same as Health and Safety Studies 356. See Health and Safety Studies 356.
- 340. Social Movements.** Origins and development of groups in promoting and resisting change, resource mobilization, strategies and tactics, individual and social consequences. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 343. Social Change in Developing Areas.** Same as Rural Sociology 343. See Rural Sociology 343.
- 344. Perspectives on the Modern World System.** Examines competing theoretical and historical perspectives on the modern world system, including debates on the international division of labor, class structure, the interstate system, and cycles and trends in the modern world economy. Analysis of implications for comparative and historical research. Prerequisite: Sociology 100 or 6 hours of anthropology, history, political science, social geography, or sociology. 3 hours or 1 unit.
- 345. Family Planning and Population Policy.** Same as Health and Safety Studies and Social Work 345. See Social Work 345.
- 346. Sociology of Sport.** Same as Kinesiology 346. See Kinesiology 346.
- 350. Soviet Social Institutions.** Structural consequences of Communist ideology and industrialism, social stratification and mobility, nationalities, family and education communications and public opinion, and socialized medicine. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 352. Attitude Theory and Change.** Same as Communications 352 and Psychology 352. See Psychology 352.
- 354. Social Structure of Southern Africa.** Same as African Studies 354. Examines formation and development of southern Africa as a regional socio-economic structure: interdependence of class, household, labor-force and production processes; studies social and political movements, state formation, and conflict. Prerequisite: Sociology 100 or 222; or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
- 356. Economics of Population and Resources.** Same as Economics 356. See Economics 356.
- 357. Human Rights.** Same as Political Science 357. Examines the idea of human rights: human rights in liberal democracies, especially in the United States; in pre-industrial societies; in totalitarian states. Studies human rights and cultural evolution; justification of human rights. Prerequisite: Sociology 100 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 358. Politics of Crime and the Criminal Process.** Same as Political Science 358. See Political Science 358.
- 359. The Social Psychology of Organization.** Same as Psychology 359. See Psychology 359.
- 364. Population Trends and Patterns.** Introduction to contemporary demographic patterns and their historical development; transition theory and other models of demographic change; components of population growth and distribution; and trends and differentials in mortality and fertility. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
- 365. Social Structure of Science.** Focuses on science as a social institution; topics include patterns of recruitment to the scientific profession, social forces shaping scientific specialization, the social stratification of scientists, social factors affecting scientific productivity. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 366. Sociology of Scientific Knowledge.** Same as Science, Technology, and Society 301. Sociological analysis of the production, evaluation, the impact of social interests on the development of scientific knowledge, Kuhn's analysis of science, the social shaping of technology, the rationality debate. 3 hours or 1 unit.
- 371. Comparative Social Institutions.** Same as Asian Studies 371. Structural systems such as family, kinship, occupations, political institutions, social stratification and mobility, using materials from less-developed and advanced industrial societies; consequences

- of different institutional systems on modernization and development. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 373. Latin American Social Institutions.** Class structures, family, kinship, religious, economic, and political institutions; trends in urbanization, ecological organization, and population. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 380. Methods of Field Research.** Instruction, training, and supervised practice in methods of field research as a basic tool of sociology; emphasis on the role of the field researcher as participant, observer, and interviewer in various kinds of research settings, and on approaches to and applications of field data. Prerequisite: Sociology 100 and 185. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 381. Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185; Sociology 100 or 6 hours in social geography, anthropology, or political science. 3 hours or $\frac{3}{4}$ unit. (May be offered on a temporary basis. See also Sociology 415.)
- 385. Social Statistics, I.** Introduces statistical methods as applied to sociology and other social sciences: probability concepts, binomial and normal distributions; statistical inference, t-test and F-test, bivariate correlation and regression, multiple regression, dummy variables and analysis of variance, contingency tables; reliability and simple index construction; types of sampling and their effects on analysis. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 185, or Mathematics 112; or equivalent. 3 hours or 1 unit. Students may not receive credit for Sociology 385 if they have received credit for any one of the following: Statistics 100, 210, 310, or 311; Psychology 233, 234, or 235; Economics 171 and 172; Agronomy 340; Educational Psychology 390; Biology 371, 372, or 373; Forestry 321; Social Work 327.
- 386. Social Statistics, II.** Examines social science applications of the general linear model and its extensions; topics include: model specification; ordinary and generalized least squares; multicollinearity; selection of predictors; interaction of variables and non-linear regression; panel and time-series data; measurement error; path analysis; recursive and non-recursive structural equation models. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 385 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
- 387. Social Statistics, III.** Examines social science applications of discrete and continuous multivariate analysis; topics include: analysis of categorical data (loglinear modelling, probit analysis, etc); geometric interpretation of matrices; factor analysis and index construction; canonical analysis; discriminant analysis; unobserved variables and structural equation models; issues in model specification and estimation. Applies statistical computing programs such as ECTA and LISREL to social science data. Prerequisite: Sociology 386 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
- 388. Basic Methods of Demographic Analysis.** Introduction to statistical and mathematical procedures in population analysis; the gathering, processing, and evaluating of registration and census data; the life table model; and procedures of mortality and fertility analysis and population projections. Prerequisite: Mathematics 112, or equivalent. 3 hours or 1 unit.
- 396. Special Topics.** Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit. May be repeated as topics vary.
- 400. Classical Sociological Theory.** Analysis of major classical sociological theorists of the nineteenth and early twentieth centuries, stressing the social, historical, and philo-

sophic foundations of sociological theory; primary emphasis on Marx, Durkheim, and Weber. Prerequisite: Sociology 200 or equivalent. 1 unit.

- 401. Contemporary Sociological Theory.** Major theorists and schools of thought since World War I with emphasis on the contemporary period; includes functionalism, exchange theory, conflict theory, symbolic interaction, and phenomenology. Prerequisite: Sociology 400 or equivalent. 1 unit.
- 402. Social Stratification.** Theory and data concerning structured social inequality in industrialized societies, with special focus on the United States. 1 unit.
- 403. Principles of Sociological Inquiry.** Examines the relationship between theory and method in sociological research; topics include problem formulation, research design, alternative theoretical frameworks and research strategies comparison of actual applications. Prerequisite: Sociology 385 or equivalent. 1 unit.
- 406. Psychological Scaling: Unidimensional Methods.** Same as Psychology 406. See Psychology 406.
- 407. Techniques in Demographic Analysis.** Same as Rural Sociology 407. The analysis of family formation and dissolution; measures of population movement and distribution; and introduction to the stable population model and to applications in the estimation of demographic measures. Prerequisite: Sociology 388. 1 unit.
- 409. Psychological Scaling: Multidimensional Methods.** Same as Psychology 409. See Psychology 409.
- 411. Methods in Comparative Sociology.** Examines problems in the design and conduct of research in cross-cultural and cross-national comparative sociology; levels of analysis and observation; the problem of equivalence and that of investigator ethnocentrism; qualitative and quantitative approaches; the ethics and politics of such research. Prerequisite: 1 unit of graduate credit in sociology, or consent of instructor. 1 unit.
- 415. Survey Research Methods, I.** A laboratory course in survey research methods to provide students with advanced training and experience in survey design, data collection, and quality control; students and staff design and collect data for a sample survey on a specific topic which varies year to year. Three to ten hours of laboratory time per week. 1 unit.
- 416. Survey Research Methods, II.** A laboratory course in survey research methods to provide students with advanced training and experience in problem formulation and computerized data analysis using statistical packages, e.g. SPSS; under staff guidance, a student will select a topic and write a professional-level paper using data collected in Sociology 415. Three to ten hours of laboratory time per week. 1 unit.
- 418. Seminar in Industrial and Economic Sociology.** Same as Labor and Industrial Relations 418. See Labor and Industrial Relations 418.
- 420. Social Organization.** Major issues and perspectives on the structure and dynamics of social organization; stratification, elites, formal organizations, and social change; contemporary theoretical and methodological developments in selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
- 421. Demography and Human Ecology.** Classic and contemporary issues and perspectives in demography and human ecology, emphasizing the relationship between demographic phenomena and social life and on the ecological approach to social organization; demographic change, analytic methods in demography, fertility, mortality, and migration; new research developments. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
- 423. Social Psychology.** Development of social psychology; contemporary theoretical and methodological perspectives; selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
- 432. Special Problems in Theory and Research on Deviant Behavior.** A seminar concerned with the critique of recent theory and research on selected problems in the study of delinquency, crime, mental disorder, and the collaborative development of new theory and research designs. Prerequisite: Sociology 331 or consent of instructor. 1 unit.
- 444. Seminar in Public Opinion.** Same as Communications 444. Development and theory

of public opinion process in society: censorship, interest groups, and propaganda; and mass media and public opinion. 1 unit.

445. Sociology of Leisure. Same as Leisure Studies 445. See Leisure Studies 445.

449. The Sociology of Sport. Same as Kinesiology 449. See Kinesiology 449.

456. Organizational Sciences, I. Same as Business Administration 410, Political Science 460, and Psychology 453. See Business Administration 410.

474. Survey Methods in Marketing Research. Same as Business Administration 431. See Business Administration 431.

477. Seminar on Community Organization. Same as Rural Sociology 477. Theories relating to the community concept and the analysis of community organization; the process of community change as applied to societies in various parts of the world. Prerequisite: Sociology 275 or consent of instructor. 1 unit.

482. Recent Developments in Sociology. Intensive study of selected topics based on contemporary works of major importance in the development of sociological theory. 1 unit. May be repeated as topics vary.

485. The Sampling of Human Populations and Social Organizations. Same as Business Administration 435 and Psychology 485. See Business Administration 435.

487. Special Problems in Rural Sociology. Same as Rural Sociology 487. See Rural Sociology 487.

490. Individual Topics in Sociology. Supervised individual investigation or study of a topic not covered by regular courses: topic selected by the student and the proposed plan of study must be approved by the adviser and the staff member who supervises the work. $\frac{1}{2}$ to 2 units.

494. Multivariate Analysis in Psychology and Education. Same as Educational Psychology and Psychology 494. See Psychology 494.

499. Thesis Research. 0 to 4 units.

SPANISH, ITALIAN, AND PORTUGUESE

(Including Catalan, Romance Linguistics, and Rumanian)

Head of Department: I. A. Schulman

Department Office: 4080 Foreign Languages Building, 707 South Mathews, Urbana

Catalan

301. Studies in Catalan Language. An introductory study of the Catalan language. Prerequisite: Eight hours of Latin or any Romance language. 2 hours or $\frac{1}{2}$ unit.

302. Studies in Catalan Literature. Introduces Catalan literature through study of major works. Prerequisite: Catalan 301 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.

Italian

101. Elementary Italian. For students who have no credit in Italian. 4 hours.

102. Elementary Italian. Continuation of Italian 101. Prerequisite: Italian 101 or one year of high school Italian. 4 hours.

103. Intermediate Italian. Rapid reading, review of grammar, composition, and conversation. Prerequisite: Italian 102 or two years of high school Italian. 4 hours.

104. Intermediate Italian. Continuation of Italian 103. Prerequisite: Italian 103 or three years of high school Italian. 4 hours.

105. Intensive Beginning Italian. Equivalent to Italian 101 and 102; for students with no prior Italian credit who wish to learn at a rapid rate: speaking, reading, writing and

- aural comprehension. 8 hours. Students may not receive credit for both Italian 105 and either 101, 102, or equivalent.
- 130. Italian Medieval Literature and Civilization.** Same as Comparative Literature 130. The development of Medieval Italian civilization in a literary context from the Sicilian School of love poetry to the early Renaissance in Florence; lectures and readings are in English. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 209. Italian Syntax and Phonetics.** Italian composition and conversation; syntax and phonetics. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 211. Composition and Conversation, I.** Training in oral-aural skill and in writing; practice in the language laboratory required. Prerequisite: Italian 209 or consent of instructor. 3 hours.
- 212. Composition and Conversation, II.** Continuation of Italian 211. Prerequisite: Italian 211 or consent of instructor. 3 hours.
- 221. Introduction to Italian Literature, I.** Introduction to representative works and movements of Italian literature since the Renaissance. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 222. Introduction to Italian Literature, II.** Introduction to representative works and movements of Italian literature in the Middle Ages and the Renaissance. Prerequisite: Italian 221 or consent of instructor. 3 hours.
- 290. Readings in Italian.** Readings chosen in consultation with an adviser. Prerequisite: Italian 104 or consent of instructor. 2 to 4 hours. May be repeated.
- 293. Honors Senior Thesis.** For candidates for honors in Italian. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
- 309. Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Comparative Literature 353. Studies in Petrarch and Boccaccio; nonconcentrators in Italian may read the works in translation; lectures are in English. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or $\frac{3}{4}$ unit.
- 313. The Divine Comedy.** Same as Comparative Literature 313. An interpretation of Dante's Divine Comedy with special attention to its position in the medieval world; a knowledge of Italian not required. 3 hours or 1 unit.
- 321. Modern Italian Literature, I.** Prerequisite: Italian 222 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 322. Modern Italian Literature, II.** Prerequisite: Italian 321 or 222, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 331. Italian Culture.** Introduction to factors that have shaped present-day Italy; basic concepts contributing to understanding its present social and cultural development. Prerequisite: Italian 211 or 221, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 333. Masterpieces of Italian Renaissance Literature.** Same as Comparative Literature 354. A reading of masterpieces of the 1400 and 1500s and a study of their predecessors and influence; nonconcentrators in Italian may read the works in translation; lectures are in English. Content rotates. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units with consent of instructor.
- 362. Introduction to Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 400. Beginning Course for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
- 401. Readings in Italian for Graduate Students.** An intensive language course designed to teach reading skills to graduate students; a continuation of Italian 400. Prerequisite: Italian 400 or consent of instructor. 4 hours. No graduate credit.
- 447. Introduction to Romance Stylistics.** Same as French, Portuguese and Spanish 447. See Spanish 447.
- 451. History of the Italian Language.** 1 unit.
- 452. Seminar in Italian Linguistics.** 1 unit.
- 462. Seminar in Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.

491. Special Topics in Italian. $\frac{1}{2}$ or 1 unit.

499. Thesis Research. 0 to 4 units.

Portuguese

- 101. Elementary Portuguese, I.** For students who have no credit in Portuguese. 4 hours.
- 102. Elementary Portuguese, II.** Continuation of Portuguese 101. Prerequisite: Portuguese 101. 4 hours.
- 103. Intermediate Portuguese.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Portuguese 102 or two years of high school Portuguese. 4 hours.
- 104. Intermediate Portuguese.** Continuation of Portuguese 103. Prerequisite: Portuguese 103 or three years of high school Portuguese. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Composition and Conversation, I.** Prerequisite: Portuguese 104 or consent of instructor. 3 hours.
- 212. Composition and Conversation, II.** Prerequisite: Portuguese 211 or consent of instructor. 3 hours.
- 222. Introduction to Brazilian Literature.** Survey of the most representative works from the sixteenth century to the present with emphasis on the evolution of the country's literary history. Prerequisite: Portuguese 221 or consent of instructor. 3 hours.
- 290. Readings in Portuguese.** Readings chosen in consultation with a departmental adviser. Prerequisite: Portuguese 104 or consent of instructor. 2 to 4 hours.
- 301. Brazilian Literature.** Prerequisite: Portuguese 222 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 302. Portuguese Literature.** Prerequisite: Portuguese 222 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 303. Luso-Brazilian Culture.** Affords a broad understanding of the origins of Luso-Brazilian civilization and culture. Prerequisite: Portuguese 211 or 221, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 304. Brazilian Culture.** Affords a broad understanding of contemporary Brazilian civilization and culture. Prerequisite: Portuguese 211 or 221, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 305. Intensive Portuguese for Spanish Speakers.** An accelerated course based on Portuguese-Spanish contrastive analysis; designed to enable students who can already read Spanish to read nonliterary and literary works in Portuguese and to develop a modicum of listening comprehension. Prerequisite: Spanish 104 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 362. Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 362. See Spanish 362.
- 407. Studies in Brazilian Literature.** Advanced study of literary movements, major writers, and intellectual and cultural ideas in Brazilian literature; subject matter varies each time the course is offered. Prerequisite: Portuguese 301 or consent of instructor. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
- 447. Introduction to Romance Stylistics.** Same as French, Italian, and Spanish 447. See Spanish 447.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 462. See Spanish 462.
- 491. Special Topics in Portuguese.** $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** 0 to 4 units.

Romance Linguistics

- 362. Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 362. See Spanish 362.

462. Seminar in Romance Linguistics. Same as French, Italian, Linguistics, Portuguese, and Spanish 462. See Spanish 462.

Spanish

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

- 101. Elementary Spanish.** For students who have no university credit in Spanish. 4 hours.
- 102. Elementary Spanish.** Continuation of Spanish 101. Prerequisite: Spanish 101 at the University of Illinois at Urbana-Champaign. All other second semester Spanish students should enroll in Spanish 122. 4 hours. Credit is not given for both Spanish 142 and 102.
- 103. Intermediate Spanish, I.** Continued development of reading, writing, and conversational skills for students who may be interested in pursuing Spanish in more advanced courses. Unlike Spanish 123, Spanish 103 places considerable emphasis on written expression in Spanish. Followed by Spanish 104, 114, or 124, this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
- 104. Intermediate Spanish, II.** Continuation of Spanish 103 for students who may be interested in pursuing Spanish in more advanced courses; continued emphasis on written and oral expression and on the reading of advanced texts. Completion of this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 103 or equivalent placement score. 4 hours.
- 114. Conversational Spanish.** Conversation in Spanish on topics of current interest; brief grammar review as necessary to improve oral skills; and reading required in preparation for classroom discussions. Fulfills the foreign language requirement but does not serve as prerequisite for advanced courses in Spanish without departmental approval. Background readings in Spanish and English. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
- 122. Elementary Spanish.** Second-semester Spanish course for all students who did not take Spanish 101 at this University. Prerequisite: Spanish 101 elsewhere or assignment by placement exam. 4 hours.
- 123. Reading and Speaking Spanish, I.** Readings of Spanish literary and cultural texts with discussion in Spanish; review and development of grammar essential to competence in reading and speaking. Followed by Spanish 114 or 124, this course fulfills the LAS foreign language requirement. Students completing Spanish 123 may not enroll in Spanish 104 without departmental approval. Students planning to take advanced courses in Spanish should enroll in Spanish 103. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
- 124. Reading and Speaking Spanish, II.** Continuation of Spanish 123. Readings of Spanish literary and cultural texts with discussion in Spanish; continued development of conversational skills. This course fulfills the LAS foreign language requirement, but does not serve as a prerequisite for more advanced courses in Spanish without departmental approval. Students planning to take additional courses in Spanish should enroll in Spanish 104. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
- 125. Beginning Spanish for Near-Native Speakers.** Introduction to Spanish orthography, syntax and vocabulary for students of Hispanic background who have had little or no formal training in the Spanish language. Prerequisite: Consent of instructor. 4 hours.
- 141. Elementary Spanish for Agriculture and Related Fields, I.** Introductory course for students in agriculture and related disciplines interested in acquiring Spanish-language competency for use in the fields of agriculture, foods and nutrition, and rural development; presents basic grammar and vocabulary, scientific terminology, and agricultural and cultural information on the Spanish-speaking areas of the world. 4 hours. Not open to students who have received credit for Spanish 101.

- 142. Elementary Spanish for Agriculture and Related Fields, II.** Emphasizes conversation and focuses on Latin America; for students in agriculture, foods and nutrition, and rural development. Prerequisite: Spanish 141 or consent of instructor. 4 hours. Credit is not given for both Spanish 102 and 142.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Introduction to the Study of Hispanic Literature.** Basic terminology and techniques for the study of the major literary genres; should be taken prior to any Spanish literature course. Prerequisite: Spanish 209 and 211, or equivalent; or concurrent registration in Spanish 209 and 211 with consent of advisor and instructor. 2 hours.
- 209. Spanish Language.** A practical course on Spanish phonology and morphology; intensive drill in Spanish sound and verb systems, and analysis of sentence structure. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
- 211. Oral Spanish.** Practice in speaking Spanish; to be taken concurrently with or subsequent to Spanish 209. Meets four hours per week. Prerequisite: Spanish 104. 2 hours.
- 215. Intensive Spoken Spanish.** Intensive oral contact with Spanish; meets five hours per week. Prerequisite: Spanish 211 or consent of instructor. 2 hours. May be repeated.
- 217. Spanish Composition.** Basic composition course; problems of written Spanish and principles of Spanish rhetorical patterns; weekly written exercises. Prerequisite: Spanish 209 and junior standing, or consent of instructor. 3 hours.
- 225. Intermediate Spanish for Near-Native Speakers.** Review at the intermediate level of Spanish orthography, syntax, and vocabulary for students of Hispanic background who have little or no formal training in the Spanish language and an introduction to the study of U.S. Hispanic minority literature. This course fulfills the LAS foreign language requirement. Prerequisite: Spanish 125 or consent of instructor. 3 hours.
- 226. Survey of Hispanic Minority Literature.** A survey of literature in English by and about people of Mexican, Puerto Rican, and Cuban descent in the United States. 3 hours.
- 232. Culture of Spain.** Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
- 233. Culture of Spanish America.** Designed for concentrators in Spanish; offered in Spanish. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
- 240. Spanish Literature: Medieval and Golden Age.** Introduction to major works and movements of the Middle Ages and the Golden Age. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 241. Spanish Literature: Eighteenth Century to the Present.** Study of representative masterpieces within the context of major periods and trends. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 242. Spanish-American Literature.** Introduction to major literary movements and works in Spanish America. Prerequisite: Spanish 200, 209, and 211, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 250. Spanish American Culture Through Its Literature.** Same as Comparative Literature 244. Studies major aspects of Spanish American culture as portrayed in its literature; readings and discussion, in English, of writers' views of socio-political issues, and of cultural characteristics and change. 3 hours.
- 260. Spanish for Industry and Commerce, I.** Introduction to vocabulary of Hispanic commerce; composition of business letters and similar texts. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
- 261. Spanish for Industry and Commerce, II.** Advanced study of Hispanic commercial vocabulary; composition of commercial correspondence and documentation. Prerequisite: Spanish 260. 3 hours.
- 270. Parateaching.** Same as French, German, Latin, and Russian 270. See French 270.
- 279. Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Russian 279. See Humanities 279.

- 280. Teachers Course.** Required for teacher-training majors in Spanish. Prerequisite: Spanish 209 or 211, or consent of instructor. 4 hours.
- 293. Honors Senior Thesis.** For candidates for honors in Spanish. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
- 298. Senior Seminar.** Intensive study of Hispanic linguistics or literature. Prerequisite: Senior standing. 2 hours. May be repeated for credit with adviser's consent. (Counts for advanced hours in LAS.)
- 305. Romanticism and Realism in Nineteenth-Century Spanish Literature.** A study of representative authors and genres of the nineteenth century; particular emphasis on the romantic drama and the realistic novel. Prerequisite: Spanish 241 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 306. The Generation of 1898.** A study of representative works of Baroja, Azorin, Unamuno, Maeztu, Valle Inclan, Benavente, A. Machado, and others. Prerequisite: Spanish 241 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 307. Spanish-American Literature to 1910.** Study of the development of Spanish-American literature from its sixteenth-century beginnings through modernismo. Graduate students read one additional major literary work and write an additional paper on that work. Prerequisite: Spanish 242 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 309. Introduction to Medieval Spanish Literature.** Historical and cultural background for the Middle Ages; selected readings in medieval literature from the Jarchas to the Corbacho. Prerequisite: Spanish 240 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 310. Contemporary Spanish-American Literature.** A study of Spanish-American literature from World War I to the present. Prerequisite: Spanish 242 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 311. Don Quixote and the Prose of the Golden Age.** Introduction to Don Quixote, to its relationship to other selected masterpieces of the Golden Age, and to the main currents and forms of Golden Age prose. Prerequisite: Spanish 240 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 313. Chicano Literature.** A survey of literature in Spanish by and about people of Mexican descent in the United States. Prerequisite: Spanish 233 and 242. 3 hours or $\frac{3}{4}$ unit.
- 314. Spanish Drama and Poetry of the Golden Age.** Prerequisite: Spanish 240 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 315. Puerto Rican Literature.** A study of representative authors and genres of Puerto Rican literature since World War II. Prerequisite: Spanish 242 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 351. Phonetics.** Prerequisite: Spanish 209 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 352. Syntax.** Required for teacher-training majors in Spanish. Prerequisite: Spanish 209 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 353. Spanish Structure.** Same as Linguistics 353. Comprehensive analysis of Spanish phonology and syntax based on present-day linguistic theory. Prerequisite: Linguistics 300; Spanish 351; Spanish 352. 3 hours or $\frac{1}{2}$ unit.
- 360. Principles of Language Testing.** Same as English as a Second Language, French, and German 360. See English as a Second Language 360.
- 362. Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 362. Comparative and historical analysis of the Romance languages. Prerequisite: Four semesters of a Romance language or Latin, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 371. Spanish for Teachers.** A consideration of language problems suggested by teaching experience. Prerequisite: Spanish 209 or equivalent. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as a Second Language, French, German, Humanities, and Slavic 382, and Linguistics 386. See Humanities 382.
- 399. Study Abroad.** Lectures, seminars, and practical work in Spanish language, literature, and civilization in Spain. Prerequisite: Spanish 200 and 211, or equivalent. 0 to 18 hours, or 0 to 3 units.

- 400. Beginning Spanish for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
- 401. Readings in Spanish for Graduate Students.** Continuation of Spanish 400; special readings in the critical literature of several disciplines. Prerequisite: Spanish 400 or consent of instructor. 4 hours. No graduate credit.
- 405. Spanish Bibliography.** An introduction to bibliographical method and to the principal bibliographical resources for the study of Spanish and Latin American literature. $\frac{1}{2}$ unit.
- 411. Medieval Literature to 1300.** Survey of medieval Spanish literature to 1300; special attention to relationship with other medieval literatures of western Europe. Prerequisite: Spanish 309. 1 unit.
- 412. Medieval Literature, 1300-1500.** Survey of medieval Spanish literature from 1300 to 1500; special attention to relationship with other medieval literatures of western Europe. Prerequisite: Spanish 309. 1 unit.
- 415. Renaissance and Baroque Prose in Spain.** Prerequisite: Spanish 311 and 314, or equivalent. 1 unit.
- 417. Renaissance and Baroque Drama in Spain.** Prerequisite: Spanish 311 or 314, or consent of instructor. 1 unit.
- 418. Seminar in Renaissance and Baroque Literature.** Same as Comparative Literature 404. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 419. Cervantes.** Don Quixote and representative minor works. Prerequisite: Spanish 311 or 314, or consent of instructor. 1 unit.
- 420. Studies in Medieval Spanish Literature.** Advanced study of the major literary movements, genres, and authors in medieval Spanish literature. Topics vary. Prerequisite: Spanish 309 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 421. Modern Spanish Novel and Essay.** 1 unit.
- 422. Contemporary Spanish Novel and Essay.** 1 unit.
- 424. Contemporary Spanish Drama.** Dramatic literature of Spain in the twentieth century. 1 unit.
- 425. Renaissance and Baroque Poetry in Spain.** 1 unit.
- 426. Spanish Poetry of the Nineteenth and Twentieth Centuries.** 1 unit.
- 427. Studies in Twentieth-Century Spanish Literature.** Advanced study of major literary movements, genres, or authors in twentieth-century Spanish literature; subject matter varies. Prerequisite: Spanish 306 or any survey of contemporary Spanish literature, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 428. Studies in Nineteenth-Century Spanish Literature.** Advanced study of major literary movements, genres, or authors in nineteenth-century Spanish literature; subject matter varies. Prerequisite: Spanish 305 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 429. Studies in Golden Age.** Advanced study of major literary movements, genres, or authors in sixteenth- and seventeenth-century Spanish literature; subject matter varies. Prerequisite: Spanish 311 or 314, or any survey of Spanish literature. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 430. Studies in Twentieth-Century Spanish-American Literature.** Advanced study of major literary movements, genres, or authors in twentieth-century Spanish-American literature; subject matter varies. Prerequisite: Spanish 307 or 310, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 432. Spanish-American Poetry.** The development and major exponents of Spanish-American poetry from the beginnings to the present. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
- 434. Spanish-American Novel.** Major movements and writers in the development of the Spanish-American novel from its beginnings to the present. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
- 435. Seminar in Spanish-American Poetry.** Prerequisite: Spanish 432. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 436. Seminar in Spanish-American Novel.** Same as Comparative Literature 462. Special

- problems in methodology and research; includes other prose fiction. Prerequisite: Spanish 434. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 437. Spanish-American Drama.** Prerequisite: Spanish 307 or 310. 1 unit.
- 438. Regional and National Literatures of Spanish America.** Advanced study of regional and national literatures in Spanish America; subject matter varies. Prerequisite: Spanish 307 or 310; or equivalent. 1 unit. May be repeated when different regional and national forms are examined.
- 439. The Spanish-American Short Story.** Intensive and analytical study of the principal cuentistas of Spanish America. Prerequisite: Spanish 307 and 310, or equivalent. 1 unit.
- 442. Seminar in Modern Spanish Literature.** Study of problems in the works of a major writer or group of writers of the eighteenth or nineteenth centuries. Prerequisite: Spanish 305; Spanish 421 or 423, or equivalent. 1 unit. May be repeated to credit as topic varies for a maximum of 2 units.
- 445. Seminar in Twentieth-Century Spanish Literature.** Investigation of literary problems presented by the Spanish novel, drama, and/or essay since 1900. Prerequisite: Spanish 421, 422, 423, or 424, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 447. Introduction to Romance Stylistics.** Same as Italian, Portuguese and French 447. A brief history of the schools and theories of Romance stylistics, especially the French-Swiss stylistique (Bally, Marouzeau, and Cressot) and the German-Spanish Stilforschungen (Spitzer, Hatzfeld, Kayser, A. Alonso, and D. Alonso); includes a study of representative works and assigned topics for analysis. Prerequisite: Graduate standing in one of the Romance languages; reading knowledge of French and Spanish or consent of instructor. 1 unit.
- 451. Seminar in Spanish Descriptive Linguistics.** Selected topics of Spanish phonology and syntax in the light of present-day linguistic theory. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 452. Seminar in Spanish Historical Linguistics.** Selected topics on the development of Spanish and its dialects in the light of present-day historical methods. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 453. History of the Spanish Language.** 1 unit.
- 454. Old Spanish.** 1 unit.
- 460. Seminar in Medieval Spanish Literature.** Research work in medieval Spanish literature; theory and practice. Topics vary. Prerequisite: Spanish 411 or 412, and 453 or 454. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 462. Selected topics in comparative Romance linguistics. Prerequisite: Spanish 362 and consent of instructor. 1 unit. May be repeated as topic varies.
- 463. College Teaching of Foreign Languages.** Same as English as a Second Language, French, German, and Russian 463. See French 463.
- 471. Applied Linguistics and Teaching College Spanish.** Study of the structure of Spanish with special emphasis on the teaching situation in elementary Spanish courses. 1 unit.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as a Second Language, French, German, and Russian 481. See French 481.
- 491. Special Topics in Spanish.** $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** 0 to 4 units.

SPECIAL EDUCATION

Acting Head of Department: L. J. Jordon

Department Office: 288 Education Building, 1310 South Sixth, Champaign

- 117. Exceptional Children.** Introduction to the study of children who deviate from the average in mental, physical, and social characteristics, including a study of the characteristics of such children and the adaptation of educational procedures to their abilities and disabilities. Prerequisite: Sophomore standing or Psychology 100. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 218. Exceptional Students in Secondary Schools.** Introduction to the education of handicapped students in secondary schools, covering the legal bases for special education, the historical treatment of handicapped high school students, and modifications in teaching methods to meet specific learning or behavior difficulties. 1 hour.
- 249. Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 306. Remediation of Academic Behavior Problems in the Regular Classroom.** Examines the application of data-based instruction (DBI) techniques to assess and remediate academic behavior problems in the regular classroom; topics include: traditional educational assessment, curriculum-based assessment, application of DBI techniques to improve academic skills, and the role of the classroom teacher in educating students with mild learning and behavior problems. 3 hours or 1 unit.
- 307. Special Needs Students in Secondary Schools.** Examines characteristics, assessment, and methodology of teaching handicapped students in regular classrooms of the secondary schools; major emphases include informal assessment procedures, modification of materials, and individualization of instruction. Prerequisite: Registration in a secondary education teacher certification program, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 308. Teaching Students with Learning and Behavior Problems in the Regular Classroom.** Examines the role of the regular classroom teacher in educating students with mild learning and behavior problems; topics include: identifying and describing learning and behavior problems, classroom behavior management techniques, remediation of academic skill deficits, and measuring and evaluating pupil progress. 3 hours or 1 unit.
- 309. Vocational Education for Special Needs Learners.** Same as Vocational and Technical Education 309. See Vocational and Technical Education 309.
- 314. Applications in Assessment of Young Exceptional Children.** Practice in designing and applying assessment devices and procedures and in using them to make educational decisions for handicapped children, birth through kindergarten age. Prerequisite: Credit or concurrent registration in Special Education 324; consent of instructor. 2 hours or $1/2$ unit.
- 316. The Gifted Child in School and Society.** A consideration of the gifted in society; who they are, their physical, psychological, social, and educational characteristics, and society's needs and provisions for them. The major portion of the course is devoted to the consideration and evaluation of instructional and administrative adjustments that should be made for the gifted in the educational structure. Prerequisite: Educational Psychology 211 or 236. 3 hours, or $1/2$ to 1 unit.
- 322. Psychology and Education of the Mentally Handicapped.** Study of the social, emotional, physical, and learning characteristics and problems of mentally handicapped children; identification and diagnosis; available services and provisions; and educational programs and curriculum of the school. 3 hours or $1/2$ unit.
- 324. Tests and Measurements in Special Education.** Interpretation of norm- and cri-

- terion-referenced tests for special populations; examines selection and design of observation systems; applies measurement-assessment data to making instructional decisions for handicapped infants, youth, and young adults. 2 hours or $\frac{1}{2}$ unit.
- 332. Characteristics and Methods of Educating the Multiply Handicapped.** Studies the physical and developmental characteristics of multiply handicapped individuals; places special emphasis upon individuals with cerebral palsy and other physical handicaps; reviews methods of educational interventions and requires demonstration of competencies in rudimentary physical management of multiply handicapped individuals. 3 hours or 1 unit.
- 335. Behavior Analysis for Teachers: Applications with Exceptional Individuals.** Prepares students to remediate behavior problems of exceptional students and adults using applied behavior analysis techniques; teaches students to define, observe, and record behavior, to chart and evaluate behavior, and to apply behavioral procedures to remediate classroom behavior problems. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Systematic Instruction for Students with Special Needs.** Elements of data-based instruction emphasizing educational planning for individuals with special needs; includes task and developmental analysis, writing instructional programs, and individualization of instruction. Covers infancy to young adults; mild to severe degrees of handicap. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 4 hours or 1 unit.
- 337. Curriculum Development and Classroom Organization for Students with Moderate and Severe Handicaps.** Studies curriculum design, development, and adaptation for students with moderate and severe handicaps; studies the following basic curriculum areas: domestic/home living, self-care, socialization, community living, leisure and recreation, and functional academics; and emphasizes throughout the course the evaluation of curriculum and program effectiveness. Prerequisite: Special Education 336. 4 hours or 1 unit.
- 338. Teaming with Parents and Staff: Communication, Training, and Cooperation.** Studies educational teams and the development, implementation, and evaluation of individualized educational programs for pupils with moderate, severe, and multiple handicaps; places special emphasis upon models of interactions, roles of team members, training of team members, and program coordination and evaluation of service delivery. 2 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Vocational and Technical Education 345. Provides students with an orientation to a behavioral approach to vocational training for handicapped adolescents and adults; topics include training, managing and evaluating vocational behavior, total service planning, and competitive employment placement and follow-up. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 3 hours or 1 unit.
- 347. Community Integration of the Handicapped.** Seminar for delivery of papers on topics related to the integration of handicapped adults into the community; residential alternatives, normalization, legal aspects, educational aspects, community aspects, etc.; examines ideological and empirical factors in community integration, including cost effectiveness analysis. 2 hours or $\frac{1}{2}$ unit.
- 359. Workshop and Laboratory in Curriculum and Methodology.** An intensive exploration of curriculum development in specialized areas of education. Requests for initiation of course sections are made by faculty or students. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 410. Law and the Handicapped.** Studies the legal rights of handicapped and disabled individuals with special emphasis on educational aspects; examines the inter-relationship of constitutional law, statute law, administrative law, and case law at the federal, state, and local levels. 1 unit.
- 411. Drugs in Special Education.** Psychoactive drugs are used extensively with children in special education; this course involves a general survey of reasons for the prescription, behavioral effects as observed in the classroom, effects on the child's behavior at home, issues concerning the use of the drugs, and litigation about these issues. 1 unit.
- 417. Programs for Special Students.** Introduces special education: characteristics, as-

assessment, and teaching methodology for students with learning and other handicaps; methodology is directed to the regular classroom teacher of special students. Prerequisite: Provisional teaching certification or completion of student teaching; or consent of instructor. 1 unit.

- 420. The Social Psychology of the Handicapped.** Studies the social and emotional adjustment of handicapped children and adults, and the somatopsychological significance of mental, sensory, and motor variations in the adjustive process; evaluation of effects of limitations imposed by the attitude of society, the attitude of the individual toward the handicap, and the handicap itself; and analysis of implications for current educational programs for the handicapped. Prerequisite: Special Education 117 or 417; Educational Psychology 312; or consent of instructor. 1 unit.
- 421. Administration and Supervision of Special Education.** Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs; examination of administrative and supervisory practices in educating exceptional children with emphasis on special education programs in the public schools; and application of administrative theory to special education programs. Field trips to observe and evaluate programs are required. Prerequisite: Special Education 417; Administration, Higher, and Continuing Education 450. 1 unit.
- 422. Theories of Academic Remediation.** Examines major theoretical approaches in the field of learning disabilities and critically evaluates them in light of research; topics include: definitions of learning disabilities, assessment and remediation strategies, critical evaluation of research, and issues in the field of learning disabilities. 1 unit.
- 424. Supervised Practice in Special Education.** Supervised practice in one or more settings in which either mildly or severely impaired students are served; practicum settings may include day, residential, special, and regular schools which serve handicapped students. Prerequisite: Admission to the graduate program in special education; consent of supervising faculty member. $\frac{1}{2}$ to 2 units.
- 425. Principles and Practices of Resource/Consulting Teaching.** Data-based instruction in a direct service setting; emphasizes provision of indirect (consultation) services to regular classroom teachers. Prerequisite: One semester of Special Education 424. 1 unit.
- 426. Theories and Practice of Consultation for Special Educators.** Focuses on aspects of resource/consulting teacher services which go beyond direct instruction services; emphasizes training resource room teachers to work as consultants to regular classroom teachers, parents and paraprofessionals. Students complete a series of consultation projects. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department head prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department head.
- 456. Problems and Trends in Special Education.** Introduces significant problems, points of view, and trends in the field concerned; explores significant research related to organization, content, and techniques in the field in question. Students are encouraged to make special studies in approved areas. 1 to 2 units.
- 466. Early Childhood Handicapped: Organization for Noncategorical Educational Intervention.** Discusses program issues and research in relation to the efficacy of various program models for young children with special needs; draws practical implications for program organization variables such as space, personnel roles, and curriculum. Covers infancy through kindergarten age. Prerequisite: Special Education 336. 1 unit.
- 483. Single Subject Research Design.** Same as Educational Psychology 483. Studies research designs that require one or a few subjects; discusses issues of the validity of treatment comparisons and generalizability of results; and presents several statistical approaches for testing a priori hypotheses. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.

- 490. Seminar for Advanced Students of Education.** Seminar in the education of exceptional children; open only to persons who have been admitted for doctoral study. Sections may be offered in the following fields: (d) program planning and orientation; and (t) teacher education. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 492. Concepts and Issues in Special Education, I.** Studies the delineation of roles and competencies for leadership positions; includes literature critique, and preparation and presentation of a major review paper in an area of research interest. Prerequisite: Admission to doctoral studies in Special Education, or consent of instructor. 1 unit.
- 493. Concepts and Issues in Special Education, II.** Seminar in current concepts and issues relating to all exceptional children; includes presentations by experts in sub-specialties of the field; requires critical review of key readings and preparation of papers synthesizing lectures, discussions and readings. Prerequisite: Special Education 492 or consent of instructor. 1 unit.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

SPEECH AND HEARING SCIENCE

Acting Head of Department: K. E. Andersen

Department Office: 901 South Sixth, Champaign

- 102. Human Communication: Systems, Processes, and Disorders.** Examines broad perspectives of theories and information regarding normal and abnormal communication: how speech and language develop, how people hear, how they produce speech and what can go wrong; addresses the impact of speech and hearing science on society, culture, and modern technologies. 3 hours.
- 105. Voice and Articulation.** Same as Speech Communication 105. Basic factors of voice and speech sound production; analysis of faults that result in minor speech deviations or inadequacies; and individual analysis and guided practice toward improvement of speech habits. 2 hours.
- 198. Freshman Seminar.** A special experimental seminar or independent study course intended to cover topics not treated by regular course offerings; open to undergraduates at any level. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the academic department concerned. While credit toward graduation is normally granted, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. 0 to 9 hours. May be repeated.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 260. American Sign Language.** Same as Linguistics and Psychology 260. See Psychology 260.
- 290. Individual Study.** Individual investigation of special problems. Prerequisite: Ten hours of speech and hearing science, and written approval by the faculty members who will supervise the student's work. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 291. Honors Course.** Individual study leading either to a thesis or to departmental honors. Prerequisite: Senior standing; a grade point of 4.0 or consent of the head of the department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
- 301. General Phonetics.** Same as Speech Communication 301. Basic principles of phonetic

- study; includes observation and representation of pronunciation, ear training, and practice in transcription. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 302. Manual Communication, I.** Study of methods of manual communication with hearing impaired individuals; analysis of the language of signs and finger spelling in relation to origins, development, and structure; and extensive practice in manual communication. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 303. Manual Communication, II.** Continuation of Speech and Hearing Science 302; an in-depth study of manual methods of communicating with hearing impaired individuals; particular emphasis on development of fluency in communicating with language-deficient deaf children and adults; and extensive practice in idiomatic language of signs. 2 hours or $\frac{1}{2}$ unit.
- 310. Effects of Noise.** Presents the effects of noise (industrial, recreational, and transportation) on the individual and the community. Topics include methods of measuring noise, the physiological and psychological effects of noise; methods of abatement and hearing conservation; and legal aspects of noise damage and noise control. 3 hours or $\frac{1}{2}$ unit.
- 348. Speech and Language Clinical Methods in the Schools.** Same as Elementary and Early Childhood Education 348. Study of methods and materials used in the schools by the speech and language clinician. Prerequisite: Speech and Hearing Science 388. 3 hours or $\frac{1}{2}$ unit.
- 375. Speech Science, I.** Same as Speech Communication 375 and Linguistics 375. Introduction to the anatomic and physiologic characteristics of the normal speech and hearing mechanisms. 4 hours or 1 unit.
- 376. Speech Science, II.** Same as Speech Communication 376 and Linguistics 376. Consideration of the physiology of the speaking act, the acoustical characteristics of voice and of speech sounds, and the hearing of speech. Prerequisite: Consent of instructor. 4 hours or 1 unit.
- 378. Hearing Science.** Acoustics, anatomy, and physiology of the auditory system; psychophysical methods; and a consideration of auditory theories and mechanics. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 383. Development of Spoken Language.** Same as Speech Communication 383. Study of the correlates of language development from the prelinguistic period to adulthood. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 384. Introduction to Stuttering.** Study of the theoretical and research literature concerning the causes, diagnosis, and treatment of stuttering and an analysis of clinical procedures in stuttering therapy. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 385. Speech Pathology, I.** A study of the symptoms, causes, and treatment of articulation disorders. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 386. Language Disorders in Children.** Definition, etiology, and description of various types of language disorders in children; assessment and intervention of these clinical cases. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 387. Basic Principles in Speech Pathology.** Discussion, demonstration, and practice of clinical approaches used with speech and language disorders. Prerequisite: Speech and Hearing Science 385, 388, and 389. 5 hours or 1 unit.
- 388. Speech Pathology, II.** A study of the symptoms, causes, and treatment of voice disorders. Prerequisite: Speech and Hearing Science 385 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 389. Appraisal in Speech Pathology.** Introduction to principles of diagnosis; discussion of administration, scoring, and interpretation of tests utilized during speech and language evaluation. Prerequisite: Speech and Hearing Science 383 and 385, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 390. Introduction to Hearing Disorders and Audiometry.** Review of the history of audiology as a profession; study of symptoms, causes, and treatment of hearing losses; and principles and application of basic audiometry. 4 hours or 1 unit.
- 392. Diagnosis of Hearing Impairments in Infants and Young Children.** Symptoms and causes of hearing impairment in young children; practice in procedures used for

the measurement of residual hearing; and the selection and use of hearing aids. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 393. Aural Habilitation and Rehabilitation.** Principles and methods of clinical and classroom retraining of the hard-of-hearing; includes lip reading, auditory training, speech disorders and conversation, and counseling. Required in curriculum of teacher training in speech and hearing science. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 398. Practicum in Audiology.** Observation, practice, and research in diagnosis and rehabilitation of auditory disorders. Students may repeat either Speech and Hearing Science 387 or 398, but not both, for 3 hours. Prerequisite: Speech and Hearing Science 389 and 393. 3 hours or $\frac{1}{2}$ unit.
- 399. Design and Analysis of Experiments in Speech and Hearing Science.** An introduction to experimental designs and methods of statistical analysis in speech and hearing research. Prerequisite: Graduate standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 401. Applied Phonology.** A survey of basic knowledge concerning normal and deviant phonological development, and principles for applying this knowledge to the assessment and remediation of phonological disorders. Prerequisite: Consent of instructor. 1 unit.
- 418. Communication and Language Problems of the Hearing Impaired, I.** An advanced course in the problems and procedures involved in the acquisition of language and communication by persons with severe hearing impairment, particularly those with profound prelingual deafness; emphasis on research and measurement in the development of speech, speechreading, residual hearing, reading, written language, and manual communication, including finger spelling and the language of signs; and stress on the applications of recent approaches in linguistics and psycholinguistics to language development. Prerequisite: Consent of instructor. 1 unit.
- 475. Experimental Phonetics, I.** Same as Linguistics 475. Theoretical consideration of speech as motor behavior; special reference to physiological investigations of normal respiration, phonation, and articulation; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
- 476. Experimental Phonetics, II.** Same as Linguistics 476. Theoretical consideration of speech as an acoustical phenomenon; special reference to acoustical investigations of voice and speech sounds; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
- 481. Seminar in Neuropathologies of Speech and Language.** Advanced study of speech, vocal, and linguistic problems associated with cerebral palsy and aphasia; topics offered in rotation, one or two each semester, include neurological aspects, aphasia, and cerebral palsy. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
- 482. Seminar in Stuttering.** Advanced study of stuttering disorders; topics vary, but emphasis is placed on measurement, clinical evaluation, and therapeutic methods. Prerequisite: A course in stuttering. 1 unit.
- 483. Psychology of Speech and Hearing Disorders, I.** Same as Psychology 483. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to speech disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
- 484. Psychology of Speech and Hearing Disorders, II.** Same as Psychology 484. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to hearing disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
- 486. Advanced Clinical Techniques in Speech and Hearing.** Semi-independent management of complex cases; participation in examination and analysis; topics offered each semester include theory of clinical practice, speech pathology, audiology, language disorders, and field study. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.

- 489. Seminar in Orofacial Anomalies and Laryngeal Pathologies of Speech.** Advanced study of speech and vocal problems associated with cleft palate, laryngeal dysfunctions, and facial-maxillary disturbances; topics offered in rotation, one each semester, include cleft palate and vocal problems. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 490. Medical Aspects of Speech Disorders and Audiology.** Study of acute and chronic hearing and speech disorders traceable to disease of the ear and vocal mechanisms in relation to the techniques and philosophies utilized in a medically oriented environment. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
- 491. Seminar in Hearing Disorders.** Principles and methods of clinical management of all types of hearing disorders; survey of current literature and research. The following topics are offered in rotation, one or two each semester: automatic audiometry, aural rehabilitation, and hearing aids and amplification. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 492. Advanced Audiology.** Advanced study of rationale and development of principles associated with special techniques, procedures, and methods used in audiology. 1 unit.
- 495. Special Problems.** Investigation of speech projects not included in theses. Prerequisite: Consent of head of the department. $\frac{1}{2}$ to 2 units.
- 496. Proseminar in Speech and Hearing Science.** Required seminar for all graduate students; involves reporting of ongoing research of faculty, visiting researchers, and students. 0 units.
- 499. Thesis Research.** Individual research in the various areas of speech and hearing science. 0 to 4 units.

SPEECH COMMUNICATION

Head of Department: J. G. Delia

Department Office: 244 Lincoln Hall, 702 South Wright, Urbana

- 101. Principles of Effective Speaking.** Preparation and presentation of short informative and persuasive speeches; emphasis on the selection and organization of material, methods of securing interest and attention, and the elements of delivery. 3 hours. Credit is not given for both Speech Communication 101 and either 111 or 112.
- 102. Introduction to Speech Communication.** Survey of the questions probed, the methods employed, and the current status of knowledge in the speech communication discipline; provides opportunities to understand the range of concerns and to explore specific areas of interest of the field. 4 hours.
- 105. Voice and Articulation.** Same as Speech and Hearing Science 105. See Speech and Hearing Science 105.
- 107. Parliamentary Procedure.** Principles and practice of parliamentary procedure. 2 hours.
- 111. Verbal Communication.** Principles and practice in communication; stress on fundamentals of exposition in writing and speaking. The University rhetoric requirement is fulfilled by this course in conjunction with Speech Communication 112. 3 hours. Credit is not given for both Speech Communication 111 and 101.
- 112. Verbal Communication.** Theory and practice of communication; stress on deliberation and fundamentals of persuasion through speaking and writing. The University rhetoric requirement is fulfilled by this course. Prerequisite: Speech Communication 111. 3 hours. Credit is not given for both Speech Communication 112 and 101.
- 113. Group Discussion and Conference Leadership.** Study of leadership, group process, and interpersonal relations in the small group, conference, and the public forum; emphasis on practice in leading and participation in various types of public discussion and conference, with materials drawn from current public questions. Prerequisite: Sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours.

- 120. Advanced Oral Communication.** Advanced principles of speech preparation and presentation; special problems and types of speeches; and considerable practice in composition and delivery of speeches. Prerequisite: Speech Communication 101 or equivalent. 3 hours.
- 123. Public Discussion and Debate.** Study of and participation in public discussion and debate with emphasis on thorough preparation and research, principles of analysis, reasoning, evidence, and persuasive presentation of well-founded convictions; previous debate experience not required. 3 hours.
- 141. Oral Interpretation.** Same as Theatre 180. Oral reading for understanding, appreciation, and communication. 3 hours.
- 142. Group Oral Interpretation of Literature.** Same as Theatre 181. Study of modern modes of group presentation of literature; emphasis on practice in script preparation, directing, and performance in chamber theatre and readers' theatre. Prerequisite: Speech Communication 141 or consent of instructor. 2 hours.
- 161. Fundamentals of Acting.** Same as Theatre 170. See Theatre 170.
- 177. The Arts of Public Discourse.** The nature and forms of practical and artistic public speech, including adaptations for the mass audience. 4 hours.
- 178. The Arts of the Theatre and Interpretative Speech.** The nature and forms of performing speech arts of theatre, interpretation, and film, including adaptations for the mass audience. 4 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Dramatics for Teachers.** Survey of methods and procedures of play production in the secondary school. 3 hours.
- 204. Speech for Teachers.** A course in teaching methods designed for prospective teachers who are non-speech communication majors; discussion of methods and materials available for teaching speech and directing extracurricular speech activities. 3 hours.
- 207. The Art of the Screen: Humor.** Study of selected comedies and other specimens of film and television humor in relation to theories of humor. Prerequisite: Consent of instructor. 3 hours.
- 208. Ideology and the Rhetoric of Film.** Examines the nature and communicative functions of the ideological content of narrative cinema, with emphasis on the Hollywood film; considers ideological dimensions of film as communication, explicit and implicit ideological dimensions of the Hollywood social problem film, relationship of genre and ideology, and the ideology of the institution of cinema. Prerequisite: Sophomore standing and one course in speech communication or film. 3 hours.
- 210. The Rhetorical Tradition.** Survey of major trends in the development of rhetorical theory from Homer to the present. 3 hours. (Counts for advanced hours in LAS.)
- 211. Business and Professional Speaking.** Study, preparation, and presentation of the chief types of business speeches; special attention to conferences, sales talks, interviews, and job applications. Prerequisite: Speech Communication 101. 2 hours.
- 213. Persuasion and the Arts.** Introduction to the study of narrative films, theatre, fiction, and poetry as vehicles of indirect and overt persuasion. 3 hours.
- 221. Persuasion.** Study of the processes of motivation as applied to speeches intended to influence group opinion and action; practice in the preparation and delivery of short persuasive speeches. Prerequisite: Speech Communication 101; junior standing. 3 hours. (Counts for advanced hours in LAS.)
- 223. Argumentation: Theory and Practice.** Study of the theory of argument, e.g., evidence, reasoning, and construction of briefs; practice in formal and informal forms of debate and public discourse on current public questions. Prerequisite: Speech Communication 101; sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
- 230. Interpersonal Communication.** Study of communication theory and its application to interpersonal relations; extensive discussion of problems of conflict and misunder-

standing in personal affairs to facilitate the development of knowledge, insights, and skills in the processes of face-to-face interaction. Prerequisite: Speech Communication 101 and sophomore standing; by permission of the head of the department, the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)

243. **The Oral Interpretation of Shakespeare.** Analysis and oral presentation of selections from Shakespeare's plays. Prerequisite: Junior standing; Speech Communication 141. 2 hours. (Counts for advanced hours in LAS.)
247. **Teaching of Speech.** Same as Secondary Education 247. See Secondary Education 247.
252. **The Rhetoric of Dissent.** A study of the rhetorical strategies and tactics employed in selected cases of dissent in American political and social life. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
253. **Case Studies in Public Discourse.** Detailed examination of selected cases of significant public discourse. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
254. **Freedom of Speech and the Ethics of Speech Communication.** Examination of the nature and variety of responses to value questions concerning communication; includes a survey of the evolution of and current controversies in freedom of speech. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
255. **Directing: Script Preparation.** Same as Theatre 281. See Theatre 281.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.25; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
291. **Honors Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Individual study leading to a thesis for honors in the Department of Speech Communication. Prerequisite: Senior standing; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
296. **Special Topics in Speech Communication.** Special topics in speech communication not treated in regularly scheduled courses. See Timetable for current topics. Prerequisite: Sophomore standing and one course in speech communication; or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
301. **General Phonetics.** Same as Speech and Hearing Science 301. See Speech and Hearing Science 301.
308. **The Art of the Screen: Exposition and Persuasion.** Same as Communications 308. Critical study of the application of the eclectic principles of the screen narrative to the transmission of information and the influencing of attitude, opinion, and action; lectures, discussions, and reports; viewing of selected films and television programs. Prerequisite: Consent of instructor. 3 hours, or 1/2 or 1 unit.
313. **Interpersonal Communication: Discussion and Interview.** Advanced study of theory, research, techniques, and training methods in interviewing and group discussion; emphasis on empirical research findings concerning communication processes in face-to-face groups. Prerequisite: Junior standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
315. **Greek, Roman, and Medieval Rhetorical Theory.** Same as Classical Civilization 315. Examination of the development of rhetorical theory, criticism, and pedagogy in Western thought; analysis of the contributions of major figures and works from Homer to the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or 1/2 or 1 unit.

- 317. Contemporary Rhetorical Theory.** Coverage of the major contributors to rhetorical theory from James and Winans to the present. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 319. Russian and East European Cinema.** Same as Communications and Slavic 319. See Slavic 319.
- 320. Argumentation and Public Decision Making.** Study of the philosophical, logical, and psychological bases of public decision making through discussion and debate. Prerequisite: Speech Communication 223 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 321. Theories of Persuasion.** Survey of theories of persuasion derived from rhetorical, philosophical, and psychological sources and their application to persuasive discourse. Prerequisite: Speech Communication 221 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 322. Renaissance and Modern Rhetorical Theory.** Significant movements in the development of rhetorical theory in England, France, and America from 1500 to the present. Prerequisite: Senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 323. Rhetorical Criticism.** Methods of interpreting and judging persuasive discourse with emphasis on political speaking and writing; lectures and practice in criticism. Prerequisite: Credit or concurrent registration in Speech Communication 322 or 350. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 324. Persuasion in the Campaign and Movement.** Consideration of factors central to the sustained persuasive campaign or movement; special attention to the nature and functions of persuasion in the political campaign. Prerequisite: Speech Communication 221 or 321, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Women and Language.** Same as Linguistics and Women's Studies 332. Study of actual and perceived differences and similarities in the use of language by women and by men; emphasizes the social contexts of speech. Prerequisite: A course in speech communication or linguistics, or equivalent. 3 hours or 1 unit.
- 335. Interpersonal Communication Processes.** Same as Communications 335. Study of the major processes involved in an individual's adjustment to the communication situations of everyday life; emphasis on the development of interpersonal competency and orientations, social perception, interpersonal sentiment and hostility, trust, and the social context as factors influencing the understanding and evaluation of interpersonal messages. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 342. Oral Interpretation of Poetry.** Analysis and oral presentation of literature representative of various poetic forms. Prerequisite: Speech Communication 141. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Criticism of the Oral Interpretation of Literature.** Examination of theories of aesthetics and practical criticism and their application to the criticism of specific examples of the oral performance of literature. Prerequisite: Speech Communication 141 or graduate standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Oral Interpretation of Prose Fiction.** Same as Theatre 376. Modern concepts underlying the relationship of interpretation to the reader's experience of literature; discussions, reports, and oral interpretations of prose forms (including chamber theatre and readers' theatre). Prerequisite: Speech Communication 141 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 350. Selected Topics in the History and Criticism of Public Discourse.** Study of selected periods and genres of public discourse in historical context, including British, American, French, Russian, German, Chinese, and Japanese. Prerequisite: One course in rhetorical criticism or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated with different content to a maximum of 12 hours or 4 units.
- 353. Criticism of Contemporary Public Discourse.** Rhetorical criticism of selected aspects of contemporary public communication. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 374. Introduction to Empirical Research Methods in Speech Communication.** Introduction to descriptive and experimental methods in speech communication; intended to produce understanding and critical evaluation of research designs. 3 hours or $\frac{1}{2}$ unit.

- 375. Speech Science, I.** Same as Linguistics and Speech and Hearing Science 375. See Speech and Hearing Science 375.
- 376. Speech Science, II.** Same as Linguistics and Speech and Hearing Science 376. See Speech and Hearing Science 376.
- 383. Development of Spoken Language.** Same as Speech and Hearing Science 383. See Speech and Hearing Science 383.
- 387. Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Slavic 387. See English 387.
- 396. Combined Undergraduate/Graduate Seminar.** Seminar on advanced topics in speech communication not treated in regularly scheduled courses; see Timetable for current topics. Prerequisite: Junior standing and two courses in speech communication, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 400. Studies in Dramatic Form and Structure.** Same as Theatre 401. See Theatre 401.
- 403. Seminar for Teachers of Speech.** Investigation of current principles, materials, and developments in the field of speech communication and of their relationship to the teacher. 1 unit.
- 417. Contemporary Viewpoints in Speech Communication Theory.** Same as Communications 417. A readings seminar comparing the principal approaches to communication and rhetorical theory in the twentieth century along with a consideration of their philosophical assumptions. 1 unit.
- 429. Seminar in Speech Communication.** Special topics in speech communication. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 430. Contemporary Theories of Oral Communication.** Systematic study of speech making and discussion as related to contemporary views of communication; examination of the theoretical literature and experimental evidence. Prerequisite: Consent of instructor. 1 unit.
- 436. Seminar in Theories and Procedures of Discussion.** Intensive examination of selected problems of communication in small, task-oriented groups: evaluation of special instrumental forms, such as the unstructured group, the work group, the panel, and the lecture-forum; critical analysis of recent research in group communication as a means of making decisions and of changing attitudes and behavior. Prerequisite: Speech Communication 313 or equivalent. 1 unit.
- 437. The Analysis of Interpersonal Interaction.** Same as Communications 437. Exploration of theory, methodology, and empirical findings of descriptive and experimental approaches to the analysis of verbal and nonverbal interaction processes, in both laboratory and naturalistic settings. Prerequisite: Speech Communication 335 or consent of instructor. 1 unit.
- 438. Seminar in Rhetorical Theory.** Study of special topics in the history of rhetorical theory. 1 unit. May be repeated for a maximum of 4 units.
- 465. Seminar in Theatre Art.** Same as Theatre 407. See Theatre 407.
- 468. Seminar in Theatre History.** Same as Theatre 406. See Theatre 406.
- 469. Seminar in the Stage History of Classic English Plays.** Same as English 469 and Theatre 405. See English 469.
- 474. Experimental Design in Speech Communication Research.** Detailed treatment of major issues and options in designs employed in speech communication research. Prerequisite: Speech Communication 374 or equivalent; introductory statistics course. $\frac{1}{2}$ or 1 unit.
- 495. Special Problems.** Individual investigation of special projects not included in theses. Prerequisite: Consent of head of department. $\frac{1}{2}$ to 2 units. Open to master's candidates for a maximum of 1 unit, and to doctoral candidates for 1 or 2 units.
- 499. Thesis Research.** 0 to 4 units.

STATISTICS

Head of Department: J. Sacks

Department Office: 101 Illini Hall, 725 South Wright, Champaign

- 100. Statistics.** Same as Mathematics 161. A first course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models. Prerequisite: Mathematics 112. 3 hours. Credit is not given for both Statistics 100 and Economics 171 or 172 or Psychology 233.
- 210. Statistics for Scientists.** Same as Mathematics 263. A first course in the use of statistical methodology for the interpretation and analysis of data arising from scientific investigations; directed toward a general audience of students in physical, biological, social, or engineering sciences; and prepares the student for the sequel course, Statistics 320. Prerequisite: Mathematics 242, 244, or 245; or equivalent. 3 hours.
- 290. Individual Study.** Prerequisite: Consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Prerequisite: Consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 300. Exploring and Analyzing Data.** Same as Anthropology 338. Exploring the structure of data: numerical summaries, graphical displays, transformations, curve-fitting; random variables: binomial, normal; statistical models: linear regression, analysis of variance, contingency tables and categorical data; statistical inference: estimation, confidence intervals, hypothesis testing. Emphasis on computational aspects and applications to data in various disciplines. Prerequisite: College algebra and consent of instructor. 4 hours or 1 unit. Students with credit in any 300-level Department of Statistics course may not receive credit for Statistics 300.
- 308. Actuarial Statistics, I.** Same as Mathematics 308. See Mathematics 308.
- 309. Actuarial Statistics, II.** Same as Mathematics 309. See Mathematics 309.
- 310. Introduction to Mathematical Statistics and Probability, I.** Same as Mathematics 363. Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Offers a basic one-semester introduction to statistics and also prepares students for Statistics 311. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit.
- 311. Introduction to Mathematical Statistics and Probability, II.** Same as Mathematics 364. Continuation of Statistics 310. Includes moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests. Prerequisite: Either Statistics 310 or both Statistics 100 and Mathematics 361. 3 hours or 1 unit.
- 320. Methods of Applied Statistics.** Same as Mathematics 369. Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests; emphasizes when and why various tests are appropriate and how they are used. Prerequisite: Statistics 210 or an introductory statistics course, Mathematics 132 or 134 or equivalent, and knowledge of basic matrix manipulations; or consent of instructor. 3 hours or 1 unit.
- 324. Analysis of Variance.** Same as Mathematics 365. Estimation and hypotheses testing in linear models; one-, two-, and higher-way layouts; incomplete layouts; analysis of covariance; and random effects models and mixed models. Prerequisite: Credit or concurrent registration in Mathematics 315 and Statistics 311. 3 hours or 1 unit.
- 325. Applied Regression and Design.** Explores linear regression, least squares estimates, F-tests, analysis of residuals, regression diagnostics, transformations, model building, factorial designs, randomized complete block designs, Latin squares, split plot designs.

Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.

- 326. Sampling and Categorical Data.** Sampling: simple random, stratified, systematic, cluster, and multi-stage sampling. Categorical data: multiway contingency tables, maximum likelihood estimation, goodness-of-fit tests, model selection, logistic regression. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 327. Statistical Consulting.** Students, working in groups under the supervision of the instructor, consult with faculty and graduate students through the Statistical Consulting Service; readings from literature on consulting. Prerequisite: Statistics 324 or consent of instructor. 3 hours or 1 unit.
- 328. Statistical Computing.** Same as Mathematics 393. Examines statistical packages, numerical analysis for linear and nonlinear models, graphics, and random number generation and Monte Carlo methods. Prerequisite: Statistics 311 or equivalent; knowledge of FORTRAN. 3 hours or 1 unit.
- 329. Time Series Analysis.** Same as Mathematics 394. Studies theory and data analysis for stationary and pre-stationed time series; examines auto-regressive moving average model building and statistical techniques; and discusses spectral model building and statistical analysis using windowed periodograms and Fast Fourier Transformations. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 330. Topics in Applied Statistics.** Same as Mathematics 368. Formulation and analysis of mathematical models for random phenomena; extensive involvement with the analysis of real data; and instruction in statistical and computing techniques as needed. Prerequisite: Statistics 311 or 320; or consent of instructor. 3 hours or 1 unit. May be taken for credit more than once with consent of instructor.
- 351. Introduction to Probability Theory, I.** Same as Mathematics 361. See Mathematics 361.
- 356. Introduction to Probability Theory, II.** Same as Mathematics 366. See Mathematics 366.
- 410. Mathematical Statistics, I.** Distributions, transformations, order-statistics, exponential families, sufficiency, delta-method, Edgeworth expansions; uniformly minimum variance unbiased estimators, Rao-Blackwell theorem, Cramer-Rao lower bound, information inequality; equivariance. Prerequisite: Statistics 311. 1 unit.
- 411. Mathematical Statistics, II.** Bayes estimates, minimaxity, admissibility; maximum likelihood estimation, consistency, asymptotic efficiency; testing and confidence intervals; Neyman-Pearson lemma, uniformly most powerful tests; likelihood ratio tests and large-sample approximation; nonparametrics. Prerequisite: Statistics 410. 1 unit.
- 425. Current Research in Applied and Computational Statistics.** Various topics, such as ridge regression; robust regression; jackknife, bootstrap, cross-validation and resampling plans; E-M algorithm; projection pursuit; all with a strong computational flavor. Prerequisite: Statistics 325, 326, and 411; or consent of instructor. 3 hours or 1 unit.
- 451. Theory of Probability, I.** Same as Mathematics 451. See Mathematics 451.
- 452. Theory of Probability, II.** Same as Mathematics 452. See Mathematics 452.
- 453. Probability and Measure, I.** Same as Mathematics 481. See Mathematics 481.
- 454. Probability and Measure, II.** Same as Mathematics 482. See Mathematics 482.
- 455. Applied Stochastic Processes.** Same as Mathematics 461. See Mathematics 461.
- 470. Statistical Decision Functions.** Same as Mathematics 470. Statistics from the point of view of decision making; introduction to the theory of games; minimax and other decision functions; techniques for determining optimal decision functions; and applications to nonsequential and sequential decision making in practice. Prerequisite: Consent of instructor. 1 unit.
- 471. Multivariate Analysis.** Same as Mathematics 471. Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: Statistics 311 and Mathematics 315, or consent of instructor. 1 unit.
- 475. Large Sample Theory.** Limiting distribution of maximum likelihood estimators, likelihood ratio test statistics, U-statistics, M-, L-, and R-estimators, nonparametric

statistics, Von Mises differentiable statistical functions; asymptotic relative efficiencies; asymptotic expansions. Prerequisite: Statistics 411 and either Mathematics 451 or 482. 1 unit.

478. Topics in Statistics. Same as Mathematics 478. Prerequisite: Consent of instructor. 1 unit.

490. Reading Course. Directed reading on various topics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated, subject to approval by the student's advisor.

499. Thesis Research. Prerequisite: Consent of instructor. 0 to 4 units.

TEXTILES, APPAREL, AND INTERIOR DESIGN

(Including Interior Design and Textiles and Apparel)

Chair of Division: M. Raheel

Division Office: 237 Bevier Hall, 905 South Goodwin, Urbana

Interior Design

160. Residential Environments. Design fundamentals utilized in the development and selection of housing to meet human needs; aesthetic, social, economic, structural, and functional aspects of residential environments. 3 hours.

161. Interior Design Studio, I. Theory and practice in the elements of interior design: design parameter development, model building; laboratory and discussion. Primarily for students in the interior design curriculum. Prerequisite: Credit or concurrent registration in Interior Design 160. 3 hours.

162. Interior Design Studio, II: Residential Alternatives. Application of basic design theory to a variety of residential environments; open only to students in the Interior Design curriculum. Prerequisite: Interior Design 160 and 161. 3 hours.

163. Codes and Specifications for Interior Design. An overview of building codes and specifications; current issues in the subject area as they relate to the profession of interior design. Prerequisite: Interior Design 160 and 161. 3 hours.

164. Computer Graphics Interior Design Studio. Introduction to the computer with emphasis on computer-aided design as related to interior design. 3 hours.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

250. Interior Design Internship. A supervised, off-campus experience in interior design through a cooperative program with selected employers. Prerequisite: Interior Design 160, 161, 262, and 263. 4 hours.

260. Interiors and Furniture, I. Development of interior environments from prehistoric times to the nineteenth century in Europe with emphasis on the social, economic, political, and cultural aspects which influenced the development of architecture and furniture; consideration of the adaptation and use of period styles in contemporary interiors. Prerequisite: History of Art 112 or consent of instructor. 3 hours.

261. Interiors and Furniture, II. Continuation of Interior Design 260. Development of interior environments through the Federal Period in America and during the nineteenth and twentieth centuries in Europe and the United States; emphasizes the social, economic, political, and cultural influences on the evolution of the styles. Prerequisite: Interior Design 260. 3 hours.

262. Interior Design Studio, III. Designing of interiors and their components; emphasis on design theory, presentation techniques, and evaluation of design concepts. Prerequisite: Interior Design 161; General Professional Courses in Art and Design 118, 120 and 122; Textiles and Apparel 280. 3 hours.

263. Interior Design Studio, IV. Examines characteristics, manufacturing processes, and application of materials as related to interior design, design process, and presentation. Prerequisite: Interior Design 262 or consent of instructor. 3 hours.

- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 360. Interior Design Studio, V.** Development of complete set of working drawings for a moderate size single family house emphasizing floor plans, elevations, sections, details, schedules, electrical and furniture layouts. Prerequisite: Interior Design 263 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 361. Development and Function of Family Housing.** Same as Agricultural Mechanization and Family and Consumer Economics 361. See Agricultural Mechanization 361.
- 378. Problems in Interior Design Studio, VI.** Individual investigations and reports of specific problems in the field of interior design. Prerequisite: Interior Design 360 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 380. Colonial American Interior Design.** An analysis of regional variations of American furnishings, interior finishes, and architecture from colonization to 1783; considers historical, economic, social, political, and religious influences on design. Prerequisite: Interior Design 261. 3 hours or $\frac{3}{4}$ unit.
- 381. Contemporary Interior Design.** Analyzes the contemporary design movement in Europe and America during the late nineteenth and twentieth centuries; considers the influences of technology, materials, economics, and artistic and social movements on the development of the decorative arts and architecture. Prerequisite: Interior Design 261. 3 hours or $\frac{3}{4}$ unit.
- 485. Interior Design Seminar.** An advanced, multidisciplinary approach to current research in interior design. Prerequisite: 6 hours of interior design or a related field at the 300- or 400-level, or equivalent; consent of instructor. 1 unit.
- 493. Advanced Studies in Interior Design.** Advanced research on a specific topic related to interior design; provides experience in one of the following types of research: laboratory, theoretical, historical, or a problem in design. Prerequisite: Interior Design 485. 1 unit.
- 499. Thesis Research.** Interior design thesis research using design, laboratory, or theoretical methodologies to investigate specific topics. Prerequisite: Interior Design 485. 0 to 2 units.

Textiles and Apparel

- 182. Apparel Production Analysis.** Introduces the nature and scope of apparel production methods in the U.S.; investigates new technology and apparel testing methods; includes apparel design analysis, cutting production analysis, principles of apparel construction techniques, production control, quality control and cost control. 3 hours.
- 183. Introduction to Textiles.** Introductory analysis and study of textile fibers, yarns, fabrications, finishes, and regulatory legislation; designed to improve consumer competence in selection, use, and care of textile products. Lecture and laboratory. Prerequisite: Chemistry 100 or exemption. 3 hours.
- 184. Apparel Design and Selection.** A comprehensive overview of apparel design and selection of clothing for individual needs as they relate to the designing and marketing of apparel goods. Prerequisite: Introduction to Art and Design 185 or General Professional Courses in Art and Design 119; or consent of instructor. 3 hours.
- 190. Cross-Cultural Analysis of Dress.** Analyzes cross-cultural variations in form, functions, and meaning of dress in relation to biological, psychological, and social needs of human beings. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Textile and Apparel Business Internship.** A supervised learning experience through a cooperative program with a textile and/or apparel related agency, business, or industry. Prerequisite: Sophomore standing; Textiles and Apparel 182, 183, or 184; consent of supervisor of internships. Not available to students on probation. 4 hours.

- 280. Textiles for Interiors.** Analysis of criteria for selection of textiles, emphasizing aesthetics, comfort, durability, energy conservation, cost and safety considerations for private and public interiors, including transportation interiors; introduction to standards and specifications for textiles used in residential and commercial interiors. Prerequisite: Textiles and Apparel 183. 3 hours.
- 281. Retailing of Home and Apparel Accessories.** Consumer analysis of accessory items of leather, fur, plastic, metal, glass, and china; includes technological, ecological, economic, and legislative aspects of each; develops analytical skills in evaluating quality of these materials. Prerequisite: Textiles and Apparel 183 or consent of instructor. 3 hours.
- 284. Apparel Design for the Market.** Design of apparel for high fashion and mass fashion markets for various price levels and age groups through the development of color sketches; includes a survey of design sources that influence contemporary dress. Prerequisite: General Professional Courses in Art and Design 120 or Introduction to Art and Design 186; Textiles and Apparel 184. 2 hours.
- 285. History of Costume.** Costumes and their settings from the early Egyptian period through the middle of the twentieth century. 3 hours.
- 286. Apparel Design: Flat Pattern.** Use of the flat pattern technique in designing and drafting clothing patterns; construction of two garments from patterns developed. Prerequisite: General Professional Courses in Art and Design 120, or Introduction to Art and Design 186; Textiles and Apparel 182; Textiles and Apparel 183 and 184. 3 hours.
- 287. Dress and Human Behavior.** Applies selected principles from the behavioral and social sciences to the analysis of dress as it relates to human behavior; includes relevant historical and contemporary theory and research. Prerequisite: Textiles and Apparel 190; Sociology 201 or Psychology 201; or consent of instructor. 3 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
- 295. Textile and Apparel Marketing.** History of the development of fiber, fabric, apparel, and related industries; present structure, organization, domestic and international operation, and interrelationships of these industries; trends of the major sectors of the primary and secondary markets; and application of the principles of marketing to textiles and apparel. Prerequisite: Business Administration 202. 3 hours.
- 296. Administrative Retailing.** Analysis of functions in a retail store with emphasis on textiles and apparel; relationship of the retailer to related primary and secondary markets and the consumer; and analysis of current trends and social influences in fashion retailing. Prerequisite: Business Administration 212. 3 hours.
- 350. Textile and Apparel Business Practicum.** A cooperatively supervised field experience in management and administration in a textile or apparel business and/or industry. Only one unit may be applied to the total required for a graduate degree in Human Resources and Family Studies, TAID option. At the undergraduate level, only four hours may be applied to the total TAID courses required. Prerequisite: Major in Textiles, Apparel, and Interior Design; Textiles and Apparel 295 or 296; and consent of instructor. Not available to students on probation. 4 or 6 hours, or 1 or 1/2 units. May be taken during the same semester for up to 12 hours or 3 units.
- 380. Advanced Textiles.** Examines chemical composition, polymer structure, and engineering potential of textile fibers; effect of chemical finishes and recycling procedures on performance characteristics of consumer textile products; and introduces physical and chemical metrology techniques useful for quality control and research purposes. Prerequisite: Textiles and Apparel 280, and Chemistry 102 or 103. 4 hours or 1 unit.
- 385. History of Textiles.** Examines the aesthetic, technological, and cultural aspects of significant textiles produced by selected societies throughout history. 4 hours or 1 unit.
- 386. Apparel Design: Draping.** Designing garments by draping fabric on a dress form; understanding garment fitting principles through fabric manipulation; developing construction techniques for design effects. Prerequisite: Textiles and Apparel 286. 4 hours or 1 unit.

- 388. Problems in Textiles and Clothing.** Individual problems in the fields of textiles, apparel, marketing, or textile design. Prerequisite: Senior standing; 3.5 grade-point average; consent of instructor; credit in one of the following: Textiles and Apparel 285, 286, 287, 294, or 380, or Business Administration 212. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 395. Concepts and Cases in Retailing.** An overview of consumer behavior as related to textiles and apparel; interrelationships of foreign and domestic textile and apparel markets; current research in retailing; and analysis of fashion marketing and retailing issues through the case study method. Prerequisite: Business Administration 212. 3 hours or $\frac{1}{2}$ unit.
- 405. Research Methods in Home Economics.** Same as Family and Consumer Economics 405. Theory and practice of empirical research methods that have application to such areas of home economics as textiles, apparel, interior design, and family and consumer economics. Prerequisite: An introductory course in statistics. 1 unit.
- 480. Seminar in Textiles.** Reviews selected research literature in the field of textiles. Prerequisite: Textiles and Apparel 380 or equivalent; consent of instructor. $\frac{1}{2}$ to 1 unit.
- 481. Principles of Textile Metrology.** Examines textile metrology as a component of the production and use of textiles; includes case studies and investigative metrology. Prerequisite: Textiles and Apparel 380 and Agronomy 340. 1 unit.
- 482. Textile Finishing: Theory and Development.** Examines developments in textile finishing technology to enhance the aesthetic and functional qualities of fibers and fabrics. Prerequisite: Textiles and Apparel 380 and Chemistry 131; graduate standing in textiles and apparel or a related area; consent of instructor. 1 unit.
- 483. Social Psychology of Dress: Research and Theory.** Analyzes and evaluates recent developments in theory and research in the social psychology of dress; emphasizes the interpersonal process and social influences affecting apparel selection; focuses on future research directions and rationale of the directions in light of latest research. Prerequisite: A course in social psychology of dress, and another course in social psychology or a related area; consent of instructor. 1 unit.
- 484. Analysis of Research in Apparel Marketing.** Analysis of apparel marketing emphasizing trends and future research directions. Prerequisite: A course in marketing and consent of instructor. 1 unit.
- 487. Seminar in Apparel.** Reviews and analyzes selected theory and research in the apparel fields. Prerequisite: Graduate standing in textiles and apparel, or consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated as topics vary.
- 488. International Marketing of Textiles and Apparel.** Examines the history, policies, organization, performance, and trends of the international textile and apparel industries. Prerequisite: Textiles and Apparel 295 or equivalent; or consent of instructor. 1 unit.
- 493. Advanced Studies in Textiles and Apparel.** Researches specific problems of limited scope. Students who do not write a thesis may substitute this course for Textiles and Apparel 499 when combined with 8 additional units for a master's degree. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

THEATRE

Head of Department: D. Knight

Department Office: 4-122 Krannert Center for the Performing Arts, 500 South Goodwin, Urbana

- 100. Practicum, I.** Laboratory in acting, directing, playwriting, theatre management, and in the design, construction, and handling of scenery, lighting, sound, properties, costumes, and makeup for public performance. 40 hours of production activity to be arranged for each credit hour. Prerequisite: Consent of instructor for non-theatre majors. 1 to 3 hours. May be repeated to a maximum of 12 hours.

- 106. Basic Theatre Practice, I.** Introduction to the theatre focusing on scenecraft; the fundamentals of acting; and the introduction of specific skills needed for continued study in acting or design areas. Student must enroll for all sections to receive credit. Prerequisite: Concurrent registration in Theatre 108. Limited to Theatre majors. 2 to 6 hours.
- 107. Basic Theatre Practice, II.** Introduction to the theatre focusing on costume, makeup, and acting; introduction to specific skills needed for continued study in acting or design areas. Student must register for all sections to receive credit. Prerequisite: Theatre 106 and concurrent registration in Theatre 108. Limited to Theatre majors. 2 to 6 hours.
- 108. Basic Theatre Practice Laboratory.** Practical experience in two of the following four areas: scenery and props construction and crew, costume construction and crew, lighting crew, and performance workshop. Prerequisite: Concurrent registration in either Theatre 106 or 107. Limited to theatre majors. 2 hours. May be repeated once.
- 109. Dramatic Analysis.** Introduction to the study of plays for theatre practitioners employing analytical methods and plays from modern theatre. Requires paper or project assignments for each play. Prerequisite: Consent of instructor for non-theatre majors. 3 hours.
- 110. Literature of the Theatre.** Introduction to the principal modes of dramatic expression in the plays of three important historical periods employing methods of dramatic analysis considered in Theatre 109. Prerequisite: Theatre 109 or consent of instructor.
- 142. Stage Makeup.** Principles, materials, and application techniques for two- and three-dimensional makeup; lecture, demonstration, and intensive practice. Prerequisite: Theatre 107 or consent of instructor. 2 hours.
- 151. Acting Studio, I.** Orientation to acting vocabulary; improvisation as a tool for communication of experience through speech and action; basic scene study; basic physical training for expressive body dynamics; fundamentals of voice and speech production. A performance is given at the end of the semester. Prerequisite: Theatre 107 and sophomore standing in acting. 1 to 8 hours. Students must register for all sections to receive credit.
- 152. Acting Studio, II.** Special emphasis on analysis of roles, characterization, and application of skills learned through improvisation to scripted plays; continued voice and movement training, and dialects. A performance is given at the end of the semester. Prerequisite: Theatre 151. 1 to 8 hours. Students must register for all sections to receive credit.
- 170. Fundamentals of Acting.** Same as Speech Communication 161. Study of the methods of acting, with emphasis on basic acting techniques; role of character in relation to play as a whole, the internal and emotional values of the play, and their interpretation by means of voice and action. 3 hours.
- 175. Improvisation in Acting.** Exploration and communication of experience through speech and action on the stage. Prerequisite: Theatre 106, 107, or 170. 4 hours.
- 176. Relationships in Acting.** Behavior in stage performance explored on the basis of the actor's relationship with self, with objects, and with other players; emphasizes analysis of playscript to discover action, environment, and relationships. Prerequisite: Theatre 106, 107, or 175; or consent of instructor. 4 hours.
- 180. Oral Interpretation.** Same as Speech Communications 141. See Speech Communications 141.
- 181. Group Oral Interpretation of Literature.** Same as Speech Communications 142. See Speech Communications 142.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. Stage Electronics.** A laboratory course to familiarize the beginning theatre student with current wiring practices and control techniques related to theatrical electronic control systems. 3 hours.
- 223. Stage Mechanics, I.** Studies traditional materials, techniques, and processes used in executing scenery for the theatre. Prerequisite: Theatre 107 or consent of instructor. 4 hours.
- 224. Stage Mechanics, II.** Examines newly accepted and developing techniques, processes,

- and materials used in constructing and rigging stage scenery. Prerequisite: Theatre 223. 4 hours.
- 225. Scene Design, I.** Projects and lectures addressing basic technical and aesthetic skills of scene design. 3 hours.
- 226. Scene Design, II.** Projects and discussions focusing on single setting problems for proscenium stage. Prerequisite: Theatre 225. 3 hours.
- 227. Senior Projects in Design, I.** Professional studio and independent projects for student designers specializing in stage scenery, lighting, or costume design. Prerequisite: Consent of instructor. 6 hours.
- 228. Senior Projects in Design, II.** Continuation of Theatre 227. Prerequisite: Theatre 227. 6 hours.
- 230. Technical Direction.** Studies mechanical drawing for the theatre, production organization, and technical direction. Prerequisite: Theatre 229 or equivalent; or consent of instructor. 2 hours.
- 231. Stage Lighting Practice.** A studio course analyzing current lighting practices and equipment by means of production oriented assignments. 3 hours.
- 232. Lighting Design for the Stage.** Lighting design for the proscenium stage. Prerequisite: Theatre 231, or consent of instructor. 3 hours.
- 233. Stage Drafting, I.** Drafting for scenery construction and rigging. Prerequisite: Theatre 107. 4 hours.
- 242. Introduction to Costume Patterning.** Introduction and practice of basic sewing, craft, and patterning skills required to construct period theatrical costumes. 3 hours.
- 253. Acting Studio, III.** Development of the actors' skills for musical theatre through the study of dance for actors, the Nicklaus Technique, continued vocal training emphasizing singing, and analysis and performance of British and American musical materials. A performance is given at the end of the semester. Prerequisite: Theatre 152. 1 to 8 hours. Students must register for all sections to receive credit.
- 254. Acting Studio, IV.** Acting in twentieth century plays. Concentrated training in American dialects and development of movement skills and mask characterization. A performance is given at the end of the semester. Prerequisite: Theatre 253. 1 to 8 hours. Students must register for all sections to receive credit.
- 255. Acting Studio, V.** Major emphasis on acting in Shakespearean and other Elizabethan drama; training in stage combat, sword and rapier; concentration on speech for Shakespeare and the classical stage. A performance is given at the end of the semester. Prerequisite: Theatre 254. 1 to 8 hours. Students must register for all sections to receive credit.
- 256. Acting Studio, VI.** Study of the techniques of acting for the camera; scenes are recorded on audio-visual tape; special topics include speech for the microphone and unarmed combat for the stage. A performance is given at the end of the semester. Prerequisite: Theatre 255. 1 to 8 hours. Students must register for all sections to receive credit.
- 263. Theatre of the Black Experience.** Surveys the Black Theatre Movement's history and literature, and studies dramatic works focused on the black experience through the rehearsal and performance of representative works of black dramatists. 3 hours. May be repeated to a maximum of 9 hours.
- 281. Directing: Script Preparation.** Same as Speech Communication 255. Methods of script analysis and the development of production concepts; explorative projects culminate in the readying of a script for rehearsal. Prerequisite: Theatre 273 and 274, Theatre 152, or Theatre 170. 3 hours.
- 291. Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
- 292. Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
- 300. Practicum, II.** Advanced laboratory in acting, directing, and theatre management; the design, construction, and handling of scenery, lighting sound, properties, costumes, and makeup for public performance. Prerequisite: For nontheatre majors, consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{1}{2}$ unit. May be repeated to a total of 12 hours or 2 units.

- 310. Theatre Planning and Programming.** Studies recent theatre architecture and theatre renovations, examining the programming process, the stage forms, the merits of various stage technological systems, and the related business, audience and production facilities of a theatre center. 3 hours or 1 unit.
- 320. Modern Japanese Drama.** Same as Asian Studies and Japanese 325. See Japanese 325.
- 321. Design for Directors.** Concepts in production design for the theatre director and exploration of theory through projects. Prerequisite: Theatre 107 or consent of instructor. 3 hours or 1 unit.
- 322. Scene Design for Non-Majors.** Lectures and projects investigating aesthetic and mechanical problems of designing scenery for the stage; no prior design experience required. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 323. Stage Mechanics, III.** Advanced study in the design and construction of large weight-supporting scenery. Prerequisite: Theatre 224 or consent of instructor. 2 hours or 1/2 unit.
- 324. Stage Mechanics, IV.** Advanced study in the design and construction of moving scenic elements. Prerequisite: Theatre 323 or consent of instructor. 2 hours or 1/2 unit.
- 325. Scene Design, III.** Investigates non-proscenium performance spaces and non-traditional design forms, including thrust and arena stage, television scenery, and industrial show design. Prerequisite: Theatre 225 and 226. 4 hours or 1 unit.
- 326. Scene Design, IV.** Design studio investigating important design styles; students develop projects dealing with period design. Prerequisite: Theatre 225, 226, and 325. 4 hours or 1 unit.
- 330. Theatrical Projection.** Integrates photographic and shadow projection with the scenic design, including preliminary research and work-ups, media preparation, projection surfaces, and stage projection equipment. Prerequisite: Theatre 231 and consent of instructor. 4 hours or 1 unit.
- 331. Sound for the Theatre.** An introduction to sound reproduction, recording, and basic systems design as applied to the modern theatre. Prerequisite: Theatre 210. 3 hours or 3/4 unit.
- 332. Stage Management.** Studies the principles and the craft of stage management. Prerequisite: Sophomore standing in a theatre curriculum or consent of instructor. 4 hours or 1 unit.
- 336. History of Scene Design.** Surveys major historic developments in stage design. Prerequisite: Junior standing. 3 hours or 1 unit.
- 337. Scene Painting Techniques.** Techniques and practice of scene painting; lab time required. Prerequisite: Consent of instructor. 2 hours or 1/2 unit.
- 338. Rendering Techniques for the Stage.** Perspective techniques for the stage; model building; developing the perspective sketch. Prerequisite: Consent of instructor. 2 hours or 1/2 unit.
- 339. Property Design.** Principles of stage property design. Prerequisite: Theatre 335 or consent of instructor. 2 hours or 1/2 unit.
- 340. Lighting Design for Dance.** Survey of conceptual technique and practice of dance lighting; also non-traditional lighting problems including disco, rock, cabaret and industrial shows. Prerequisite: Theatre 231 or 232, or equivalent. 4 hours or 1 unit.
- 342. Costume Patterning.** Draping and drafting patterns for period costumes. 3 hours or 1 unit.
- 345. Costume History for the Stage, I.** Surveys theatrical costume and fashion of major periods; emphasizes relationships to styles of art and dramaturgy, social milieu, and production design. Prerequisite: Theatre 223 and 224, or 415, or equivalent. 4 hours or 1 unit.
- 346. Costume History for the Stage, II.** Continuation of Theatre 345. Prerequisite: Theatre 345 or equivalent. 4 hours or 1 unit.
- 347. Costume Rendering.** Studio course in costume rendering techniques: analysis of costume figure, rendering of fabrics, exploration of various rendering media. Prerequisite: Theatre 245. 3 hours or 1 unit.
- 353. Creative Dramatics for Children.** Study of the subject matter and techniques of

- creative dramatics for children with laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Theatre for the Child Audience.** Study of the history, objectives, and techniques of play production for the child audience; laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. The History and Development of the American Musical Theatre.** Surveys the American Musical from early minstrel show and operetta origins to current unique theatrical form. Prerequisite: Junior standing or above. 3 hours or $\frac{3}{4}$ or 1 unit.
- 361. Development of Theatrical Forms, I.** History of the drama and theatre of ancient Greece and Rome, the Middle Ages, and the Italian and English Renaissance. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 4 hours or 1 unit.
- 362. Development of Theatrical Forms, II.** History of the drama and theatre of the Spanish Renaissance, seventeenth-century France, the English Restoration, the eighteenth and nineteenth centuries in Europe and America, and the Orient. Prerequisite: Theatre 361 or equivalent and consent of instructor. 4 hours or 1 unit.
- 371. Contemporary Theatrical Forms.** Study of post-World War I theatre, including the New Stagecraft, expressionism, Brecht and epic theatre, theatre of the absurd, and later developments. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 3 hours or 1 unit.
- 372. Introduction to Theatre Management.** An introduction to the basic practices of theatre management with emphasis on facilities management, arts marketing, and the financial problems in the performing arts. Prerequisite: Junior standing in theatre or consent of instructor. 3 hours or 1 unit.
- 375. Acting: Rehearsal Techniques.** Acting laboratory emphasizing the actor's work with the director. Fall semester deals with contemporary drama; spring semester deals with classical drama. Taught in conjunction with Theatre 381; students may not register concurrently in Theatre 381. Prerequisite: Theatre 176 or consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 2 units.
- 376. Oral Interpretation of Prose Fiction.** Same as Speech Communications 345. See Speech Communications 345.
- 381. Directing: Rehearsal.** Exploration of methods for directing actors and conducting rehearsal. Students may not register concurrently in Theatre 375. Reading and research in current directing principles and practices required of graduate students. Prerequisite: Theatre 281 and consent of instructor. 3 hours or 1 unit.
- 385. Preparation for Auditions.** Each actor, through extensive research, prepares a portfolio of audition pieces for the opportunities imminent before and after graduation for resident companies, commercial productions, and film, or professional graduate schools. Prerequisite: Theatre 151, 152, 253, and 254; or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 390. Professional Internship.** Professional employment with an approved host institution in an area related to the student's academic program; exposure to professional situations in which the commercial theatre operates. Full documentation of internship activities required. Prerequisite: Senior or graduate standing in theatre; consent of Internship Coordinator. 0 to 14 hours, or 0 to 3 units.
- 401. Studies in Dramatic Form and Structure.** Same as Speech Communication 400. Studies in the relationship of dramatic form and structure to the contemporary production of historical and modern plays. Prerequisite: Consent of instructor. 1 unit.
- 403. Studies in Theatre History: Seventeenth Century to 1900.** Examines selected movements and contributors to the theatre from the English Restoration to the nineteenth century. Prerequisite: Theatre 362 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
- 404. Studies in Theatre History: Twentieth Century.** Examines selected movements and contributors to the theatre from the late nineteenth-century to the contemporary period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.

- 405. Seminar in the Stage History of Classic English Plays.** Same as English and Speech Communication 469. See English 469.
- 406. Seminar in Theatre History.** Same as Speech Communication 468. Studies in the history of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 407. Seminar in Theatre Art.** Same as Speech Communication 465. Studies in the aesthetics of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 411. Colloquium in Advanced Design and Theatre Technology.** Projects in design for the theatre or in theatre technology, including stage scenery, costuming, lighting, makeup, projections, and sound and stage systems. Prerequisite: Candidacy for M.F.A. in theatre with design and technology specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
- 415. Proseminar in Theatre Practice.** Review of contemporary theatre practice in the United States and western Europe, survey of methods in production research, and advanced instruction in theatre specialties. A diagnostic procedure is employed which culminates in the presentation of student projects to a faculty jury. Prerequisite: Admission to graduate study in theatre. 1 or 2 units.
- 450. Theatre in Education.** Examines effective teaching practices for students of theatre and the development of theatre and the development of theatre education in America considered in two seminars; topics include: methods of teaching theatre; and the academic theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 471. Colloquium in Acting.** Intensive professional training in acting, dynamics, voice and speech, and theatre movement with a different focus each semester: specifically musical theatre comedy (Moliere Restoration), late 19th, early 20th century Shakespeare, acting for the camera. A performance is given at the end of the semester. Prerequisite: Candidacy for M.F.A. in theatre with acting specialty, or consent of instructor. $\frac{1}{4}$ to 2 units. Students must register for all sections to receive credit. May be repeated to a maximum of 12 units.
- 480. Theory of Staging.** Seminar in theatre interpretation which considers alternative rationales which explicitly or implicitly underlie performance conceptions; performance theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
- 481. Colloquium in Directing.** Individual assignments in directing, stage managing, or coaching of actors carried out in conjunction with the semester's productions; prepared at Krannert Center or in conjunction with the training of actors in the undergraduate curriculum. Prerequisite: Candidacy for M.F.A. in theatre with directing specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
- 491. Special Problems.** Individual research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 2 units.
- 495. Creative Project.** Open to M.F.A. candidates in theatre only. 1 to 2 units.
- 499. Thesis Research.** 0 to 4 units.

THEORETICAL AND APPLIED MECHANICS

Head of Department: F. A. Leckie

Department Office: 212 Talbot Laboratory, 104 South Wright, Urbana

NOTE: Credit is allowed for only one of Theoretical and Applied Mechanics 150, 152, 154, or 156. Credit is not allowed for both Theoretical and Applied Mechanics 212 and either Theoretical and Applied Mechanics 154 or 156.

- 150. Analytical Mechanics (Statics).** Resultants of force systems; conditions of equilibrium of force systems; analysis of forces acting on members of trusses, frames, etc.; forces

due to friction; and centroids. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 2 hours.

- 152. Engineering Mechanics, I (Statics).** Analysis of force systems; equilibrium of two- and three-dimensional systems; trusses, frames, friction; principle of virtual work. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 3 hours.
- 154. Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212 with less emphasis on some topics. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 4 hours.
- 156. Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 5 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 212. Engineering Mechanics, II (Dynamics).** Elements of vector calculus as applied to mechanics; kinematics of three-dimensional motion of a particle and of a rigid body; motion relative to translating and rotating reference frames; and kinetics of particles and rigid bodies using principles involving force, mass and acceleration, work and energy, and impulse and momentum. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.
- 221. Elementary Mechanics of Solids.** Relationship between the internal stresses and deformations produced by external forces acting on deformable bodies, primarily elastic components. Normal and shear stresses and deformations produced by tensile, compressive, torsional and bending loading of members; state of stress and failure; deflection of beams; elastic strain energy and impact loading; stability and buckling of columns. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.
- 224. Behavior of Materials.** Same as Civil Engineering 210. Mechanical behavior of engineering materials, including metals, ceramics, polymers, and materials of construction (concrete, wood, bitumens, and asphaltic concretes); laboratory sessions demonstrating macroscopic behavior and explanations of that behavior in terms of phenomena on the microscopic level. Prerequisite: Theoretical and Applied Mechanics 221. 4 hours.
- 235. Fluid Mechanics.** Lectures and weekly laboratory sessions on fluid properties; fluid statics; continuity, momentum, and energy principles; ideal and real fluid flow; similitude; laminar and turbulent boundary layers; closed conduit flow, open channel flow, and compressible flow; turbomachinery. Prerequisite: Theoretical and Applied Mechanics 212. 4 hours.
- 293. Research and Design Project.** Formulation of an applied mechanics research and design project to be completed in Theoretical and Applied Mechanics 294. Guidance is received from a faculty member; experience in research and development aspects of engineering design is gained by means of mathematical modelling, numerical analysis, and laboratory experimentation. Prerequisite: Senior or second-semester junior standing in engineering mechanics. 2 hours.
- 294. Research and Design Project.** Completion of the project formulated in Theoretical and Applied Mechanics 293. Each student prepares a technical report or paper and presents the results orally; the best papers are presented at a symposium held at the end of the semester, bound together and published as a Theoretical and Applied Mechanics *Report*. Prerequisite: Theoretical and Applied Mechanics 293. 4 hours.
- 299. Thesis.** Thesis investigation of special subjects including theoretical and/or experimental research. Prerequisite: Senior standing; approval of head of department. 3 hours.
- 308. Fluid Mechanics of Convective Heat Transfer.** Same as Mechanical Engineering 308. See Mechanical Engineering 308.
- 311. Vibrations of Mechanical Systems, I.** Theory and application of free and forced vibrations of single and multiple degree of freedom discrete linear systems; matrix methods and the eigenvalue problem; Lagrange's equations; damping; modal analysis; impulse and spectral responses; high-speed PC data acquisition; and experimental vibration analysis. Prerequisite: Theoretical and Applied Mechanics 154, 156, or 212;

and Math 341 or 345. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Theoretical and Applied Mechanics 311 and Civil Engineering 374.

- 314. Advanced Dynamics for Engineers.** Newtonian mechanics of a system of particles; Lagrangian mechanics of a dynamical system; the kinematics and dynamics of a rigid body; and engineering applications. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 345 or equivalent, and credit or concurrent registration in Mathematics 343. 3 hours or $\frac{3}{4}$ unit.
- 321. Advanced Mechanics of Solids.** Review of elementary mechanics of solids; transformations of stress and strain; modes and criteria for failure, including fracture-mechanics concepts; unsymmetrical bending; shear flow and shear center; torsion of noncircular sections; curved beams; Castigliano's theorem; plasticity and limit-load calculations. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
- 324. Flow and Fracture of Structural Metals.** Fundamental concepts of strength of crystalline engineering materials at atomic, single crystal, and polycrystalline levels of association in relation to engineering mechanisms of failure; functional relationship between material variables, state of stress, strain, time, temperature, and failure of engineering components by creep, stress rupture, fatigue, and brittle fracture. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 326. Experimental Stress Analysis.** Measurement of stresses or deformations that are of significance in the engineering design of load-resisting members; use of optical, electrical, and mechanical instrumentation; brittle coatings, electrical resistance gauges, photoelasticity; new methods. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 327. Deformation and Fracture of Polymeric Materials.** Introduction to structure, morphology, and properties of amorphous and semi-crystalline polymers and polymer blends; polymer linear viscoelasticity-continuum mechanics (phenomenological treatment); molecular aspects of polymer linear viscoelasticity; nonlinear viscoelastic behavior; yield phenomena and plastic flow; mechanisms and mechanics of damage and fracture; damping and impact behavior of polymers; adhesion, composites, and surface coating. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 328. Mechanical Behavior of Composite Materials.** Fundamental concepts underlying formation, characteristics, and behavior of such composite materials as fiber-reinforced laminates, honeycomb structural sandwiches, and load-bearing adhesive joints; their use in engineering structures and components under static, dynamic, and cyclic loading. Micromechanics, lamination theory, visco-elasticity, anisotropic elasticity, hygrothermal stress, fracture mechanisms and mechanics, and degradation in different environments; methods of design, analysis, and testing. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 335. Dynamics of Fluids.** An intermediate course in the mechanics of fluids introducing analytical methods of solution for ideal and real fluids; potential flow theory, theoretical approaches to viscous flows, including boundary layer theory; and the analysis of compressible flows. Prerequisite: Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
- 351. Fundamental Concepts of Deformable Body Mechanics.** Introduction to the general theories of kinematics of deformable bodies; general balance laws applicable to continuum mechanics; constitutive relations (stress-strain relations); and introductions to linear elasticity, linear viscoelasticity, and special concepts in other areas of solid mechanics and fluids. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343 and 345. 3 hours or $\frac{3}{4}$ unit.
- 360. Continuum Mechanics, I.** A unified treatment of modern continuum mechanics; linear algebra and analysis, review of kinematics and general balance laws, and general theory of mechanical constitutive equations (simple materials). Prerequisite: Theoretical and Applied Mechanics 351 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 373. Fundamentals of Engineering Acoustics.** Same as Electrical Engineering 373. See Electrical Engineering 373.

- 392. Design and Analysis in Engineering Practice.** Examples of design problems which occur in engineering practice and the procedures which are used to solve them; emphasis on establishing the relationship between the sophistication of analysis and the level and nature of the design process. Considerable use is made of the case study approach and students are expected to execute a number of tasks at different design levels. Prerequisite: Senior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 393. Independent Study.** Individual studies in any area of theoretical and applied mechanics. 1 to 8 hours, or $\frac{1}{4}$ to 2 units.
- 400. Seminar.** Discussion and lectures on current research topics in Engineering Mechanics. Required of all graduate students each semester. $\frac{1}{4}$ unit.
- 412. Vibrations of Mechanical Systems, II.** Examination of problems in the free and forced vibration of continuous linear elastic structures, including strings, rods, beams, membranes, and plates; Hamilton's principle, Sturm-Liouville problems; solution by separation of variables, integral equation and transform methods; variational and other approximate methods of solution including the finite element method; Green's functions; and random vibrations and statistical energy analysis. Prerequisite: Theoretical and Applied Mechanics 311 or Civil Engineering 374; Theoretical and Applied Mechanics 314 or equivalent. 1 unit.
- 416. Energy Principles in Engineering Mechanics.** Introduction to the variational principles of mechanics and their applications to engineering problems; the derivation, interpretation, and applications of the principle of virtual displacements, the principle of minimum potential energy, and the principle of complementary energy; major emphasis on Castigliano's theorem, Hamilton's principle, and Lagrange's equations of motion; brief treatment of variational methods of approximation; and numerous illustrative applications to the stress analysis of statically determinate and statically indeterminate frames, problems of elastic stability, the theories of rings and curved beams, the theory of elastic plates, vibrations of structures, and wave motions. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 417. Stochastic Structural Dynamics.** Same as Aeronautical and Astronautical Engineering 452. See Aeronautical and Astronautical Engineering 452.
- 418. Aerodynamic Noise.** Same as Aeronautical and Astronautical Engineering 453. See Aeronautical and Astronautical Engineering 453.
- 424. Properties of Engineering Materials.** Structure of metals and behavior of materials under various conditions of loading and use, including static loading, creep, fatigue, and impact; effects of high and low temperature, strain rate, state of stress, and internal structure; criteria of failure; relation of mechanical properties to behavior; significance of mechanical properties; tests and interpretation of test data; and material specifications. 1 unit.
- 428. Analysis of Nonlinear Systems.** Same as Electrical Engineering 428. See Electrical Engineering 428.
- 429. Theory of Linear and Nonlinear Viscoelasticity.** Same as Aeronautical and Astronautical Engineering 429. See Aeronautical and Astronautical Engineering 429.
- 431. Theory of Ideal Fluid Flow.** Topics in advanced fluid mechanics, particularly the motion of incompressible fluids of negligible viscosity. Differential equations of motion and several methods of obtaining flow solutions, including velocity potentials and stream functions; superposition of the effects of sources, doublets, and vortices; and methods of conformal mapping. Resultant forces and moments on bodies and lifting surfaces; theory and application of free streamline flows; vortex motions; and surface wave theory. Prerequisite: An elementary course in fluid flow; a course in advanced calculus. 1 unit.
- 432. Theory of Flow of Viscous Fluids.** Theoretical development, analysis, and solution of incompressible viscous fluid flow problems; derivation of the differential equations of motion, starting with the stress relations occurring in viscous fluids; development of direct and approximate solutions for laminar flows; presentation of boundary-layer theory; introduction to the occurrence of turbulence and its characterization; basic equations for analyzing turbulent flows; presentation of approximate solution for flows in boundary layers with and without pressure gradients; pipes and jets; and consid-

- eration of experimental observation and application to technological problems. Prerequisite: An elementary course in fluid flow; a course in differential equations. 1 unit.
- 438. Turbulence.** Statistical models for characterizing turbulence; statistical theory, energy considerations, and nature of turbulence in typical flows; laboratory experiments illustrating hot-wire technique of turbulence measurements and the structure of turbulence. Prerequisite: Theoretical and Applied Mechanics 432 or equivalent. 1 unit.
- 441. Applied Analysis in Engineering.** Training in applications of mathematics to engineering problems, including ordinary differential equations and special functions, boundary-value problems and series solutions, and partial differential equations; illustrations taken from engineering mechanics. Prerequisite: Mathematics 242; Mathematics 343 and 345 recommended. 1 unit.
- 442. Applied Analysis in Engineering.** Continuation of Theoretical and Applied Mechanics 441. Application of complex-variable methods; Laplace transforms; Fourier transforms; and special topics selected by the instructor. Prerequisite: Mathematics 242; Mathematics 343 and 345 recommended. 1 unit.
- 445. Advanced Physical Acoustics.** Same as Electrical Engineering 445. See Electrical Engineering 445.
- 451. Theory of Elasticity with Application to Engineering Problems.** Study of the mechanics of elastic deformable bodies, based on the fundamental concepts of equilibrium, geometry of strain, and properties of materials; detailed study of relations between stresses, strains, and displacements; and special consideration given to their significance in engineering problems. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343; Mathematics 341 or equivalent. 1 unit.
- 452. Theory of Elasticity with Application to Engineering Problems.** Continuation of Theoretical and Applied Mechanics 451. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 454. Theory of Shells.** Stress analysis of shell-type structures, such as ships, submarines, monocoque aircraft structures, concrete roofs and domes, pressure vessels, and containers for liquids; differential geometry of shell theory, equilibrium equations, momentless theory, strains, statically indeterminate problems, energy formulations, and stability of shells. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 457. Classical Elastostatics.** A modern unified treatment of the concepts and techniques developed by investigating the Cauchy-Navier equations; emphasis on the interpretation and motivation of ideas and their interrelation for the solution of three-dimensional problems; and topics including the classical boundary-value problems, existence and uniqueness theorems, stress functions and displacement potentials, singular states of stress, extension of Green's method to the equations of elasticity, method of series, and approximation techniques. Intended for (1) students interested in the current state of knowledge in classical elasticity, and (2) students planning doctoral dissertations in classical elasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent; consent of instructor. 1 unit.
- 458. Elastic Waves.** Simple one-dimensional waves; Fourier and Laplace transforms; review of linear elasticity; waves in an unbounded medium; reflection, refraction, and surface waves; basic singular solutions, integral representation theorems; waves in an elastic half-space; waveguides; waves in anisotropic and heterogeneous media. Prerequisite: Theoretical and Applied Mechanics 311 or Electrical Engineering 373; and Theoretical and Applied Mechanics 431 or 451; and Mathematics 346; or consent of instructor. 1 unit.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Physics 459. See Mathematics 459.
- 462. Theory of Plasticity.** The physical and mathematical formulation of the mechanics of inelastically deformed bodies, plastic stress-strain laws, and their association with yield and loading function; members subjected to biaxial and triaxial stress conditions; applications to flexure and torsion of prismatic members; expansion of thick-walled cylinders and spherical shells; and introduction to problems in plane plastic flow and variational plasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent. 1 unit.

- 392. Design and Analysis in Engineering Practice.** Examples of design problems which occur in engineering practice and the procedures which are used to solve them; emphasis on establishing the relationship between the sophistication of analysis and the level and nature of the design process. Considerable use is made of the case study approach and students are expected to execute a number of tasks at different design levels. Prerequisite: Senior standing or consent of instructor. 3 hours or $3/4$ unit.
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- 424. Properties of Engineering Materials.** Structure of metals and behavior of materials under various conditions of loading and use, including static loading, creep, fatigue, and impact; effects of high and low temperature, strain rate, state of stress, and internal structure; criteria of failure; relation of mechanical properties to behavior; significance of mechanical properties; tests and interpretation of test data; and material specifications. 1 unit.
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- 432. Theory of Flow of Viscous Fluids.** Theoretical development, analysis, and solution of incompressible viscous fluid flow problems; derivation of the differential equations of motion, starting with the stress relations occurring in viscous fluids; development of direct and approximate solutions for laminar flows; presentation of boundary-layer theory; introduction to the occurrence of turbulence and its characterization; basic equations for analyzing turbulent flows; presentation of approximate solution for flows in boundary layers with and without pressure gradients; pipes and jets; and consid-

- eration of experimental observation and application to technological problems. Prerequisite: An elementary course in fluid flow; a course in differential equations. 1 unit.
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- 442. Applied Analysis in Engineering.** Continuation of Theoretical and Applied Mechanics 441. Application of complex-variable methods; Laplace transforms; Fourier transforms; and special topics selected by the instructor. Prerequisite: Mathematics 242; Mathematics 343 and 345 recommended. 1 unit.
- 445. Advanced Physical Acoustics.** Same as Electrical Engineering 445. See Electrical Engineering 445.
- 451. Theory of Elasticity with Application to Engineering Problems.** Study of the mechanics of elastic deformable bodies, based on the fundamental concepts of equilibrium, geometry of strain, and properties of materials; detailed study of relations between stresses, strains, and displacements; and special consideration given to their significance in engineering problems. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 343; Mathematics 341 or equivalent. 1 unit.
- 452. Theory of Elasticity with Application to Engineering Problems.** Continuation of Theoretical and Applied Mechanics 451. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 454. Theory of Shells.** Stress analysis of shell-type structures, such as ships, submarines, monocoque aircraft structures, concrete roofs and domes, pressure vessels, and containers for liquids; differential geometry of shell theory, equilibrium equations, momentless theory, strains, statically indeterminate problems, energy formulations, and stability of shells. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
- 457. Classical Elastostatics.** A modern unified treatment of the concepts and techniques developed by investigating the Cauchy-Navier equations; emphasis on the interpretation and motivation of ideas and their interrelation for the solution of three-dimensional problems; and topics including the classical boundary-value problems, existence and uniqueness theorems, stress functions and displacement potentials, singular states of stress, extension of Green's method to the equations of elasticity, method of series, and approximation techniques. Intended for (1) students interested in the current state of knowledge in classical elasticity, and (2) students planning doctoral dissertations in classical elasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent; consent of instructor. 1 unit.
- 458. Elastic Waves.** Simple one-dimensional waves; Fourier and Laplace transforms; review of linear elasticity; waves in an unbounded medium; reflection, refraction, and surface waves; basic singular solutions, integral representation theorems; waves in an elastic half-space; waveguides; waves in anisotropic and heterogeneous media. Prerequisite: Theoretical and Applied Mechanics 311 or Electrical Engineering 373; and Theoretical and Applied Mechanics 431 or 451; and Mathematics 346; or consent of instructor. 1 unit.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Physics 459. See Mathematics 459.
- 462. Theory of Plasticity.** The physical and mathematical formulation of the mechanics of inelastically deformed bodies, plastic stress-strain laws, and their association with yield and loading function; members subjected to biaxial and triaxial stress conditions; applications to flexure and torsion of prismatic members; expansion of thick-walled cylinders and spherical shells; and introduction to problems in plane plastic flow and variational plasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent. 1 unit.

and emphasis on the needs and activities of metropolitan planning organizations. Prerequisite: Civil Engineering 230, Urban Planning 332, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 331. Regional Transportation Planning.** Same as Civil Engineering 331. See Civil Engineering 331.
- 337. Transportation Planning Workshop.** Analysis, evaluation, and plan preparation for a client of a real-world transportation problem; the planning process including extensive use of Urban Transportation Planning Systems (UTPS) package. Prerequisite: One transportation-related course. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 341. Land Resource Evaluation.** Same as Landscape Architecture 341. See Landscape Architecture 341.
- 342. Seminar on Environmental Policy and Law.** Identification and analysis of environmental issues and legal developments primarily at the state and federal levels. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 343. Environmental Quality Management.** Same as Environmental Studies 393. See Environmental Studies 393.
- 344. New Town Development in Europe and the U. S.** Applies planning and design skills to the development and management of New Towns with case study examples. Prerequisite: Urban Planning 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Urban Economic Development and Fiscal Packaging.** Public-private-partnerships in urban economic development, including study of potentials, problems, and projects; financing urban economic development through federal grant programs, tax increment financing and other means. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 347. Land Use Planning Workshop.** Small group field work applying principles and techniques to specific land use problems in selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 348. Environmental Planning Workshop.** Small group field work applying planning theory, principles, and techniques to specific environmental problems of selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 349. Environmental Management and Planning Simulation.** Management of environmental resources for a large urban area using computer assisted gaming simulation techniques; focuses on the law, technology, administration, and politics associated with environmentally sensitive decisions that require interrelated responses and development of consistent strategies. Prerequisite: Urban Planning 307, 308, 342, 401, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 358. Economic Development Planning Workshop.** Small group field work applying planning and economic principles and techniques to specific economic development problems in selected jurisdictions. Prerequisite: Urban Planning 316 or 407, or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
- 360. Introduction to Social Planning.** Survey of the major social policy issues confronting urban areas in the United States today; examines problems, policies, and programs in several functional areas (education, manpower development, health, welfare, etc.), as well as their interrelationships and their respective contributions to the problems of poverty; and analyzes processes of citizen participation as well as the roles of government in general and the planner in particular. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 365. Social Planning Evaluation.** Evaluates design and research as it applies to social planning; emphasizes the logic and theoretical assumptions underlying the design, development, implementation, and evaluation of social planning programs rather than techniques of data analysis. Prerequisite: Sociology 185 or Urban Planning 316, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 374. Neighborhood Planning.** Examines rationale and techniques for planning at the neighborhood level; the major social, political, and economic issues that confound public and private sector efforts to revitalize distressed neighborhoods. Prerequisite: Urban Planning 260 or 360, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 375. Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Environmental Studies 341, and Geography 341. See Civil Engineering 341.
- 377. Housing Workshop.** Small group field work dealing with real world problems and clients; clients vary each time the course is taught. Local, regional, state, and national governments or nonprofit organizations serve as clients. Prerequisite: Urban Planning 247 or 473; or consent of instructor. 3 to 6 hours, or $\frac{3}{4}$ to $1\frac{1}{2}$ units. May be repeated once for credit.
- 394. Special Topics in Urban and Regional Planning.** Seminar on topics of current interest, as announced in the Timetable. 2 to 6 hours, or $\frac{1}{2}$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 12 hours or 4 units.
- 399. Study Abroad.** Studies comparative urban, regional, national and supranational planning systems, with emphasis on comparing European and Third World with United States planning. Consists of a seminar-discussion section and an application-workshop section. Prerequisite: Urban Planning 247 or equivalent. Urban Planning 301 or 304, or consent of instructor. 0 to 10 hours, or 0 to $2\frac{1}{2}$ unit.
- 401. Land Use Planning and Policy Formulation.** Principles and techniques for the preparation of land use, transportation, and community facilities plans; delineation of the comprehensive plan and the policy report; and social and economic implications of land use planning. Prerequisite: Consent of instructor. 1 unit.
- 406. Urban and Regional Analysis.** Same as Geography 406. Economic and demographic analysis of regional growth and change; emphasizes forecasting and impact studies. Topics include data sources, economic base studies, population estimation and projection, economic impact analysis, and employment projection; practical application of methods to a study area. Prerequisite: Introductory statistics such as Sociology 185 or Geography 185 or consent of instructor. 1 unit.
- 407. Economic Analysis of Public Plans and Policies.** Techniques of policy analysis and evaluation; includes microeconomic concepts, cost-benefit analysis, cost-effectiveness, and planning-programming-budgeting systems; and examines selected public policies in areas such as transportation, environmental control, health, education, housing, and local finance. Prerequisite: Consent of instructor. 1 unit.
- 414. Issues in Local Public Finance.** Recent trends in financing local governments; revenue and expenditure analysis; accounting and budgeting methods for local governments, with particular emphasis on financing capital improvements and the planning process. Prerequisite: Graduate standing in Urban and Regional Planning, or consent of instructor. 1 unit.
- 434. Urban Transportation Policy.** Major policy elements in urban transportation and the relationship of urban transportation to the region, including the decision-making process, configuration and growth of the metropolitan area, and allocation of resources. 1 unit.
- 445. Spatial Design Methods.** Same as Landscape Architecture 442. See Landscape Architecture 442.
- 450. Issues in Regional Development.** Same as Geography 450. See Geography 450.
- 456. Regional Science Methods: Economic and Demographic.** Same as Geography 456. See Geography 456.
- 457. Seminar in Regional Science.** Same as Geography 457. See Geography 457.
- 473. Housing and Urban Policy Planning.** The role of housing in American social policy planning; economic modeling of the housing market, emphasizing supply and demand functions and private market imperfections; and analysis of public policies for housing as they affect special consumer groups, such as the poor, the elderly, and the nonwhite. Prerequisite: Urban Planning 407 or consent of instructor. 1 unit.
- 474. Housing and Community Development Law.** Seminar using expanded case methods to research and analyze housing and community development law emphasizing rights, responsibilities, and procedures. Prerequisite: One law course using the case method, comparable legal experience. 1 unit.
- 475. Housing and Urban Planning Analysis.** Housing location and developmental models; housing need and market analysis techniques; survey and appraisal of housing;

and case studies of current housing problems and current research priorities. Prerequisite: Urban Planning 407 and 473, and a course in urban real estate; or consent of instructor. 1 unit.

- 480. Advanced Planning Theory.** Recent advances in planning, policy-making and decision-making theories as they relate to the efficient use of land and to the complex interrelationships among the major uses of land, i.e., housing, transportation, agriculture; specific applications vary annually, reflecting the students' dissertation research topics. Prerequisite: Urban Planning 301, 303, and 304; or equivalents. 1 unit.
- 483. Geology, Hydrology, and Land Use.** Same as Landscape Architecture 483. Elements of geology and hydrology with emphasis on land-related issues: geologic feasibility of large-scale construction and development, geologic hazards and resources, and water management on the geologic scale from individual wells to watersheds. Prerequisite: Urban Planning 247 or 305; or consent of instructor. 1 unit.
- 490. Professional Internship.** Summer, part-time, or other professional-level employment in the field of planning, usually in an area of concentration; exposure to the social, political, and institutional setting in which planning operates; and full documentation of internship activities required. Prerequisite: Consent of instructor. 0 units.
- 494. Seminar.** Selected topics in urban and regional planning; several sections each semester. Prerequisite: Consent of instructor. 1 unit.
- 497. Urban Planning Research.** Independent study in selected urban and regional planning topics. Prerequisite: Consent of instructor and head of the department. $\frac{1}{4}$ to 1 unit. No more than 4 units may be applied toward the Master of Urban Planning degree.
- 498. Master's Project.** A major independent or small-group project, conducted in lieu of a master's thesis. Prerequisite: Consent of instructor. 1 unit.
- 499. Thesis Research.** Prerequisite: Graduate standing in urban and regional planning; consent of the head of the department. 0 to 4 units.

VETERINARY BIOSCIENCES

Head of Department: W. C. Wagner

Department Office: 3516 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

- 300. Gross Anatomy, I.** The systematic and topographic study of the pure and applied anatomy of the dog and cat by lecture and dissection laboratory. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 301. Histology-Embryology, I.** Lecture-laboratory consideration of basic microscopy, cytology, and both the development and histology of tissues and their organization into the locomotory, integumentary, and digestive systems of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 302. Gross Anatomy, II.** Study of the systematic and topographic anatomy of the large domestic animals, including reference to diagnostic and surgical procedures, by lecture and dissection laboratory. Prerequisite: Veterinary Biosciences 300 and 301, or consent of instructor. 5 hours or $1\frac{1}{4}$ units.
- 305. Histology-Embryology, II.** Lecture-laboratory consideration of the development and histology of the cardiovascular, urinary, reproductive, respiratory, and endocrine systems of domestic and laboratory animals. Prerequisite: Veterinary Biosciences 301. 3 hours or $\frac{3}{4}$ unit.
- 306. Veterinary Orthopedic Biomechanics.** Same as Bioengineering 306. Explores the relationship between the biology and mechanics of the musculoskeletal system and its role in the pathobiology and treatment of orthopedic diseases utilizing the techniques of morphology and mechanical engineering; interdisciplinary course for both life science

- and engineering students. Prerequisite: Biology 111 and Physiology 101, or equivalents; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 307. Comparative Primate Anatomy.** Same as Anthropology 308. Lecture-discussion and dissection laboratory comparing the organ systems of old and new world primates to those of a dog. Prerequisite: Veterinary Biosciences 300 or Physiology 234, or equivalent; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 309. Veterinary Clinical Electrocardiography.** Utilizes basic principles of cardiac electrophysiology in delineating the value and limitations of electrocardiography in veterinary medicine and diagnosing cardiac enlargement and/or arrhythmias. Prerequisite: Veterinary Biosciences 316. 1 hour.
- 310. Neurobiology.** An introduction to the science of neurobiology, both neuroanatomy and neurophysiology and their importance to an understanding of the normal integrative nervous system of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 315. Physiology, I.** Lecture-discussion and laboratories on endocrine and reproductive systems, physiology of vision, ear structure and function. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 316. Physiology, II.** Lecture-discussion of digestive, cardiovascular, and respiratory systems; and acid-base balance. Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 317. Physiology-Pharmacology Laboratory.** Laboratory study of physiological processes and the effects of drugs upon these processes. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
- 318. Pharmacology, I.** Lecture-discussion on the general principles of pharmacology and analysis of the action of chemical agents on physiological processes. Prerequisite: For professional students, second-year standing in the veterinary curriculum; for graduate students, Veterinary Biosciences 315 and 316, or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 319. Pharmacology, II.** Lecture-discussion on the action of chemical agents on physiological processes and disease-producing organisms. Prerequisite: Veterinary Biosciences 318 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 320. Toxicology.** Discusses the mechanisms of action, clinical, diagnostic, and therapeutic aspects of chemical and plant toxicants in domestic animals. Prerequisite: Veterinary Biosciences 319 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 322. Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Clinical Medicine 322. Lectures designed to assist the student in integrating knowledge of the science of pharmacology with an understanding of veterinary internal medicine; emphasizes the establishment of therapeutic objectives as applied to various body systems. Prerequisite: Fourth-year standing in the veterinary curriculum. 2 hours.
- 324. Nutritional Aspects of Large Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in cattle, horses, sheep, and swine; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
- 326. Nutritional Aspects of Small Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in small animals; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 329. Advanced Veterinary Toxicology.** Applies and expands concepts in Veterinary Biosciences 320; emphasizes discussion of clinical and diagnostic aspects of major toxicoses. The optional laboratory is offered only to students enrolled in the discussion section; laboratories and field trips give students additional expertise in proper diagnostic and therapeutic practices. Prerequisite: Veterinary Biosciences 320. 1 or 2 hours.
- 345. Statistical Methods.** Same as Agricultural Engineering, Animal Science, and Forestry 345. See Animal Science 345.

- 349. Basic Toxicology.** Same as Environmental Studies 349. see Environmental Studies 349.
- 367. Radiology and Radiobiology.** Same as Veterinary Clinical Medicine 367. See Veterinary Clinical Medicine 367.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Clinical Medicine and Veterinary Pathobiology 378. See Veterinary Clinical Medicine 378.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.
- 405. Morphology of Reproduction.** Morphology of genital and endocrine organs of reproduction in domestic and laboratory animals, including histochemistry and radioautography; interpretation of illustrations, such as light and electron micrographs, as well as morphometric and stereologic data. Prerequisite: Credit or concurrent registration in Physiology 406. $\frac{1}{2}$ unit.
- 412. Advanced Endocrinology.** Same as Animal Sciences 412 and Physiology 412. See Physiology 412.
- 413. Cardiovascular Physiology.** Same as Physiology 413. Structure and function of myocardial cells, mechanics of contraction, determinants of cardiac performance, methods for assessing cardiac contractility, determinants of myocardial oxygen utilization, coronary circulation and its regulation, neurogenic control of circulation, circulation during exercise, heart failure, myocardial hypoxia and ischemia. Prerequisite: Veterinary Biosciences 316 or Physiology 401; or consent of instructor. $\frac{1}{2}$ unit.
- 414. Neurotoxicology.** Same as Environmental Studies 414 and Psychology 414. Examines mammalian nervous system responses to xenobiotics (chemicals, pharmaceuticals, and toxins). Also studies neurotoxic responses beginning with the molecular and cellular level up to the behavioral level using biochemical, electrophysiological, and behavioral methods. Prerequisite: Credit or concurrent registration in Biochemistry 350 or 352, and Veterinary Biosciences 310 or equivalent. $\frac{3}{4}$ unit.
- 431. Advanced Reproductive Endocrinology.** Same as Animal Science 431 and Physiology 431. See Animal Science 431.
- 432. Advanced Reproductive Physiology.** Same as Animal Science 432. See Animal Science 432.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433 and Physiology 433. See Animal Science 433.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Animal Science 463 and Biophysics 463. Lectures, demonstrations, and laboratory on the fundamentals of radioisotope procedures and applications in biology and medicine. Prerequisite: Quantitative chemistry; one year each of mathematics, physics, and biology, or consent of instructor. 1 unit.
- 465. Comparative Disposition of Xenobiotics.** Lecture-discussion concerning the fate of foreign chemicals in various species of animals; principles of absorption, distribution, biotransformation, and excretion of drugs and toxicants; and pharmacokinetics and factors which modify these processes. Prerequisite: Biochemistry 353 and Veterinary Biosciences 320, or equivalent. 1 unit.
- 466. Comparative Environmental Toxicology and Drug Resistance.** The chemistry, action, and disposition of selected toxic substances at levels associated with environmental contamination; nature and biological consequences of host-toxicant interactions from the perspective of chronic and subclinical effects. Prerequisite: Veterinary Biosciences 465 or Environmental Studies 331; or consent of instructor. $\frac{3}{4}$ unit.
- 467. Principles of Drug and Toxicant Evaluation.** Comprehensive discussion of the design and performance of clinical trials for evaluation of drugs and toxic materials in domesticated animals. Prerequisite: Veterinary Biosciences 318 or equivalent; credit or concurrent registration in Agronomy 340 or Biology 371. $\frac{3}{4}$ unit.
- 490. Seminar.** Required of all graduate students whose major is veterinary biosciences. 0 or $\frac{1}{4}$ unit.

- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 496. Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

VETERINARY CLINICAL MEDICINE

Head of Department: E. Small

Department Office: 244 Small Animal Clinic, 1008 West Hazelwood, Urbana

- 322. Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Biosciences 322. See Veterinary Biosciences 322.
- 327. Practice Management for Veterinarians.** Principles of managing a private veterinary practice including practice evaluation, financing, legal formats for owning and operating a practice, economics, personnel management, accounting and record keeping, and marketing. Prerequisite: Third or fourth year standing in veterinary curriculum. 1 hour.
- 342. Interpretive Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 342. See Veterinary Pathobiology 342.
- 347. Veterinary Clinical Oncology.** Advanced clinical techniques used in the diagnosis and treatment of neoplastic diseases of domestic animals. Prerequisite: Fourth year standing in the veterinary curriculum. 1 hour.
- 348. Advanced Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 348. See Veterinary Pathobiology 348.
- 351. Introduction to Surgery.** Surgical principles including sterile technique, hemostasis, tissue handling, and wound healing with emphasis on clinical application in domestic animals; laboratory covers demonstrations and practice of surgical principles. Prerequisite: Third year standing in veterinary curriculum. 1 hour.
- 352. General Small Animal Surgery.** Surgical procedures of major body systems, emphasizing preoperative, operative, and postoperative patient care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 351. 1 $\frac{1}{2}$ hours.
- 353. General Large Animal Surgery.** Surgical procedures of major body systems, emphasizing preoperative, operative, and postoperative patient care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 351. 1 $\frac{1}{2}$ hours.
- 354. Special Small Animal Surgery.** Lecture and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and after care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 352. 2 $\frac{1}{2}$ hours.
- 355. Special Large Animal Surgery.** Lecture and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and after care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 353. 2 $\frac{1}{2}$ hours.
- 360. Medicine, I: General Medicine.** Diagnosis, treatment, and prophylaxis of infectious, noninfectious, and surgical diseases of the small domestic animals; lectures, quizzes, and demonstrations. Required in the veterinary curriculum. Prerequisite: Second-year standing in veterinary curriculum. 5 hours.
- 362. Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases; lectures, quizzes, and demonstrations. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
- 363. Small Animal Dermatology.** The first half of the course presents a systematic ap-

proach to small animal dermatologic diagnoses and therapeutics; the second half deals with immunological disorders, seborrheic syndromes, hereditary disorders, cutaneous neoplasms, and feline dermatology. Prerequisite: Veterinary Clinical Medicine 364 or equivalent, or consent of instructor. 1 hour.

- 364. Medicine, II: General Medicine.** Diagnosis, treatment, and prophylaxis of infectious and non-infectious, metabolic, and toxic diseases of domestic and exotic animals. Prerequisite: Third year standing in veterinary curriculum. 4 hours.
- 366. Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
- 367. Radiology and Radiobiology.** Same as Veterinary Biosciences 367. General principles of radiology and radiobiology techniques and application to the diagnosis and therapy of animal diseases; lectures and discussions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 3 hours.
- 368. Infectious Diseases.** Diagnosis, treatment, and prophylaxis of infectious diseases of domestic animals. Prerequisite: Third year standing in Veterinary Medicine. 5 hours.
- 369. Clinical and Laboratory Practice.** Clerkship in veterinary clinical medicine and surgery for VM-4 professional students. Prerequisite: Fourth-year standing in veterinary medicine professional curriculum, or equivalent. 2 to 5 hours.
- 371. The Evolution and Principles of Surgery.** Studies the evolution of surgery from an empiric craft to a scientific discipline. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
- 372. Veterinary Jurisprudence.** Principles of law of importance to members of the veterinary profession; animal disease and related regulatory laws and their administration; and federal procedure under animal disease, food, and meat inspection laws. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
- 373. Small Animal Urology.** The anatomic and physiologic basis for urologic examination of the dog and cat; discussions integrate lesions, pathogenesis, and signs of disease and stress the pathophysiologic basis of diagnosis and therapy in small animal urology. Prerequisite: Veterinary Clinical Medicine 360 or consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 375. Theriogenology.** Examines principles of animal reproduction, fertility, and obstetrics of all species of domestic animals, emphasizing farm animals; lectures, discussion, and laboratory practice in obstetrics, pregnancy diagnosis, and male and female in fertility. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
- 376. Veterinary Anesthesiology and Fluid Therapy.** Principles of veterinary anesthesiology emphasizing clinical application of anesthetic techniques and procedures in domestic animals; clinical pharmacology of preanesthetic, anesthetic and related drugs, anesthetic and physiologic monitoring equipment, and shock; teaches fluid and electrolyte therapy with overall emphasis on maintenance of homeostasis in anesthetized animals. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
- 377. Disease Prevention and Therapy in Swine Production.** Practical diagnostic, preventive, and treatment procedures in modern veterinary swine practice; relationships between swine production methods and disease conditions; and herd health programs. Lectures, laboratories, and field trips. Prerequisite: Fourth-year standing in veterinary curriculum. 2 hours.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Pathobiology 378. Lectures and demonstrations illustrating the interrelationships between the basic sciences and their applications in medicine and surgery; includes methods of restraint and handling of several animal species. Prerequisite: First-year standing in the veterinary curriculum. 1 hour.
- 379. Advanced Veterinary Ophthalmology.** Anatomic, physiologic, pathologic, and pharmacologic considerations in eye diseases and their treatments; instrumentation and methods of study of ocular structure, physiology, and diseases; and laboratories devoted to techniques of examination of the eye and surgical procedures used in treatment of eye diseases. Prerequisite: Fourth-year standing in veterinary curriculum. 1 or 2 hours (1 hour if taking lecture only; 2 hours if taking lecture and lab), or $\frac{3}{4}$ unit.

- 380. Dairy Herd Health Management.** A study of dairy cattle practice, including economics, enterprise, management, herd and individual cow health, reproduction, and disease control. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 382. Exotic Pets.** Principles of restraint, diagnosis, and medical and surgical treatment of diseases of small exotic mammals, birds, reptiles, and fish kept as pets. Prerequisite: Third-year standing in veterinary curriculum. 1 hour.
- 384. Client Relations.** Introduction to client relations, including techniques of effective verbal and nonverbal communication and applications of these techniques for veterinary students. 1 hour.
- 385. Advanced Radiographic Interpretation: Large Animal.** In-depth study of radiographic diagnosis applied to large animals, primarily equine; lecture, case study, and discussion centering on anatomic areas, e.g., foot, fetlock, metacarpus/metatarsus, carpus, tarsus, upper limb joints, and head and neck. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
- 386. Advanced Radiographic Interpretation—Small Animal.** An exercise in systematic interpretation of small animal radiographs. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
- 387. Advanced Veterinary Anesthesiology.** Lectures cover mechanical ventilators and the physiologic effects of mechanical ventilation on acid-base status, cardiopulmonary function and other homeostatic mechanisms in anesthetized animals; high frequency ventilation in relation to other forms of mechanical respiratory support; recently developed anesthetic agents, techniques, and their clinical applications; interactions between non-anesthetic drugs and their effects on surgical patient response to anesthetic and anesthetic-related agents. Prerequisite: Fourth year standing in veterinary curriculum or consent of instructor. 1 hour or $1\frac{1}{4}$ unit.
- 389. Small Animal Diagnostic Instrumentation.** Training in the use of special medical and surgical diagnostic techniques, including endoscopy, ultrasound, and an introduction to electrodiagnostics. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 390. Equine Reproduction.** Instruction in equine reproductive physiology, infectious and noninfectious infertility problems, obstetrical procedures, and preventive medicine practices. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 391. Advanced Orthopedics: Fracture Fixation.** Advanced instruction in the pathophysiology of bone fracture and healing, techniques of fracture fixation and complications of fracture repair. Prerequisite: Veterinary Clinical Medicine 361 and 365; fourth year standing in the veterinary curriculum. 1 hour.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $1\frac{1}{4}$ to $3\frac{1}{4}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 393. Advanced Neurology.** An advanced course which expands the participants' knowledge of clinical neurology and introduces participants to research techniques used in the elucidation of neurologic disease processes. Prerequisite: Senior or graduate standing in the College of Veterinary Medicine; or consent of instructor. 1 hour or $1\frac{1}{2}$ unit.
- 395. Beef Cattle Economics, Management, and Herd Health.** A study of management systems and the economic factors that influence the cattle industry; health programs for beef cattle emphasizing the herd approach and the veterinarian's role in the beef cattle industry. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 396. Advanced Small Animal Surgery.** Lecture and laboratories in advanced small animal surgery. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 397. Advanced Equine Lameness.** An elective in the diagnosis and treatment of equine lameness. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
- 399. Special Senses.** Studies the structure, development, and function of the eye and ear; discusses specific pharmacologic agents and selected anatomical abnormalities which alter normal physiologic processes. Prerequisite: Registration in the veterinary curriculum. 1 hour.

- 484. Current Concepts in Comparative Surgery.** Advanced study of topics concerning the pathophysiology, diagnosis, and current therapy of diseases which are treated with surgical procedures. Prerequisite: DVM or equivalent or consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 490. Seminar.** Required of all graduate students whose major is veterinary clinical medicine. 0 or $\frac{1}{4}$ unit.
- 491. Recent Advances in Veterinary Internal Medicine.** A series of lectures, seminars, and discussions devoted to intense study of new pathophysiologic aspects of selected topics in veterinary internal medicine. Each semester is devoted to three topics. Prerequisite: The D.V.M. degree or equivalent, and consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated. No more than $\frac{1}{4}$ unit may be given toward a Master's degree or a total of $\frac{1}{2}$ unit toward a Ph.D. degree.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 493. Advanced Topics in Veterinary Clinical Medicine.** Instruction in advanced diagnosis, therapeutic modalities, and research methodologies in the areas of small animal internal medicine, small animal surgery, equine and food animal medicine and surgery, ophthalmology, theriogenology, radiology, and clinical pharmacology. Prerequisite: D.V.M. degree or equivalent; consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

VETERINARY MEDICAL SCIENCE

Dean of College: R. E. Dierks

Department Office: 3229 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

Effective January 1, 1980, the graduate courses in veterinary medical science have been realigned with one of the three departments in the College of Veterinary Medicine. The following courses have been retained to allow existing VMS students to complete their degree requirements in veterinary medical science.

- 490. Seminar.** Required of all graduate students whose major is veterinary medical science. $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

VETERINARY PATHOBIOLOGY

Head of Department: J. A. Shadduck

Department Office: 2522 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

- 326. Parasitologic Techniques and Systematics.** Survey of taxonomy of animal parasites; structures used for taxonomy are studied after collection, preservation, and preparation of parasite specimens. Prerequisite: Veterinary Pathobiology 333 and 336, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 330. Veterinary Medical History, Ethics, and Orientation.** Introduction to the history, recent developments, scope, and trends of veterinary medical education, practice, research, public health, and other areas; functions, obligations, and organization of the profession. Prerequisite: First-year standing in veterinary curriculum. 1 hour.

- 331. Veterinary Bacteriology and Mycology.** Studies the properties of bacteria and fungi responsible for diseases of domestic and wild animals; emphasizes epidemiology, pathogenesis, and morphological and cultural characteristics of bacteria and fungi, and diagnosis. Prerequisite: First-year standing in veterinary curriculum or consent of instructor. 4 hours.
- 332. Veterinary Immunology.** Fundamental principles of immunology; mechanisms and functions of the humoral and cell-mediated immune responses; role of the immune system in protection against infectious diseases and tumors; immune dysfunctions and diseases of immunologic origins. Lectures and laboratory. Prerequisite: Veterinary Pathobiology 331 or consent of instructor. 2 hours or $1/2$ unit.
- 333. Protozoan, Arthropod and Helminth Parasites.** Protozoan, arthropod, helminth parasites affecting domestic animals and humans; lectures, discussions, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 20 hours in chemistry or animal biology, or both; consent of instructor. 5 hours or 1 unit.
- 334. General Pathology.** Cellular, organic, and systematic reactions to acute and chronic injury related to infections, circulatory disturbances, intoxications, parasitism, immunologic disorders, metabolic disturbances, and disturbances of growth, including neoplasms; lectures, quizzes, demonstrations, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 25 hours in histology, parasitology, physiology, and microbiology; consent of instructor. 4 hours or 1 unit.
- 335. Special Pathology.** Disease processes including specific diseases, affecting organs and anatomic systems. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 337. Veterinary Virology.** Fundamental principles of animal virology; mechanisms of virus-cell and virus-host interactions; explores properties of the major groups of animal virus in relation to replication and pathogenesis of viral disease. Lecture and laboratory. Prerequisite: Veterinary Pathobiology 331 or consent of instructor. 2 hours or $1/2$ unit.
- 338. Veterinary Clinical Pathology.** Discusses the function and interpretation of hematological, chemical, and certain other procedures, including exfoliative cytology, as aids in the diagnosis of animal diseases; emphasizes the correlation of laboratory findings with fundamental changes and clinical manifestations of disease. Prerequisite: Second-year standing in veterinary curriculum. 4 hours.
- 339. Basic Biomedical Photography.** Uses photography as a tool for scientific communication emphasizing production and design for research and instructional purposes; encourages students to explore in depth those areas that are of specific interest (e.g., clinical photography, photomicrography, special techniques in lighting, or areas such as multimedia productions or self-instructional techniques). Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 1 or 2 hours.
- 341. Food Hygiene and Public Health.** Introduction to public health; diseases of animals transmissible to man; and procedures and techniques used in inspection of food of animal origin. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 2 hours or $1/2$ unit.
- 342. Interpretive Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 342. Discusses clinical pathologic findings used in the diagnosis of disease affecting domestic animals including dog, cat, horse, and cow with emphasis on hematology, urinalysis, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338 or equivalent. 2 hours.
- 343. Diseases of Poultry.** The causes, symptoms, lesions, prevention, and treatment of noninfectious and infectious diseases of domestic birds; lectures, quizzes, and PLATO demonstrations. Prerequisite: Third or fourth year standing in veterinary curriculum or consent of instructor. 2 hours.
- 344. Clinical Immunology.** The impact of immunologic mechanisms in clinical medicine; autoimmunity, tolerance, immune complex disease, and immunoprophylaxis; lectures and demonstrations. Prerequisite: Veterinary Pathobiology 332 or equivalent. 2 hours or $1/2$ unit.
- 346. Management and Diseases of Laboratory Animals.** Principles of colony manage-

- ment and disease control of common laboratory animals; emphasizes the production and maintenance of quality animals for research; and includes a field trip to AAALAC-accredited facilities. Prerequisite: Two courses in biology and consent of instructor. 2 hours or $1/2$ unit.
- 348. Advanced Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 348. Advanced lectures, discussions, and laboratory work in hematology, exfoliative cytology, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338. 2 hours.
- 350. Epidemiology.** Principles and uses of epidemiology and biostatistics in the practice of veterinary medicine. Prerequisite: Second-year standing in veterinary curriculum. 2 hours or $1/2$ unit.
- 355. Animal Necropsy Procedures.** Instruction and practice in the performance of post-mortem dissections; emphasizes the recognition of macroscopic pathologic changes on the assessment of their effects and on their diagnostic significance. For nonpathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; and consent of instructor. 1 or 2 hours, or $1/4$ or $1/2$ unit. May be repeated to a maximum of 6 hours or 1 $1/2$ units.
- 356. Diseases of Laboratory Animals.** Survey of diseases of major importance in laboratory animal medicine. The etiology, pathogenesis, clinical signs, treatment, and control of the diseases; emphasis on diagnostic principles and methods. 1 hour.
- 374. General Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Medical Sciences 374. See Health and Safety Studies 374.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Clinical Medicine 378. See Veterinary Clinical Medicine 378.
- 379. The Etiology, Pathology, and Differential Diagnosis of Diseases of Animals: A Review and Update.** An integrated discussion and presentation of the etiology, pathology, and differential diagnoses of the more common diseases or groups of diseases encountered in veterinary medicine. Prerequisite: Fourth-year standing in professional curriculum in veterinary medicine. 2 hours.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $1/4$ to $3/4$ unit. May be repeated to a maximum of 6 hours or 1 unit.
- 415. Mechanisms of Microbial Infections.** Newer concepts of host-microorganism relations; emphasis on the dynamics and pathogenic mechanisms of microorganisms, immune responses and defense factors of the host, and pathogenesis of specific infections. Lectures, discussions, laboratory, and special problems. Prerequisite: Microbiology 326 or Veterinary Pathobiology 332, or equivalent; consent of instructor. $3/4$ or 1 unit.
- 416. Epizootiology.** Principles and problems of epizootiology; special consideration of the zoonoses; ecology of the host and parasite as related to resistance, adaptation, perpetuation, and distribution; the principles and factors in interference, carrier and latent states, and reservoirs and control. Prerequisite: Veterinary Pathobiology 331 or 332, or equivalent, or consent of instructor. 1 unit.
- 418. Concepts and Topics in Immunology.** Same as Biology 418. Newer concepts and theories in the field of immunology, including theories of antibody formation and immunological tolerance, regulation of the immune response, biosynthesis and structure of antibodies, and evolutionary aspects of the immune response. Lectures and discussion. Prerequisite: Consent of instructor; Microbiology 327 and Biology 307 recommended. $1/2$ unit.
- 419. Animal Virology.** Same as Microbiology 419. A discussion-laboratory with major emphasis on host-parasite relationships, natural history, and epidemiology, supplemented with appropriate laboratory techniques as they pertain to the major groups of animal viruses. Prerequisite: Microbiology 327 and 328, or Veterinary Pathobiology 331 and 332; Biochemistry 350 or 354; consent of instructor. $3/4$ unit.
- 425. Experimental Parasitology.** Same as Biology 425. A broadly based consideration of the relationship of parasites to their hosts and to their environments, and of the factors which influence these relationships. Prerequisite: A laboratory course in parasitology

- or protozoology; organic chemistry; Biochemistry 350 and statistics recommended. 1 unit.
- 427. Parasitology Seminar.** Discussion of selected historic and current literature related to parasitology. Prerequisite: Veterinary Pathobiology 333 and 336; or Genetics and Development 321 or equivalent; or concurrent registration in any one of these courses. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 437. Immunoparasitology.** Discusses the immune response to protozoan, helminth, and arthropod parasites of veterinary and zoonotic importance and its relationship to parasite survival, protective immunity and diagnosis. Prerequisite: Veterinary Pathobiology 332 or Genetics and Development 307, or equivalent; and Veterinary Pathobiology 333. 1 unit.
- 444. Immunobiological Methods.** Same as Animal Science 444. Laboratory exercises, demonstrations, and discussions of methods and techniques in cellular immunology and immunobiology. Prerequisite: Genetics and Development 307 or Microbiology 327; or equivalent survey course in immunology or immunochemistry. $\frac{1}{2}$ unit.
- 445. Veterinary Diagnostic Pathology, I.** Instruction in the performance of necropsy examinations; emphasizes recognition, interpretation, oral presentations, and written descriptions of gross and histologic lesions; emphasizes histologic features of lesions. For pathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 446. Veterinary Diagnostic Pathology, II.** Instruction in the use of supplemental diagnostic data in the areas of bacteriology, clinical pathology, immunology, parasitology, toxicology, and virology in arriving at differential and definitive diagnoses; emphasizes pathogenesis of gross and histologic lesions and mechanisms of lesion development. Prerequisite: Veterinary Pathobiology 445 or equivalent, or consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 447. Pathology Seminar.** Discusses selected pathologic and clinico-pathologic material; requires presentation of a formal seminar. Prerequisite: Credit or concurrent registration in Veterinary Pathobiology 445, and consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
- 448. Toxicologic Pathology.** Examines the morphological and biochemical aspects of cellular reactions to injury in acute and chronic toxicities; effect of selected toxic agents on target organs in relation to induced functional and structural changes. Prerequisite: Veterinary Pathobiology 334; and Veterinary Biosciences 320 or Animal Science 360; or equivalent. $\frac{3}{4}$ or 1 unit.
- 449. Pathology of Selected Systems.** Pathogenesis and pathology of disease processes in selected tissue and organ systems; emphasizes the mechanisms of cellular and tissue responses to injury. Topics differ each term. Prerequisite: Veterinary Pathobiology 335 or equivalent; consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 450. Concepts in Pathology.** Discusses experimental and theoretical aspects of general pathology; emphasizes an interdisciplinary approach to mechanisms of disease processes. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. 1 unit.
- 453. Tumor Biology.** Examines concepts and principles of the neoplastic process and its morphologic correlates; topics include events mediated by chemical and viral causes of neoplastic transformation, behavioral alterations that mark commitment to neoplastic growth, biology of metastases, and clonal selection as a property of successful tumors. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. $\frac{3}{4}$ unit.
- 455. Comparative Oncology.** Comparative study of the nature of mammalian and avian neoplasms based on general and special methods of tumor identification and classification; lectures, demonstrations, and laboratory. Prerequisite: Veterinary Pathobiology 334 and 335, or equivalent. 1 unit.
- 459. Surgical Pathology.** Discusses and interprets disease processes of domestic animals;

- emphasizes interpretation of pathologic changes in tissue specimens obtained during surgical procedures; correlates structure, function, and prognosis. Prerequisite: Veterinary Pathobiology 445 and 455, or equivalent; consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
- 490. Seminar.** Required of all graduate students whose major is veterinary pathobiology. 0 or $\frac{1}{4}$ unit.
- 491. The Experimental Method in Veterinary Research.** Planning of experiments, use of controls, interpretation of results, sources of error, and writing the research report. $\frac{1}{2}$ unit.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 496. Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Biosciences 496. Interdisciplinary seminar on topics within the area of toxicology; topics vary each semester. Seminars are presented by faculty, visiting lecturers, and students based upon their study, research, and/or professional activities in the selected topic area. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

VOCATIONAL AND TECHNICAL EDUCATION

Department Head: L. A. Phelps

Department Office: 347 Education Building, 1310 South Sixth, Champaign

- 101. Nature of the Teaching Profession.** Introduction to educational problems; a general study of the nature of teaching; its opportunities and responsibilities. Through individual work, students are helped to evaluate their potentialities for teaching. 2 hours.
- 152. Pre-educational Internship.** Early field experiences in an educational setting, including observation and laboratory experiences in community colleges, adult vocational programs, business and industry, health service settings, or governmental agencies; provides opportunities for career exploration, professional orientation, interrelating theory and practice, and understanding the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 3 hours.
- 181. Introductory Woodwork.** Beginning course in hand woodwork, with emphasis on both manipulative skills and related technical material. This course is offered for majors in industrial education and students in the occupational therapy curriculum. May be taken by others as an elective on a space available basis. 4 hours.
- 182. Advanced Course in Woodwork.** Advanced course in design and construction of woodwork projects with related technical information. Prerequisite: Vocational and Technical Education 181. 4 hours.
- 189. Supervised Occupational Experience.** Provides students preparing to teach in the vocational and technical fields the occupational experience necessary or appropriate to complete the requirements in these curricula. Students who are employed and concurrently enrolled in this course complete assignments covering the related technical information of their chosen fields and undergo regularly scheduled written, oral, and performance examinations. Application for a job assignment must be made three months prior to the semester in which placement is desired. Prerequisite: Sophomore standing. 2 or 3 hours. May be repeated to a maximum of 17 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 240. Principles of Vocational and Technical Education.** Provides each specialized educational worker with a common orientation as to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Prerequisite: Vocational and Technical Education 101; Psychology 100. 2 to 4 hours.

- 249. Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper five percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
- 252. Educational Internship.** A practicum in a postsecondary educational setting to prepare students for educational roles where public school certification is not necessary or appropriate. Prerequisite: Vocational and Technical Education 152 and satisfactory progress in the technical education specialties curriculum. 5 to 8 hours.
- 271. Technique and Curriculum Development for Teaching Data Processing and Office Machines.** Introduces curriculum and techniques for teaching the operation of a variety of office machines and computers for processing data; introduces current methods of teaching the use of computer processing equipment and requirements for employment. 3 hours.
- 275. Pre-Student Teaching in Agricultural Education.** Supervised experience in the work of a teacher of vocational agriculture during a two- or three-week period in the summer; planning summer work, teaching adult classes, supervising occupational practice or on-the-job training of students, advising school-sponsored youth organizations, counseling students, studying a community, becoming acquainted with facilities and equipment used in a vocational agriculture program, and becoming familiar with the situations in which the student will later do student teaching during a school year. Course work is started during the summer with official registration and course completion in the fall semester. Prerequisite: Educational Policy Studies 201. 2 or 3 hours.
- 276. Student Teaching in Agricultural Education.** Supervised experience in the work of a teacher of vocational agriculture during an eight-week period; planning programs, teaching high school and adult students, managing facilities and equipment, supervising students on the job, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 277. 8 hours.
- 277. Programs and Procedures in Agricultural Education.** Preparation for a successful experience in student teaching and for beginning work as a teacher of vocational agriculture; teaching high school and adult classes, maintaining and using facilities and equipment, supervising occupational experience programs, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 276. 5 hours.
- 278. Vocational Home Economics Education for Youth and Adults.** Preparation for work as a teacher in vocational home economics programs for youth and adults; study of procedures for planning, organizing, executing, and evaluating home economics occupational programs. Prerequisite: Senior standing and consent of instructor. 3 hours.
- 280. General Drafting for Teachers.** An integrating course to prepare industrial education students to teach drafting; deals primarily with the problems of organizing and teaching drafting courses. 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 309. Vocational Education for Special Needs Learners.** Same as Special Education 309. Examines contemporary legislation, program models, assessment, and instructional practices pertaining to special needs learners in vocational, technical and practical arts education programs at the secondary and post-secondary levels. Prerequisite: Student teaching or consent of instructor. 2 to 4 hours, or 1/2 to 1 unit.
- 345. Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Special Education 345. See Special Education 345.
- 349. Special Study and Investigation in Vocational and Technical Education.** Offers opportunity for an individual to study, on or off campus, selected problems, trends, and new developments or to conduct specialized technological investigations for the

- improvement of instructional programs in areas related to vocational and technical education. Prerequisite: Consent of instructor; demonstrated ability to pursue special study or investigation proposed. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 350. Education for Rural Development in Low Income Countries.** Same as Agriculture 350. Study of educational institutions needed to further rural development in developing nations; emphasizes educational programs that enable rural families to improve their quality of life. Prerequisite: Senior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 353. Curriculum Development in Nutrition Education.** Same as Health and Safety Studies 313. Applies principles of teaching and learning to nutrition education for children and adults emphasizing choice of content, teaching techniques, and resources to promote interest and enhance achievement. Prerequisite: Foods and Nutrition 220 and Educational Psychology 311, or consent of instructor. 3 hours or 1 unit.
- 354. Program Development in Family Life Education.** Studies current issues impacting on families, family organization and family functioning and interaction; reviews theories of human development as they relate to curriculum development in family life education; emphasizes selecting and organizing content, and specific approaches to teaching family relationships in school and non-school settings. Prerequisite: Psychology 100; Human Development and Family Ecology 105; Human Development and Family Ecology 215 or consent of instructor. 3 hours or 1 unit.
- 359. Professional Skill Development Workshop in Vocational and Technical Education.** Designed to teach practitioner-oriented skills in specialized areas of vocational and technical education; students or faculty members may make requests for initiation of sections of this course. Topics vary; consult Timetable for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 370. Agricultural Education for Inexperienced Teachers.** Specific help with the problems of beginning teachers; campus meeting in early fall; other meetings in centers in the state convenient to beginning teachers; and visits by instructors to schools in which enrolled teachers are employed. Prerequisite: Vocational and Technical Education 276 and 277 or equivalent. 3 to 4 hours, or $\frac{3}{4}$ to 1 unit.
- 381. Foundations of Career, Occupational, and Practical Arts Education.** A study of basic concepts and practices of career, occupational, and practical arts education; explores the development of the curricular areas concerned, including types of programs, their place and role in various types of educational settings, students served, and issues and trends in program change. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 382. Cooperative Vocational and Technical Education Programs.** Provides the specific professional background required of teachers, coordinators, and administrators who organize and conduct public school programs utilizing community resources and experiences; includes the background, philosophy, organization, and administration of cooperative education. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 383. Planning and Organizing Content for Career, Occupational, and Practical Arts Education.** Emphasizes selection, organization, and preparation of content for instructional programs in career, occupational, and practical arts education; students perform task analyses, prepare instructional objectives, arrange content in appropriate sequence, and determine allocation of resources. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 384. The General Shop Program.** A laboratory and theory course in the organization and administration of the industrial arts general shop program. Prerequisite: Sixteen hours of undergraduate credit in appropriate vocational and technical education courses. 4 hours or 1 unit.
- 385. Problems in Concurrent Work-Education.** While employed in approved cooperating business firms, students observe the relationships between their activities and the specialized educational programs in the high school and community college; in class sessions, emphasis on job analysis, current trends, wage and benefit structure, personnel practices, labor relations, and their implications for teaching. Prerequisite: Completion of prescribed courses in vocational and technical education for teaching in their area of specialization; consent of instructor. 4 hours or 1 unit.
- 387. Training Programs in Industry.** Study of the organization, instruction, supervision,

and evaluation of training programs conducted within industry and their relationships to other educational agencies. 4 hours or 1 unit.

- 388. Special Techniques of Teaching Career, Occupational, and Practical Arts Education.** A study of teaching techniques appropriate to career, occupational, and practical arts education; focuses on communication methods and instructional strategies; students conduct investigations, develop materials, and make applications to their areas of concern. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 392. Curriculum Modification and Individualized Instruction.** Gives students a working knowledge of, and skills in, the principles and application of individualized instruction theory and methods with competency-based vocational education as its prime focus; includes theory and practices in modifying existing curricula and developing new programs and curricula. Prerequisite: Vocational and Technical Education 383, or course work in curriculum development. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 399. Issues and Developments in Vocational and Technical Education.** A special course for experimentation or for seminar on topics not treated by regularly scheduled courses; requests for initiation of this course may be made by students or faculty members. Topics vary; consult Timetable for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 442. The Community College.** Same as Administration, Higher, and Continuing Education 442. See Administration, Higher and Continuing Education 442.
- 445. Investment in Human Resources.** Same as Labor and Industrial Relations 445. See Labor and Industrial Relations 445.
- 448. Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Secondary Education 448. See Administration, Higher, and Continuing Education 448.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
- 450. Evaluation in Vocational, Technical, and Practical Arts Education.** Theory and techniques of vocational education evaluation in cognitive, affective, and psychomotor domains at different educational levels; development and analysis of activities and instruments for student and program evaluation, follow-up studies, and interpretation of results for self-evaluation and for administrative decision making. Prerequisite: Educational Psychology 392 and Vocational and Technical Education 471, or consent of instructor. 1 unit.
- 451. Directing Personnel Development in Vocational, Technical, and Practical Arts Education.** Principles and techniques for development of personnel in programs of vocational, technical, and practical arts education; emphasis on personnel development and instructional supervision of paraprofessionals, employers, and foremen of vocational and technical education students. Prerequisite: One unit in vocational and technical education or consent of instructor. 1 unit.
- 453. Disciplined Inquiry in Vocational Education.** Provides an analysis and synthesis of disciplined inquiry in vocational education including an historical perspective, formulation of the research process, and the utilization and communication of research. Prerequisite: Vocational and Technical Education 381 and Educational Psychology 390; or equivalent. 1 unit.
- 454. Problems of Home Economics Teachers in the School and Community Setting.** Advanced study of principles of teaching and learning in the school and community setting; includes group meetings on campus and in centers convenient to students, and visits by the instructor to settings in which enrollees work. Instruction utilizes the experience and resources of teachers enrolled. Prerequisite: BS in Home Economics Education; currently teaching home economics. 1 unit.
- 455. Principles of Supervision of Home Economics Interns in School and Non-School**

Settings. Studies principles and techniques for the development of supervisors of student interns; develops the educational capabilities of supervisors for their role as educators through knowledge of supervisory processes and practices and awareness of the scope of the supervisor's responsibilities. Prerequisite: Educational Psychology 311 and 312; or equivalent. 1 unit.

456. Problems and Trends in Specialized Fields of Vocational and Technical Education. Introduction to significant problems, points of view, and trends in the field concerned; explores significant research relating to organization, content, and techniques in the field in question. Topics vary; consult Timetable for specific section offerings. Students are encouraged to make special studies in approved areas. 1 unit.

471. Policy and Program Development in Vocational, Technical, and Practical Arts Education. Local, state, and national policies for vocational and technical education; organizing for policy making and program development; and developing desirable policies and programs. 1 unit.

472. Course Planning and Teaching Procedures in Agricultural Education Programs. Gathering data essential in course planning, constructing course plans, and developing resource units, teaching procedures, and instructional aids. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.

473. Adult Education in Agriculture. The case for adult education, needs of young and older adults for agricultural education, development and present status of adult education in agriculture, objectives, evaluation, using advisory committees, organizing adult classes, enrolling students, course planning, teaching procedures and aids, supervised practice, group activities, and facilities. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.

474. Supervised Experience in Agricultural Education Programs. Supervised agricultural experience programs as an educational strategy; importance and meaning of supervised agricultural experiences; planning, conducting, supervising, and evaluating agricultural experience programs; relation of supervised agricultural experience programs to establishment and advancement in an occupation; keeping and using records; and relating class instruction to supervised agricultural experience programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.

475. Organizing and Teaching Agricultural Mechanics. Agricultural mechanics as a phase of vocational education in agriculture: purposes, course planning for high school students, young and older adults; methods of teaching and evaluating on-job instruction; planning agricultural-mechanics laboratories and facilities; and providing and teaching safety in agricultural mechanics. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.

476. Guidance in Vocational, Technical, and Practical Arts Education. The guidance function of a vocational or technical teacher; developing guidance related instructional programs; identifying and selecting students for vocational and technical programs; determining labor market needs and projections and job requirements; providing occupational information; placing graduates; counseling parents, students, supervisors, advisory committee members, union members, and employers; and conducting follow-up studies. 1 unit.

481. History and Basic Concepts of Vocational and Technical Education. The historical development of modern vocational education; the educational theories underlying its development; and the educational concepts upon which present programs and procedures are based. 1 unit.

482. Research Studies in Vocational and Technical Education. Study and evaluation of examples of research in this field; consideration of the research needed to solve present problems. Each student proposes and completes a brief research project, or plans in detail a major research project to be completed later. 1 unit.

488. Foundations of Curriculum Development for Occupational and Practical Arts Education. Synthesizes selected sociological, psychological, and epistemological foundations for curriculum development in occupational and practical arts education; ap-

plication of theories from fundamental disciplines to practice in existing and emerging curricula involving perceptual and psychomotor learning. $\frac{1}{2}$ or 1 unit.

- 489. Administration of Vocational and Technical Education.** Problems and approved practices in the administration and supervision of programs of vocational, technical, and practical arts education in secondary schools, junior colleges, and technical institutes. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar for Advanced Students of Education.** Seminar in vocational and technical education open only to persons who have been admitted for doctoral study in vocational and technical education; sections are usually offered in the following areas: (a) industrial education, (b) agricultural education, (c) home economics education, (d) business education, and (e) general vocational and technical education. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

WOMEN'S STUDIES

Director of Office: J. T. Peterson

Office address: 304 Stiven House, 708 South Mathews, Urbana

- 111. American Women in Change: An Introduction.** Interdisciplinary introduction to women's studies in literature, history, and speech communication; includes women's actual roles in American history (seventeenth to early twentieth centuries) and literature and sex-related issues in language; and emphasizes interconnections among the three fields. 3 hours.
- 112. Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Ecology 145 and Sociology 145. The impact of culture and society on gender roles, including socialization and identity formation, as expressed in lifestyles, marriage and family alternatives, and patterns of education and employment. 3 hours.
- 199. Undergraduate Open Seminar. 1 to 5 hours.**
- 219. Women in Japanese Literature.** Same as Asian Studies, Comparative Literature, and Japanese 219. See Japanese 219.
- 224. Women in Society.** Same as Sociology 224. See Sociology 224.
- 235. Women in Politics.** Same as Political Science 235. See Political Science 235.
- 245. Women in the Labor Market.** Same as Economics 245. See Economics 245.
- 262. Cultural Images of Women.** Same as Anthropology 262. See Anthropology 262.
- 272. History of Women in Europe, 1700 to the Present.** Same as History 272. See History 272.
- 273. The History of American Women: Colonial Period to the Present.** Same as History 273. See History 273.
- 280. Women Writers.** Same as English 280. See English 280.
- 302. Sex Roles.** Same as Human Development and Family Ecology 302 and Sociology 302. See Sociology 302.
- 332. Women and Language.** Same as Linguistics and Speech Communication 332. See Speech Communication 332.
- 341. Applications of Sex Role Theory to Counseling.** Same as Educational Psychology 341. See Educational Psychology 341.
- 346. Sexism: Social Service and Social Welfare.** Same as Social Work 346. See Social Work 346.

- 370. Selected Topics on Women and Politics.** Same as Political Science 370. See Political Science 370.
- 396. Seminar in Women's Studies.** Interdisciplinary seminar on special topics in women's studies. Prerequisite: Women's Studies 111 or 112, and two courses in women's studies at the 200-300 levels; junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated once as content varies.

Appendix A

LANGUAGE OFFERINGS

The following is a complete list of the languages regularly offered, together with the unit responsible for offering the course. The reader should consult the listing for the unit for the specific courses offered in the language.

<i>Language</i>	<i>Unit responsible for the language</i>
African Languages	Linguistics
Arabic	Linguistics
Bulgarian	Slavic Languages and Literatures
Catalan	Spanish, Italian, and Portuguese
Chinese	Asian Studies
Coptic	Classics
Czech	Slavic Languages and Literatures
Danish. <i>See</i> Scandinavian	Germanic Languages and Literatures
French	French
German	Germanic Languages and Literatures
Greek (Ancient)	Classics
Hausa. <i>See</i> African Languages	Linguistics
Hebrew	Linguistics
Hindi	Linguistics
Italian	Spanish, Italian, and Portuguese
Japanese	Asian Studies
Korean	Asian Studies
Latin	Classics
Lingala. <i>See</i> African Languages	Linguistics
Norwegian. <i>See</i> Scandinavian	Germanic Languages and Literatures
Persian	Linguistics
Polish	Slavic Languages and Literatures
Portuguese	Spanish, Italian, and Portuguese
Russian	Slavic Languages and Literatures
Sanskrit	Linguistics
Scandinavian	Germanic Languages and Literatures
Serbo-Croatian	Slavic Languages and Literatures
Spanish	Spanish, Italian, and Portuguese
Swahili. <i>See</i> African Languages	Linguistics
Swedish. <i>See</i> Scandinavian	Germanic Languages and Literatures
Ukrainian	Slavic Languages and Literatures
Urdu. <i>See</i> Hindi	Linguistics
Wolof. <i>See</i> African Languages	Linguistics

Other languages may be offered by tutorial in the following units:

Asian Studies
 Latin American and Caribbean Studies
 Linguistics

Appendix B

RUBRIC ABBREVIATIONS

Following is a list of official rubric abbreviations for courses currently approved for offering on the Urbana-Champaign campus of the University of Illinois.

A A E	Aeronautical and Astronautical Engineering
ACCY	Accountancy
ADV	Advertising
AFAS	Air Force Aerospace Studies
AFLNG	African Languages
AFRO	Afro-American Studies
AFRST	African Studies
AGCOM	Agricultural Communications
AG E	Agricultural Engineering
AG EC	Agricultural Economics
AG M	Agricultural Mechanization
AGR	Agriculture
AGRON	Agronomy
AHCE	Administration, Higher and Continuing Education
ANAT	Anatomical Sciences
AN S	Animal Science
ANTH	Anthropology
ARAB	Arabic
ARCH	Architecture
ART&D	Introduction to Art and Design
ARTCI	Cinematography
ARTCR	Crafts
ARTED	Art Education
ARTGD	Graphic Design
ARTGP	General Professional Courses in Art and Design
ARTHI	History of Art
ARTID	Industrial Design
ARTPA	Painting
ARTPH	Photography
ARTPR	Printing
ARTSC	Sculpture
AS ST	Asian Studies
ASTR	Astronomy
ATMOS	Atmospheric Sciences
AVI	Aviation
B ADM	Business Administration
B&T W	Business and Technical Writing
BIOCH	Biochemistry
BIOEN	Bioengineering
BIOL	Biology
BIOPH	Biophysics
BULG	Bulgarian
BUS	Business
CATAL	Catalan
C E	Civil Engineering
CER E	Ceramic Engineering
CH E	Chemical Engineering
CHEM	Chemistry
CHIN	Chinese
CLCIV	Classical Civilization
C LIT	Comparative Literature

COMM	Communications
COP	Coptic
C S	Computer Science
CZECH	Czech
DANCE	Dance
ECON	Economics
ED PR	Educational Practice
EDPSY	Educational Psychology
EDUC	Education
E E	Electrical Engineering
EEE	Ecology, Ethology, and Evolution
EL ED	Elementary and Early Childhood Education
ENG	Engineering
ENG H	Engineering Honors
ENGL	English
ENTOM	Entomology
ENVST	Environmental Studies
E P S	Educational Policy Studies
E S L	English as a Second Language
F A A	Fine and Applied Arts
FACE	Family and Consumer Economics
FIN	Finance
F N	Foods and Nutrition
FOR	Forestry
FR	French
F S	Food Science
G & D	Genetics and Development
G E	General Engineering
GEOG	Geography
GEOL	Geology
GER	German
GMC	Germanic
GRK	Greek
HDPE	Human Development and Family Ecology
HSS	Health and Safety Studies
HEBR	Hebrew
HINDI	Hindi
HIST	History
HORT	Horticulture
HRFS	Human Resources and Family Studies
HUMAN	Humanities
I D	Interior Design
I E	Industrial Engineering
ITAL	Italian
JAPAN	Japanese
JOURN	Journalism
KINES	Kinesiology
KOREA	Korean
L A	Landscape Architecture
L A S	Liberal Arts and Sciences
LA ST	Latin American and Caribbean Studies
LAT	Latin
LAW	Law
LEIST	Leisure Studies
LING	Linguistics
L I R	Labor and Industrial Relations
LIS	Library and Information Science

MATH	Mathematics
MCBIO	Microbiology
M E	Mechanical Engineering
MED S	Medical Sciences
MET E	Metallurgical Engineering
MIL S	Military Science
MIN E	Mining Engineering
MUSIC	Music
NA	Medical-Surgical Nursing
NE	Public Health Nursing
NS	General Nursing
N S	Naval Science
NUC E	Nuclear Engineering
NUTRS	Nutritional Sciences
PERS	Persian
PHIL	Philosophy
PHYCS	Physics
PHYSL	Physiology
PLBIO	Plant Biology
PL PA	Plant Pathology
POL	Polish
POL S	Political Science
PORT	Portuguese
PSYCH	Psychology
REHAB	Rehabilitation Education
RELST	Religious Studies
RHET	Rhetoric and Composition
RMLNG	Romance Linguistics
R SOC	Rural Sociology
RUSS	Russian
R TV	Radio and Television
SANSK	Sanskrit
SCAN	Scandinavian
S CR	Serbo-Croatian
SE ED	Secondary Education
SLAV	Slavic
SOC	Sociology
SOC S	Social Science
SOC W	Social Work
SOILS	Soils
SP ED	Special Education
SPAN	Spanish
SPCOM	Speech Communication
SPSHS	Speech and Hearing Science
STAT	Statistics
STS	Science, Technology, and Society
T A	Textiles and Apparel
T A M	Theoretical and Applied Mechanics
THEAT	Theatre
UKR	Ukrainian
U P	Urban and Regional Planning
V B	Veterinary Biosciences
V C M	Veterinary Clinical Medicine
V M S	Veterinary Medical Science
VP	Veterinary Pathobiology
VOTEC	Vocational and Technical Education
W S	Women's Studies

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Where to Write or Telephone for Information about:

ADMISSIONS FOR UNDERGRADUATE, GRADUATE, AND VETERINARY MEDICINE STUDENTS; APPLICATION FORMS; TIMETABLES: Admissions and Records, University of Illinois at Urbana-Champaign, 10 Henry Administration Building, 506 South Wright Street, Urbana, Illinois 61801, (217) 333-0302.

EMPLOYMENT ASSISTANCE: Student Financial Aid, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, Illinois 61820, (217) 333-0600.

FINANCIAL ASSISTANCE: Student Financial Aid, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, Illinois 61820, (217) 333-0100.

SCHOLARSHIP, AWARD, AND FELLOWSHIP INFORMATION; HONORS PROGRAMS; PUBLICATIONS OF COLLEGES, SCHOOLS, AND OTHER URBANA-CHAMPAIGN CAMPUS UNITS:

College of Agriculture
College of Applied Life Studies
Institute of Aviation
College of Commerce
and Business Administration
College of Communications
College of Education
College of Engineering
Institute for Environmental Studies
College of Fine and Applied Arts

Graduate College
Institute of Labor
and Industrial Relations
College of Law
College of Liberal Arts and Sciences
Graduate School of Library and
Information Science
School of Social Work
College of Veterinary Medicine

HOUSING: Housing Information, University of Illinois at Urbana-Champaign, 110 Turner Student Services Building, 610 East John Street, Champaign, Illinois 61820, (217) 333-0050.

MOTOR VEHICLE AND BICYCLE REGISTRATION: Campus Parking, University of Illinois at Urbana-Champaign, 505 East Green Street, Champaign, Illinois 61820, (217) 333-3530.

PERMANENTLY PHYSICALLY HANDICAPPED STUDENTS: Rehabilitation-Education Services, University of Illinois at Urbana-Champaign, 1207 South Oak Street, Champaign, Illinois 61820, (217) 333-4602.

STUDENT ASSISTANCE: Student Assistance Center, University of Illinois at Urbana-Champaign, 107 Turner Student Services Building, 610 East John Street, Champaign, Illinois 61820, (217) 333-4636.

CAMPUS LIFE AND STUDENT WELFARE: Dean of Students, University of Illinois at Urbana-Champaign, 130 Turner Student Services Building, 610 East John Street, Champaign, Illinois 61820, (217) 333-0050.

VETERANS' EDUCATIONAL BENEFITS: Veterans Educational Benefits, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, Illinois 61820, (217) 333-0100.

OTHER INFORMATION: Public Affairs, Swanlund Administration Building, 601 East John Street, Champaign, Illinois 61820, (217) 333-5010.

CHICAGO CAMPUS: Admissions and Records, University of Illinois at Chicago, P.O. Box 4348, Chicago, Illinois 60680, (312) 996-4377. Admissions, Health Sciences, P.O. Box 6998, Chicago, Illinois 60680, (312) 996-7755.

Reference copies of this publication are available at Illinois public libraries, high schools, and community colleges. Copies of the *Undergraduate Programs*, *Graduate Programs*, and *Courses* catalogs may be purchased at or ordered by mail from the Illini Union Bookstore, 715 South Wright Street, Champaign, Illinois 61820.

**COURSES
CATALOG**

1990-92

University of Illinois
at Urbana-Champaign

University of Illinois administrative offices at Urbana-Champaign are open Monday through Friday from 8:00 a.m. to 12:00 noon and 1:00 to 5:00 p.m., except on all campus holidays which are indicated in the University Calendar.

An information center, available to visitors to the campus, is located in the north entrance lobby of the Old Union. The center is open from 8:00 a.m. to 5:00 p.m. daily, including Saturdays and Sundays, when classes are in session.

Direct printer information resources about the campus are available at the Campus Visitor's Center in Levi Family Center, 918 West Illinois Street. Visitors are welcome between 9:00 a.m. and 4:00 p.m., Monday through Friday, excluding campus holidays.

The commitment of the University of Illinois to the most fundamental purposes of academic freedom, equity, of opportunity, and human dignity requires that persons seeking admission and employment be treated as individuals and be free from invidious discrimination in all its forms, whether or not specifically prohibited by law.

The policy of the University of Illinois is to comply with all federal and state nondiscrimination, equal opportunity, and affirmative action laws, orders, and regulations. The University of Illinois will not discriminate against any person because of race, color, religion, sex, national origin, ancestry, age, marital status, handicap, or favorable discharge from the military or status as a disabled veteran or a veteran of the Vietnam era. This nondiscrimination policy applies to admissions, employment, access to and treatment in the University programs and activities.

Among the forms of invidious discrimination prohibited by University policy but not law is sexual orientation. Complaints of invidious discrimination based upon sexual policy are to be handled within existing University procedures.

For inquiries concerning the equal opportunity and affirmative action policies of the University, please contact the Office of Diversity Programs, William A. Siegel, Assistant Chancellor and Director of Affirmative Action Unit, Old Union and Old Administration Building, 918 West Illinois Street, Champaign, Illinois 61820, (312) 333-0574.

Information contained herein is for informational purposes only and is subject to change without notice. Individual questions and needs should be contacted for further information. Courses, faculty assignments, prerequisites, publication of computer requirements, standards, tuition and fees, and programs may be changed from time to time. Classes are not necessarily offered each semester or each year. The University retains the exclusive right of judge, award, delivery, and may decline to award any degree, certificate, or other evidence of successful completion of a program, regardless of course of instruction based thereon. While some external programs bear credit hours and designed for the purposes of qualifying students for registration, certification, or licensure in a profession, successful completion of any such program in no way guarantees registration, certification, or licensure by an agency not the University of Illinois.

**COURSES
CATALOG**

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University of Illinois
at Urbana-Champaign

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COURSES CATALOG

About the University of Illinois at Urbana-Champaign

Since its founding in 1867, the University of Illinois at Urbana-Champaign has earned a reputation as an institution of international stature. It is recognized for the high quality of its academic programs and the outstanding facilities and resources it makes available to students and faculty, including a library with the third largest academic collection in the country.

The University of Illinois at Urbana-Champaign is a comprehensive institution offering undergraduate, graduate, and professional degrees in more than 100 fields of study. There are approximately 35,000 students (26,000 undergraduate; 9,000 graduate) and 12,600 faculty and staff members in the University community.

About This Catalog

This is one of three catalogs describing study at the University of Illinois at Urbana-Champaign. The *Undergraduate Programs* and the *Graduate Programs* catalogs give detailed information relating to admission, costs, programs, and requirements for undergraduate students and graduate students respectively. This catalog gives information about all courses — both undergraduate and graduate — that are currently available at the University as possible offerings. Course descriptions are arranged in alphabetical order by department and in numerical order within the department listing.

Courses numbered:

100-199 are intended primarily for freshmen and sophomores, although they may also be taken by juniors and seniors. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

200-299 are intended for undergraduate students who satisfy the published prerequisite(s), if any. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

300-399 are intended primarily for juniors, seniors, and professional and graduate students who satisfy published prerequisite(s), if any. These courses are offered for either undergraduate credit (expressed in hours) or graduate credit (expressed in units). Only graduate students and certain seniors with Graduate College approval may receive graduate credit.

400-499 are available for professional and graduate students, and for certain seniors with Graduate College approval to register for graduate credit (expressed in units).

An undergraduate must have 30 hours of credit to be classified as a sophomore, a minimum of 60 hours to be classified as a junior, and a minimum of 90 hours to be classified as a senior. A graduate student is a person who has been admitted to the Graduate College.

Following the title of each course is a brief description of the content, the credit given, and the requirements for admission to the course, if any. Additional information relating to the course content is available from the department offering the course. Special requirements for admission to certain courses are introduced by the word *prerequisite*. Courses listed in this catalog are subject to revision without advance notice and are not necessarily offered each semester or each year. Individual departments or units should be contacted for information regarding regularity of course offerings.

Each department has available the undergraduate course number 199. Undergraduate Open Seminar. This is a special course for independent study, for experimentation, or for seminars on topics not treated by regularly scheduled courses. Requests for initiation of the course and suggestions for areas of study may be made by students or faculty. The seminar may be offered only with the approval of the faculty member involved and the department head. A student may accumulate an unlimited number of credit hours in 199 courses, but no more than 12 such hours listed on the student's transcript may be counted toward fulfilling graduation requirements. Exceptions to this rule are made in cases where a larger number of credit hours in 199 courses is an integral part of a formal college-approved program of study (such as Individual Plans of Study or Unit One). Credit toward satisfying particular college or departmental requirements is contingent upon approval of the appropriate college or departmental committee.

Credit for undergraduate students is counted in semester hours. A semester hour represents the work of one classroom period for fifty minutes each week through one semester (two periods per week in an eight-week summer session), or the equivalent in laboratory or field work, or approved independent study. In descriptions of courses, "3 hours" means 3 hours of credit each semester or summer session.

Credit for graduate students taking courses numbered 300 and above typically is counted in units. One unit is usually considered the equivalent of 4 semester hours of credit.

Undergraduate students wishing to enroll in courses numbered 300 and above for graduate credit or in 400-level courses for undergraduate credit must obtain the advance approval of the Graduate College.

Each undergraduate student is expected to pursue a normal program of studies; the number of hours required varies with the college and the curriculum. More or less than a normal program may be permitted only by the dean of the student's college or the dean's representative. To be eligible for participation in specified undergraduate student activities, the student must carry 12 hours in a semester. Twelve credit hours and above (3 units and above) in a semester comprise a full program of study for tuition and fees assessment; in an eight-week summer session the number of hours is 6 semester hours and above (1 1/2 units and above). For information about criteria determining eligibility for Dean's List recognition, interested students should contact their college offices.

The minimum program required for receipt of maximum educational benefit payments under the Veterans Readjustment Benefits Act of 1966 and for receipt of social security benefits as a dependent is 12 hours (or 3 units) in a semester and 6 hours (or 1 1/2 units) in an eight-week summer session.

ACCOUNTANCY

Head of Department: L. A. Tomassini

Department Office: 360 Commerce Building (West), 1206 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Fundamentals of Accounting.** A survey course in the principles of accounting for students registered in schools and colleges other than Commerce and Business Administration. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 200 and either 201 or 202.
201. **Principles of Accounting, I.** Introduction to financial accounting; the communication of relevant information to external parties; includes development of accounting model, internal control, measurement processes, data classification and terminology as well as interpretation and use of the resultant financial statements. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 201 and 200.
202. **Principles of Accounting, II.** Introduction to managerial accounting; fundamentals of cost-volume analysis and product costing, management reporting and information for decision-making; introduction to budgets and standards for planning, control, and performance measurement. Prerequisite: Accountancy 201. 3 hours. Credit is not given for both Accountancy 202 and 200.
211. **Intermediate Accounting, I.** Accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts for external reporting purposes; emphasizes the use of accounting information as a basis for decisions by management, stockholders, creditors, and other users of financial statements and accounting reports. Prerequisite: Accountancy 202. 3 hours.
221. **Cost Accounting.** Use of costs for control and decision making, with emphasis on standard costs, relevant costs, direct costing, nonmanufacturing costs, and responsibility accounting; for students who have already studied the basic elements of job order, process costs, and budgeting. Prerequisite: Accountancy 202. 3 hours.
251. **Basic Federal Income Tax Accounting.** Basic discussion of history, theory, and broad outlines of federal income taxation for individuals, partnerships, and corporations, including the more important basic concepts involved in federal income taxation. Prerequisite: Accountancy 200 or 202. 3 hours.
290. **Cooperative Accounting Education Practice.** Off-campus practice in public, private, or governmental accounting for students participating in intern or cooperative (repeated internship) programs. Prerequisite: Consent of instructor; internship in accounting curriculum. 0 hours. May be repeated.
299. **Senior Research.** A research and readings course for students majoring in accountancy. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. May be repeated to a maximum of 6 hours.
300. **Socio-Economic Management as Public Policy.** Same as Business Administration, Political Science, and Social Science 300. See Political Science 300.
311. **Intermediate Accounting II.** Examines accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts of financial accounting for external reporting purposes; continuation of Accountancy 211. Prerequisite: Accountancy 211 or equivalent. 3 hours or $\frac{3}{4}$ unit.
312. **Advanced Accounting.** Accounting for various entities including partnerships, consolidations, and mergers; also considers such topics as foreign exchanges, fund and segment reporting, and accounting for reorganizations. Prerequisite: Accountancy 211. 3 hours or $\frac{3}{4}$ unit.
322. **Managerial Accounting and Organizational Controls.** Studies managerial accounting and its functioning as an information subsystem, in relation to the system of organization and the attainment of the goals of the enterprise; stresses the interactions of the components of the enterprise in response to information generated by the managerial accountant. Prerequisite: Accountancy 221; senior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
331. **Accounting Systems Design.** Examines the fundamentals of accounting systems design, including systems analysis and design techniques; surveys hardware and software considerations.

analyzes accounting applications within functional areas of the firm; and studies the control of computerized systems in a business environment. Prerequisite: Accountancy 202 and Computer Science 105, or equivalent. 3 hours or $\frac{3}{4}$ unit.

332. **Introduction to Management Information Systems.** Same as Business Administration 391. Analyzes information systems from a management control perspective, emphasizing organization environment, technology, decision models and performance evaluation as determinants of information processing requirements; cases and design projects explore the management of information processing systems, major functional applications and impacts of information technology on individuals and society. Prerequisite: Computer Science 105 or equivalent, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
333. **Information Organization for Management Information Systems.** Same as Business Administration 392. See Business Administration 392.
334. **Management Information System Development.** Same as Business Administration 393. See Business Administration 393.
335. **Management Information and Control Systems.** Same as Business Administration 394. Integration of behavioral, quantitative, and system design concepts in relation to professional work in the management information systems area. Prerequisite: Business Administration 393 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
341. **Introduction to Auditing.** Surveys the auditing discipline encompassing issues common to external, internal (and operational) auditing; specific topics include auditing theory, evidential matter, principles of internal control, sampling, testing, and the impact of the computer. Prerequisite: Accountancy 211 and 331, and Economics 172. 3 hours or $\frac{3}{4}$ unit.
342. **Advanced Auditing Concepts and Practice.** Emphasizes the concepts and practice of professional auditing, including the application of generally accepted auditing standards, review of internal control, audit reporting practices, professional ethics, S.E.C. practices, statistical sampling, auditing EDP systems, and management advisory services practice. Prerequisite: Accountancy 341. 3 hours, or $\frac{3}{4}$ or 1 unit.
343. **Control and Audit of Computer Systems.** Considers the impact of the computer on the performance of the audit; studies the means by which the auditor adjusts the audit to an EDP environment; deals with both control issues and tests of activity, as well as computer security. Prerequisite: Accountancy 341, and Computer Science 105 or equivalent; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
344. **Internal Auditing and Management Control.** Examines concepts, standards, and procedures of internal auditing and management control; discusses specific case studies and problems to develop student awareness of and skills in the nonfinancial types of auditing such as operational, compliance, and management auditing, especially as practiced by either a business or a not-for-profit organization's own auditors. Prerequisite: Accountancy 341. 3 hours or $\frac{3}{4}$ unit.
351. **Advanced Income Tax Problems.** Practical and theoretical training in the more common and important provisions of the federal income tax, advanced problems, and tax case research and preparation. Prerequisite: Senior standing; Accountancy 251. 3 hours, or $\frac{3}{4}$ or 1 unit.
361. **Public Sector Accounting.** Examines accounting, budgeting, auditing, and reporting principles and practices for municipalities and other not-for-profit organizations, including federal government, public schools, universities, hospitals, charities, religious organizations, and others. Prerequisite: Accountancy 200, 202, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
371. **Introduction to International Accounting.** Explores similarities and differences of accounting principles and procedures between the United States and other countries with special emphasis on worldwide and regional standardization; emphasizes consolidation of foreign subsidiaries, performance evaluation of foreign operations, statement analysis, translation, solutions to inflation accounting, and taxation of multinationals. Prerequisite: Accountancy 211 and 221, or equivalent; or Business Administration 460. 3 hours or $\frac{3}{4}$ unit.
401. **Accounting Analysis, I.** Uses of accounting information; collection, processing, and communication of accounting information; measurement of assets, liabilities, equities, and income; and accounting system design. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
402. **Accounting Analysis, II.** An in-depth study of accounting valuation processes, accounting income measurement, and special reporting problems of multiple-entity organizations. Prereq-

- quisite: Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
403. **Managerial Accounting.** Introduction to management accounting as part of the firm's information system, in terms of modern cost accounting and budgetary systems for planning and controlling business operations. Prerequisite: Credit or concurrent registration in Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
404. **Auditing.** Introduction to conceptual and applied material in the specialized accounting area of auditing; emphasizes the audit process, reporting, and professional responsibilities. Prerequisite: Credit or concurrent registration in Accountancy 402, or equivalent; enrollment in graduate degree program or consent of instructor. ½ unit.
405. **Federal Taxation.** Introduction to historical and conceptual as well as applied material in the accounting area of federal taxation; emphasizes the provisions of the tax law relevant to accounting measurement methods. Prerequisite: Accountancy 401; enrollment in graduate degree program or consent of instructor. ½ unit.
411. **Concepts and Principles.** The fundamental structure of accounting theory developed through the study of concepts characteristic of accounting and an examination of the literature dealing with the concise formulation of accounting principles. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor; Accountancy 491. 1 unit.
417. **Financial Statement Analysis.** Examines tools and techniques of financial statement analysis from the perspective of investors and creditors; emphasizes theoretical and empirical properties of financial ratios. Prerequisite: Business Administration 451, 460, and 472; or equivalent; and enrollment in graduate degree program or consent of instructor. 1 unit.
421. **Management Accounting, I.** Examines recent conceptual and analytical developments in the area of management accounting; includes a study of modern and relevant planning and control techniques and their underlying concepts as applied to the various functional areas within the firm. Prerequisite: Enrollment in graduate degree program or consent of instructor; an undergraduate course in management accounting. The student's background in statistics, economics, and mathematics should be equivalent to the undergraduate requirements of the University of Illinois College of Commerce and Business Administration in these areas. 1 unit.
422. **Management Accounting, II.** Development of the role and importance of accounting data in conjunction with modern quantitative methods in the process of industrial enterprise administration; attention focused on the use of existing accounting data in models and the demands on data accuracy and reliability as well as the necessity to develop additional data for the purpose of facilitating integrated planning, budgeting, and control processes. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
431. **The Theory of Accounting System Design.** Problems and procedures in connection with designing and installing accounting systems. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
432. **Information Systems and Inquiry Processes.** Investigates systems theory and methodology as a basis for generating knowledge useful in action to achieve social goals. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
441. **Auditing Concepts and Standards.** Seminar on contemporary audit theory and standards which provides background for discussion of contemporary audit issues; surveys the professional literature relating to such issues with an emphasis on the development of an ability to critique this literature. Prerequisite: Accountancy 341 and 342, or equivalent; enrollment in a graduate degree program or consent of instructor. 1 unit.
450. **Impact of Income Tax on Management Decisions.** Studies the impact of federal income tax law on management decisions; stresses awareness and recognition of the types of tax problems, so that the managers who are generalists will recognize situations where they will need to seek advice from specialists. Prerequisite: Business Administration 460 or consent of instructor. 1 unit.
451. **Partnership Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving partnerships and their partners, including Subchapter S corporations and their shareholders. Prerequisite: Accountancy 251 or equivalent. 1 unit.
452. **Corporate Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving corporations and their shareholders; cover-

- age includes formations, operations, distributions, liquidations, reorganizations, and affiliations. Prerequisite: Accountancy 351 or equivalent. 1 unit.
453. **Selected Topics in Federal Taxation.** Seminar on federal tax topics of current interest in specialized areas; topics include international taxation, deferred compensation, problems of closely held businesses, estate planning, taxation of trusts, and new developments. Prerequisite: Accountancy 351 or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units. Additional topics will be offered for additional credit.
459. **Income Tax Development.** A theoretical and historical approach to the study of the development of federal income taxation, together with some research on tax cases and critical appraisal of the current law and proposals for its revision. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
471. **Multinational Enterprise Accounting.** Analysis of accounting for operations of multinational enterprises which are subject to a wide variety of regulatory, social, and environmental influences; emphasizes financial and managerial accounting systems and their functions as evaluative, control, and reporting tools; and examines social accounting, foreign taxation, and nonmonetary evaluation methods. Prerequisite: Undergraduate degree in accountancy or equivalent; or Business Administration 460 and consent of instructor. 1 unit.
472. **Accounting Under Different Social Systems.** Analyzes and compares accounting systems under different social systems with emphasis on the impact of regulatory and political structures on accounting; compares both macro and micro accounting systems for politically centralized and decentralized planning. Prerequisite: Undergraduate degree in accounting. 1 unit.
485. **Theoretical Constructs in Accounting Research.** Examines the role of information in economic and behavioral models of decision making under uncertainty; presents major paradigms underlying contemporary accounting research. Interdisciplinary approach; readings drawn from the accounting, behavioral, economics, and finance literature. Prerequisite: Mathematics 363, Accountancy 491, and Economics 402. 1 unit.
491. **Methods and Practices in Professional Research.** Instruction in research methods, materials, and techniques together with individual practice in conducting and reporting specific professional research projects. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. 1 unit.
492. **Accountancy Research Orientation.** Comparative study of alternative methodologies and conceptual frameworks and their application to selected current research issues central to the development of accounting thought, both theoretical and empirical. Prerequisite: Accountancy 411 and 421 and courses in behavioral science, mathematics, and economics; or equivalent background and admission to the accountancy Ph.D. program; or consent of instructor. 1 unit.
493. **Special Research Problems.** Individual investigations or research projects selected by the students, subject to approval by the graduate adviser and the executive officer of the department. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. $\frac{1}{4}$ to 2 units.
494. **Doctoral Research Seminar.** Seminars in various accounting areas designed to enhance the research abilities of doctoral students and to assist them in preparing research proposals; these include Behavioral Dimensions, Public Sector, Tax, Auditing, Managerial, and others announced in the *Timetable*. Prerequisite: Credit or concurrent registration in Accountancy 492 or consent of instructor. 1 unit. May be repeated.
495. **Models of Decision and Choice.** Same as Psychology 434. See Psychology 434.
499. **Thesis Research.** Individual direction and guidance in writing theses; seminar discussion of progress made. 0 to 4 units.

ADMINISTRATION, HIGHER, AND CONTINUING EDUCATION

Head of Department: Paul W. Thurston

Department Office: 333 Education Building, 1310 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
267. **The American College.** A survey of the American college and university; its history, structures, problems, trends, and governance. Provides an opportunity to explore the nature and scope of higher education in the United States. 3 hours.
362. **Adult Learning and Development.** Same as Educational Psychology 362. Theory of and research on adult learning and development; includes societal context, performance, physiology and health, personality, and learning; and considers stability and change during young adulthood, middle age, and old age. Prerequisite: Educational Psychology 311 or 312, or equivalent, or consent of instructor. 4 hours or 1 unit.
363. **Instructional Design.** Same as Educational Psychology 363. See Educational Psychology 363.
380. **Continuing Education General Seminar.** Introductory analysis of literature and professional practice in continuing education of adults; for beginning graduate students majoring in continuing education and for non-majors. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
418. **Economics of Education, Health, and Human Capital.** Same as Economics 418. See Economics 418.
433. **Clinical Supervision of Instruction.** Same as Curriculum and Instruction 416. See Curriculum and Instruction 416.
438. **Instructional Supervision.** Methods, theories, and research applying to the supervision and evaluation of classroom instruction; includes analysis and application of research in effective teaching practices, formative and summative evaluation, staff development, data collection techniques, and alternative feedback methods. Prerequisite: Graduate standing or consent of instructor. 1 unit.
442. **The Community College.** Same as Vocational and Technical Education 442. Community colleges and vocational-technical institutes: their purposes, function, and objectives; social forces related to their development and evaluation; characteristics and needs of students; educational programs and teaching strategies; and organization, control, and financing. 1 unit.
443. **The College Student.** Study of the characteristics and development of college students, the institutional contexts in which they operate, and the interaction of students with the college environment. 1 unit.
448. **Continuing Education Program Development.** Same as Curriculum and Instruction 402 and Vocational and Technical Education 448. Analysis of the process of planning and conducting continuing education programs for adults; includes theory, research, and practice regarding sponsors, need appraisal, objectives, selection and organization of learning activities, and evaluation. Recommended for majors in continuing education. Prerequisite: Consent of instructor. Administration, Higher, and Continuing Education 362 is recommended, especially for majors in continuing education. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department head prior to enrollment. $\frac{1}{2}$ to 1 unit. May be repeated for credit with consent of advisor and department head.
450. **Public Control and Administration of Education.** Provides the basic common understanding of theory and practice in operation and control of schools useful to teachers and other citizens; analyzes both formal and informal influences on governance; and serves as an introductory course for prospective administrative officers and supervisors. Not open to experienced administrators nor to students who have taken any of the following (or equivalents): Administration, Higher, and Continuing Education 430, 440, 461, 462, 463, 465, 466. 1 unit.

452. **Current Issues in Higher Education.** Seminar on current issues, problems, and trends in higher education. Prerequisite: Two units in higher education or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
455. **The Principalship in Elementary and Secondary Education.** Provides an overview and analysis of the administrative, supervisory, and leadership functions of building-level administrators; emphasizes the design and implementation of effective educational programs on a school-wide basis; analyzes administrative tasks and processes through case studies, interviews with practitioners, simulations, and readings. Prerequisite: Administration, Higher and Continuing Education 450 and teaching experience required. 1 unit.
461. **School Improvement.** Study of major ideas on school improvement, past and present, and of emerging research on the condition of public education in the United States. In-depth examination of reform proposals for changing the organization of schools, the instructional program, and the roles of students, teachers, and school administrators. Prerequisite: Graduate standing or consent of instructor. 1 unit.
462. **Organization and Business Administration of Public Education.** Organization and operation of public school government; functions and processes of school business administration, including internal organization of the division of business services; and scope and role of the business manager, budgetary process, accounting and financial reporting, contracts, liability, insurance, purchasing, auxiliary services, salary policies, and methods of survey, evaluation, and planning. Prerequisite: Administration, Higher, and Continuing Education 450, 430 or 440, and 461. 1 unit.
463. **The Role of Administrative Leadership.** Studies perspectives on administrative leadership drawn from the social sciences and their application to the analysis and formulation of strategies for performing leadership functions in educational administration. Prerequisite: For majors in educational administration, Administration, Higher, and Continuing Education 461 and Educational Psychology 413; for students in other departments, admission to a post-master's degree program and consent of instructor. 1 unit.
464. **Directed Field Experience in Administration.** Direct experience in the study of educational problems of concern to administrators; features an action component whereby the student is provided with opportunities for assuming responsibility for decision making in a live or simulated setting; each student works under the supervision of a professor, and where possible and appropriate, a practicing administrator. 1 to 3 units. May be repeated to a maximum of 3 units, with no more than 1 unit earned at the master's level.
465. **Personnel Administration.** Principles, problems, and trends in the administration of professional public school personnel; organization of personnel; the legal framework of the personnel function; selection, evaluation and development of staff; collective bargaining, contract administration and personnel policy; and the personnel administrator's role as a catalyst for school improvement. Prerequisite: Administration, Higher, and Continuing Education 469 or equivalent or consent of instructor. 1 unit.
466. **Public School Finance.** Advanced graduate study of financing public education systems in the United States; focuses on the social, economic, political, legal, and technical dimensions of developing school finance policy for federal, state, and local governments; relates theory and research in public school finance to administrative practice in budgeting and financial administration. Prerequisite: Graduate standing or consent of instructor. 1 unit.
468. **The Political and Social Context of Schooling.** The political and social environment of public education in the United States; analysis of the power structure and its influence on educational policy making at the district level; examination of the evolving roles of state and federal agencies, the courts, private organizations, and interest groups in school governance. Studies the tension between the ideal of a democratically controlled public school system and the growing power of educational experts. Prerequisite: An undergraduate course in political science, or an introductory course in the politics of education such as Educational Policy Studies 309, or consent of instructor. 1 unit.
469. **Legal Basis of Educational Administration.** Examines the range of federal and state constitutional and statutory sources that apply to the constituents (pupils, parents, teachers, administrators, and board members) engaged in public schools. Emphasizes development of legal analytical skills. Prerequisite: Administration, Higher, and Continuing Education 450 or consent of instructor. 1 unit.

471. **State and Federal Educational Politics and Policies.** Examines the legislative and political processes in the formulation of current federal and state educational policies, together with the evaluation of policy and the formulation of policy alternatives. Prerequisite: Administration, Higher, and Continuing Education 469. 1 unit.
474. **The American College and University.** Introduction to higher education as a subject: its history, purposes, leaders, and literature; attention to conceptual framework in which further development of this subject can progress. 1 unit.
475. **Administration of Higher Education.** Administrative practices, procedures, and arrangements for policy implementation in the American college (including the community college) and university; special attention given to the roles of major administrative officers. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
477. **Student Personnel Work in Higher Education.** Studies the theoretical foundations and principles underlying the practice of student personnel work; investigation of the role and function of student personnel workers in terms of their relationship to various goals, philosophies, issues, trends, and research. 1 unit.
478. **The Administration of Student Personnel Work.** Structural arrangements for meeting student-oriented needs in the American college (including the junior college) and university; attention to the role of the chief administrative officer for student affairs. Prerequisite: Administration, Higher, and Continuing Education 477 or equivalent. 1 unit.
479. **Organization and Control of Higher Education.** Organizational patterns whereby colleges and universities seek to accomplish their purposes; agencies involved in the control of higher education. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
480. **Internship in the Administration of Higher Education.** Provides supervised direct experience in the administration of higher education; with the aid of the faculty, students select the institution and position most relevant to their career goals. Prerequisite: Consent of instructor. 1 unit. No more than 2 units may be given toward an advanced degree.
483. **Societal Context of Continuing Education.** Analyzes the continuing education agency as a social system; includes learning group, planning committee, organizational relations with parent institution, and linkage with community; recommended for majors in continuing education. Prerequisite: A basic graduate course on social systems (such as Educational Psychology 413, Educational Policy Studies 315 or 385, Sociology 456 or 492, or Psychology 355). 1 unit.
484. **Continuing Education Internship.** Supervised field experience. Prerequisite: Consent of instructor. 1 to 2 units. May be repeated to a maximum of 4 units.
485. **Continuing Education Agency Administration.** Organization and administration of continuing education programs for adults; decision making, policy, finance, personnel, program, and community relations; analysis of theory, research, and practice; and emphasis on case analysis. Recommended for majors in continuing education. Prerequisite: Administration, Higher, and Continuing Education 483 and a basic administration course (such as Administration, Higher, and Continuing Education 450 or 479, Vocational and Technical Education 489, Library Science 405, or Business Administration 401). 1 unit.
486. **Continuing Education Advanced Seminar.** Analyzes specialized topics related to continuing education of adults; for advanced students. Recommended for majors in continuing education. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
490. **Seminar for Advanced Students of Education.** Open only to persons who have been admitted for doctoral study in the Department of Administration, Higher, and Continuing Education. Prerequisite: Consent of instructor. 1 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Prerequisite: Consent of instructor. 1 to 2 units.
497. **Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Social Work 497, and Political Science 469. See Labor and Industrial Relations 497.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ADVERTISING

Head of Department: Kim B. Rotzoll

Department Office: 103 Gregory Hall, 810 South Wright, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
281. **Introduction to Advertising.** A survey of the economics, psychology, and philosophy of advertising; preparation of advertisements; selection of media; and organizational structure. Not open to seniors unless enrolled in the College of Communications. Prerequisite: Sophomore standing and consent of department. 3 hours. This course may require limited participation as a subject in research.
288. **Sales Writing.** Same as Business and Technical Writing 271. See Business and Technical Writing 271.
291. **Special Problems.** Special projects, research, and independent reading in advertising for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Written research proposal and consent of head of department. 2 or 3 hours.
309. **Public Relations.** Publicity methods and public relations; representation of profit and non-profit institutions to the public; use of communications research and media; product publicity reviewed, case studies utilized. Prerequisite: Junior standing in the College of Communications; consent of department. 3 hours or ½ unit.
381. **Advertising Research Methods.** Overview of basic concepts of research methodology with particular emphasis on advertising research. Computer analysis and interpretation of actual data sets; measurement with both structured and unstructured techniques; principles of survey and experimental design. Prerequisite: Advertising 281; junior standing; a specified course in statistical methods; consent of department. 3 hours or ½ unit. No graduate credit is given to graduate majors in advertising.
382. **Advertising Creative Strategy and Tactics.** Theory and practice of advertising message planning and creation for print and broadcast media; use of consumer and market surveys, copytesting methods, and advertising readership studies. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or ½ unit. No graduate credit is given to graduate majors in advertising.
383. **Advertising Media Planning.** Analyzes the various advertising media in terms of markets served and factors to consider in the selection and evaluation of media. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or ½ unit. No graduate credit is given to graduate majors in advertising.
390. **Advanced Creative Strategy and Tactics.** Advanced work in application of behavioral science and creative process to planning and writing of advertisements. Prerequisite: Advertising 382; consent of department. 3 hours, or ½ or 1 unit.
391. **Advertising Management: Planning.** Application of analytical planning concepts to advertising planning and decision making; covers all of the decision making areas of advertising. Prerequisite: Advertising 381, 382, and 383; Mathematics 111 or 112, or equivalent; Business Administration 202; consent of department. 3 hours or ½ unit. No graduate credit is given to graduate majors in advertising.
392. **Advertising Management: Strategy and Tactics.** Application of advertising management decision criteria to actual communication problems involving advertisers; development of strategy and tactics. Prerequisite: Advertising 391. 3 hours or ½ unit. No graduate credit is given to graduate majors in advertising.
393. **Advertising in Contemporary Society.** Studies advertising as an institution and its role in communications, society, our economy, and business. Prerequisite: Advertising 281; senior standing; consent of department. 3 hours or ½ unit. No graduate credit is given to graduate majors in advertising.
450. **Foundations of Advertising.** Evaluation of key periods, events, and individuals having significant impact on the evolution of American advertising philosophy, structure, and performance. Prerequisite: Advertising 281 and 393, and consent of instructor. 1 unit.
481. **Economic and Social Aspects of Advertising.** Same as Communications 481. Examines advertising as an institution; the economic, social, and legal aspects of advertising with focus on current problems. Prerequisite: Advertising 391, 393, and consent of department. 1 unit.

482. **Research Methods in Advertising and Communications.** Same as Communications 482. A treatment of basic research concepts and procedures in the social sciences with emphasis on advertising and communications; examines both nonquantitative and quantitative methods. Prerequisite: Advertising 381, a basic course in statistical methods, and consent of department. 1 unit.
483. **Advertising as Communication.** Advertising messages from the perspective of attitude and persuasive communication theories; application of theory to advertising communication issues. Prerequisite: Advertising 381 or equivalent undergraduate research course; Advertising 482 or an equivalent graduate research course recommended. 1 unit.
484. **Advertising and Consumer Behavior.** Examines consumer behavior as a means of shaping the communications message; use of the behavioral sciences in creative communication strategy. Prerequisite: Advertising 391 and consent of department. 1 unit.
485. **Advertising Planning and Decision Making.** Same as Communications 485. Examines the theoretical foundations of decision theory as they relate to planning and decision making in advertising; reviews concepts of strategic planning and client side operations; case studies utilized extensively. Prerequisite: Advertising 391 and consent of department. 1 unit.
486. **Analytical Methods in Advertising and Communications.** Same as Communications 486. Seminar emphasizing fundamental problems in advertising and communications and the methods applicable to their solution; problem areas covered include aspects of message-related issues and response function building and usage; applies methods drawn from various disciplines to these problem areas; and applies analyses on pre-collected advertising and communications data using computerized statistical program packages. Prerequisite: Advertising 391 and a specified course in statistical methods. 1 unit.
487. **Graduate Seminar.** Provides advertising students and faculty the opportunity to interact on current topics. Faculty will discuss work in progress. Students will be required to present. Prerequisite: Consent of department. $\frac{1}{2}$ unit. Must be repeated by master's program graduate students for a total of 1 unit.
490. **Special Topics in Advertising.** Prerequisite: Consent of department. $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Prerequisite: Graduate standing in advertising. 1 to 2 units.

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

Head of Department: Wayne C. Solomon

Department Office: 101 Transportation Building, 104 South Mathews, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
212. **Aerodynamics, I.** Quasi-one-dimensional flow; conservation of mass, momentum, and energy; steady flow with variable area; steady, constant area flow with friction, heat addition, and mass injection; shock waves; nonsteady, one-dimensional flows; and two-dimensional flow, oblique shock waves, and Prandtl-Meyer waves. Prerequisite: Mechanical Engineering 207; Theoretical and Applied Mechanics 156; credit or concurrent registration in Mathematics 343. 4 hours.
213. **Aerodynamics, II.** Equations of motion for a viscous, heat-conducting fluid; exact solutions of the Navier-Stokes' equations; boundary layer theory; inviscid approximations, vorticity, and circulation; potential flow; solutions of potential flow equations, sources, sinks, and Prandtl-Meyer flow; thin airfoil and slender body theory; and method of characteristics. Prerequisite: Aeronautical and Astronautical Engineering 212. 4 hours.
224. **Flight Structures, I.** Development of fundamental concepts of elasticity as related to stress, strain, equilibrium, compatibility, and material properties; applications to flight vehicle structural problems in unsymmetric bending, torsion, thick-walled cylinders, rotating discs, shear flow, and shear center problems. Prerequisite: Mathematics 345; Theoretical and Applied Mechanics 156. 4 hours.
225. **Flight Structures, II.** Energy concepts with applications to indeterminate flight structures, sandwich beams, and shear flow; elastic and plastic buckling of columns and plates; and

- membrane theory of shells. Prerequisite: Aeronautical and Astronautical Engineering 224. 4 hours.
233. **Aircraft Propulsion.** Fundamentals of air breathing jet propulsive devices; prediction of thrust, specific fuel consumption, and operating performance; ramjets; turbojets; turbofans; turboprops; aerothermodynamics of inlets, combustors, and nozzles; compressors, turbines, and propellers; and component matching. Prerequisite: Aeronautical and Astronautical Engineering 212 or first course in gas dynamics. 3 hours.
241. **Flight Vehicle Design.** Introduction to preliminary design of airplanes, missiles, and space vehicles; further development of concepts in orbital mechanics, hypersonic aerodynamics, and aerodynamic heating. Prerequisite: Aeronautical and Astronautical Engineering 213, 225, 233, and 255; Computer Science 101. 3 hours.
254. **Aerospace Dynamic Systems, I.** Modeling of linear dynamic systems; Laplace transforms and linear feedback control systems; stability criteria and design techniques; introductory aircraft flight stability and control. Prerequisite: Mathematics 345 and Theoretical and Applied Mechanics 156. 4 hours.
255. **Aerospace Dynamic Systems, II.** Examines particle kinematics and dynamics; fundamentals of orbital mechanics; Lagrange's equations; vibration of multiple degree of freedom systems and continuous elastic structures; rotational kinematics and dynamics of rigid bodies. Prerequisite: Aeronautical and Astronautical Engineering 254 and Mathematics 225. 4 hours.
260. **Aerospace Laboratory, I.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on fluid dynamics, aerodynamics, thermal, combustion and propulsion phenomena. Prerequisite: Aeronautical and Astronautical Engineering 213 and 233. 2 hours.
261. **Aerospace Laboratory, II.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on structural mechanics, vibrations, dynamics, and systems. Prerequisite: Aeronautical and Astronautical Engineering 225 and 255. 2 hours.
280. **Energy Alternatives and Societal Values: Technology Assessment for Non-Engineers.** The energy/environment crisis as a societal problem. Energy alternatives: their technology, potential, and human and environmental consequences. Values, technology, and the social construction of future reality. Introduction to the information, ideas, values, and perceptions currently affecting the societal definition and resolution of the energy/environment problem. Student participation in simulated adversary proceedings, role-playing, panel discussions, and values-clarification and problem-clarification strategies. Lectures and extensive readings. 4 hours.
281. **Introduction to Renewable Energy Sources.** The technology of renewable energy sources: wind power and the performance of large and small wind turbine systems; ocean thermal energy conversion and ocean wave power; solar thermal electric power; solar cells; the elements of design and sizing of solar heating and cooling systems; hydroelectric power; biomass fuels; hydrothermal-reservoir and dry-rock geothermal energy; energy storage; on-site energy systems; the concept of appropriate technology; and the economics of renewable energy systems. Prerequisite: Mathematics 132, and Physics 102 or 108; or consent of instructor. 3 hours.
292. **Seminar.** Reports and discussions of recent developments in the fields of aerodynamics, flight mechanics, power plants, structures, and maintenance and operations as related to airplanes, missiles, and space vehicles. Prerequisite: Senior standing. 1 hour.
296. **Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
303. **The Effect of Space Environment on Satellite Motion.** Free molecule aerodynamics; gravity gradient and solar radiation torques on satellites; interaction of on-board magnetic dipoles with the earth's magnetic field; solar wind; cosmic dust and micrometeoroid torques; lifetime problem and density determination; and utilization of these various environmental effects in satellite attitude control. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.

306. **Orbital Mechanics.** Analysis of orbits in an inverse-square gravitational field; elementary rocket dynamics, impulsive orbit transfer and rendezvous, and Lambert's Theorem with applications; patched-conic trajectories, planetary swing-by maneuvers, and linearized orbit theory with application to simplified analytical models; perturbations. Prerequisite: Aeronautical and Astronautical Engineering 255 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Aerodynamics of Compressible Fluids.** Methods of solution of fluid flow problems in subsonic, transonic, and supersonic flight regimes. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.
313. **Aerodynamics of Incompressible Fluids.** Governing equations for incompressible flow; vorticity, circulation, and Kelvin's, and Helmholtz's theorems; velocity potential and stream function; three-dimensional steady and nonsteady flows, d'Alembert's paradox, and apparent mass; two-dimensional steady flows, complex potential and velocity, and mapping of flows; two-dimensional airfoils and Joukowski transformation and airfoils; and thin airfoil theory. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
314. **Aerodynamic Heat Transfer.** Thermal boundary layers; turbulent heat transfer; aerodynamic heating; and radiative heat transfer. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.
316. **Applied Aerodynamics.** Two-dimensional and finite wing theory with emphasis on the mechanisms of lift and drag generation; Reynolds number and Mach number effects; drag analysis; high-lift wing systems; propeller and rotor aerodynamics; control surface design; and application of V/STOL aerodynamics. Prerequisite: Aeronautical and Astronautical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
317. **Elements of Magnetohydrodynamics.** Equations of magnetohydrodynamics; single-fluid and multiple-fluid models; magnetic interaction parameters; magnetosonic waves; hydromagnetic shock waves; aligned-field and crossed-field flows; theory of characteristics; MHD acceleration, generation, and propulsion. Prerequisite: Aeronautical and Astronautical Engineering 212 or consent of instructor. 3 hours or 1 unit.
319. **Aircraft Flight Mechanics.** Steady and quasi-steady aircraft flight performance; take-off and landing, climbing and diving, cruise, level turn, and introduction to energy methods; longitudinal, directional, and lateral static stability and control; and introduction to longitudinal and lateral motion and dynamic stability. Prerequisite: Aeronautical and Astronautical Engineering 213, 233, and 255, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
320. **Finite Element Methods in Aerospace Structures.** Finite element methods in the analysis of aerospace structures; includes treatment of different types of elements in the analysis of static, dynamic, and stability problems; and emphasizes structures most commonly used in aerospace applications. Introduction to NASTRAN program use. Prerequisite: Computer Science 101 and Aeronautical and Astronautical Engineering 225. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
326. **Theory of Continuous Media.** Introduction to the general theory of continuous media and its application to the theories of elasticity, fluid mechanics, and inelasticity; stress and strain tensors and their invariants; nonlinear equilibrium conditions; the mechanism of deformation of single crystal and polycrystalline media; basic concepts of the structure of matter; thermodynamic considerations; and equations of state and stress-strain relationships with applications. Prerequisite: Consent of instructor. 3 hours or 1 unit.
333. **Electric Propulsion.** Elements of propulsion as applied to deep space missions; physics of ionized gases; plasmadynamics; electrothermal, electromagnetic, and electrostatic acceleration of gases to high velocity; high-impulse thruster design and performance; and the resistojet, arcjet, ion engine, MPD arc, and plasma gun. 3 hours or 1 unit.
334. **Rocket Propulsion and Rocketry.** Basic principles of rocket propulsion and rocketry, propellants and their influence on design of rockets, internal and external ballistics, combustion processes, design of components, flight performance, and rocket testing. Prerequisite: Aeronautical and Astronautical Engineering 212 or equivalent. 3 hours or $\frac{3}{4}$ unit.
351. **Aeroelasticity and Aeroinelasticity.** Advanced fundamental treatment of aerodynamic and dynamic structural phenomena associated with flexible airplanes and missiles; divergence

of linear and nonlinear elastic lifting surfaces; effect of elastic and inelastic deformations on lift distributions and stability; elastic flutter of straight and swept wings; equations of disturbed motion of elastic and inelastic aircraft; dynamic response to forces, gusts, and continuous atmospheric turbulence; creep divergence of lifting surfaces; flutter in the presence of creep; and effect of temperature on inelastic divergence and flutter. Prerequisite: Aeronautical and Astronautical Engineering 255. 3 hours or 1 unit.

381. **Wind Power Technology.** Aerodynamic, electromechanical, and structural design of wind power systems: classical windmills; modern wind power generators; wind characteristics and distribution; instrumentation and measurement; energy storage considerations; socioeconomics of wind power systems; performance of large and small scale wind turbines; and current design approaches. Prerequisite: A fluids course, an electrical course, and a course in mechanics, all at the 200 level or higher; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
391. **Special Problems.** Special problems relating to the theory, design, testing, operation, maintenance, or production of airframes or aircraft power plants. Prerequisite: Senior standing in engineering; consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
404. **Optimization of Aerospace Systems.** Formulation of parameter and functional optimization problems for dynamic systems; applications of optimization principles to the control and performance of aerospace vehicles, including optimal flight paths, trajectories, and feedback control. Prerequisite: Aeronautical and Astronautical Engineering 255 or equivalent. 1 unit.
406. **Advanced Orbital Mechanics.** Circular restricted three body problem; surfaces of zero velocity, libration points, halo orbits; perturbed two body motion; Gauss and Lagrange planetary equations, Hamilton's principle, canonical equations and the Delaunay variables, application to artificial Earth satellites; orbit determination. Prerequisite: Aeronautical and Astronautical Engineering 306 or consent of instructor. 1 unit.
412. **Aircraft Dynamic Stability and Control.** Study of dynamic stability and control of rigid aircraft: small disturbance theory, linearization of equations of motion; uncontrolled motion characteristics, longitudinal and lateral natural modes; open loop control response; introduction to closed-loop response. Prerequisite: Aeronautical and Astronautical Engineering 319, or consent of instructor. 1 unit.
414. **Boundary Layer Theory.** Theories of the boundary layer of a compressible fluid and their solutions, laminar and turbulent; boundary layer in hypersonic flows. Prerequisite: Aeronautical and Astronautical Engineering 213. 1 unit.
415. **Wing Theory.** Theoretical analysis of the aerodynamic characteristics of two- and three-dimensional wings and multiple-body systems in subsonic and supersonic flows. Prerequisite: Mathematics 346 or equivalent. 1 unit.
417. **Fundamentals of Gas Kinetics.** Fundamental concepts required to study gas dynamic problems from the viewpoint of kinetic theory; derivation of the Boltzmann equation from classical mechanics; reduced and truncated distribution functions and the BBGKY hierarchy; molecular collisions; flux vectors and equations of change; moment equations; summational invariants: H-theorem and Maxwellian distribution; inclusion of the effect of solid surfaces in kinetic theory; existence theory for the Boltzmann equation; iteration procedures; moment methods; Chapman-Enskog procedure; and first and second approximations to the distribution function, heat flux vector, and stress tensor. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 1 unit.
418. **Theory of Rarefied Gas Flows.** Application of kinetic theory to rarefied gas flow problems; free-molecule flow; near free-molecule flow; linearized problems; and flows with appreciable deviation from equilibrium. Prerequisite: Aeronautical and Astronautical Engineering 417. 1 unit.
428. **Theory of Large Deformations in Nonlinear Continuous Media.** Fundamental concepts of large deformations in nonlinear elasticity and inelasticity with applications: generalized tensors, finite deformations, stress-strain relations in terms of strain energy functions, solutions of tension, shear and bending problems, finite plane strain, theory of successive approximations, fiber-reinforced beams, plates and cylinders, thermodynamics of deformable media, stability considerations, and constituent relations for inelasticity. Prerequisite: Aeronautical and Astronautical Engineering 326 or equivalent. 1 unit.
429. **Theory of Linear and Nonlinear Viscoelasticity.** Same as Theoretical and Applied Mechanics 429. Fundamental concepts of viscoelasticity with applications: elastic-viscoelastic analogies,

- creep and relaxation functions, thermomechanical reciprocity relations, variational principles, model fitting, shear center motion, thick-walled cylinders under pressure and inertia loads with material annihilation, sandwich plates, propagation of viscoelastic waves, vibration of bars, plates and shells, nonlinear elastic-viscoelastic analogy, properties of nonlinear viscoelastic stress-strain laws, creep rupture, and torsion of nonlinear bars and shells. Prerequisite: Aeronautical and Astronautical Engineering 326 or consent of instructor. 1 unit.
434. **Aerodynamic Heating.** Theory of convective aerodynamic heating in high-speed flow and laminar and turbulent flows; ablation, transpiration cooling, and mass transfer cooling; aerodynamic heating in hypersonic flow, real gas effects, and effect of pressure interactions and vorticity interactions; and heat transfer in rarefied gas flows. Prerequisite: Aeronautical and Astronautical Engineering 414 or equivalent. 1 unit.
438. **Fundamentals of Combustion.** Same as Mechanical Engineering 403. Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex detonation waves; and supersonic burning. Prerequisite: Aeronautical and Astronautical Engineering 213 or Mechanical Engineering 305. 1 unit.
452. **Stochastic Structural Dynamics.** Same as Theoretical and Applied Mechanics 417. Structural dynamics problems treated from a probabilistic point of view; theory of probability and random processes introduced as mathematical tools; response of structures under random excitation is studied in order of increasing complexity; and probability of failure for such structures is discussed. Prerequisite: Aeronautical and Astronautical Engineering 255, Theoretical and Applied Mechanics 314, or equivalent. 1 unit.
453. **Aerodynamic Noise.** Same as Theoretical and Applied Mechanics 418. Mathematical techniques for the analysis of intensity, spectrum, and directivity of noise field in various environments; practical examples including jet and rocket engines, propeller and fan, sonic boom, and cabin noise of high speed vehicles. Prerequisite: Graduate standing in engineering, physics, or mathematics. 1 unit.
490. **Seminar.** Presentation by graduate students and staff of current topics in the field of aeronautics. Prerequisite: Graduate standing in aeronautical and astronautical engineering. 0 units.
493. **Special Problems.** Theoretical and experimental investigations of problems in airplane, missile, and space flight engineering. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Research in the various areas of the aeronautical and astronautical engineering sciences. 0 to 4 units.

AFRICAN STUDIES

Director of Center: Donald E. Crumme
Center Office: Room 101, 1208 West California, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Elementary Hausa, I.** Same as African Languages 201. See African Languages 201.
202. **Elementary Hausa, II.** Same as African Languages 202. See African Languages 202.
210. **Introduction to Modern African Literature.** Same as Comparative Literature 210 and English 211. Significant contemporary African writings depicting the history and cultural traditions of African peoples. 3 hours.
211. **Elementary Lingala, I.** Same as African Languages 211. See African Languages 211.
212. **Elementary Lingala, II.** Same as African Languages 212. See African Languages 212.
213. **African Oral Literature.** Examines the oral literature of the African continent in all its varieties (tales, myths, songs, proverbs, etc.), in translation. Places the literature in its many contexts (historical, cultural, religious, political, legal, sociological, etc.). Explores the process of oral transmission, unique to oral literature, with particular reference to the continuity between African and Afro-American oral literature. 3 hours.

222. **Introduction to Modern Africa.** Same as Anthropology, Political Science, and Sociology 222. An interdisciplinary introduction to Africa dealing with basic themes and problems in the politics, economics, sociology, anthropology, and history of Africa. 3 hours.
231. **Elementary Swahili, I.** Same as African Languages 231. See African Languages 231.
232. **Elementary Swahili, II.** Same as African Languages 232. See African Languages 232.
241. **Elementary Wolof, I.** Same as African Languages 241. See African Languages 241.
242. **Elementary Wolof, II.** Same as African Languages 242. See African Languages 242.
303. **Intermediate Hausa, I.** Same as African Languages 303. See African Languages 303.
304. **Intermediate Hausa, II.** Same as African Languages 304. See African Languages 304.
310. **Modern African Fiction.** Same as Comparative Literature and French 310 and English 370. Examines selected major African novels along thematic and formal lines; literary responses to colonialism and political independence and the crises that accompanied both in Africa; and study of critical approaches to the African novel and African characteristics of and contribution to the novel as a genre. Readings in English. Prerequisite: African Studies 210 or 222, or junior standing. 3 hours or 1 unit.
313. **Intermediate Lingala, I.** Same as African Languages 313. See African Languages 313.
314. **Intermediate Lingala, II.** Same as African Languages 314. See African Languages 314.
325. **Southern Africa: Race and Power.** Same as History 325 and Political Science 333. An interdisciplinary survey of both the internal and international dimensions of the changing situation in Africa south of the Zambezi; focuses on the historical background to, and a political, economic, and social analysis of current events in the Republic of South Africa, Mozambique, Namibia, and Zimbabwe, emphasizing the central significance of race and power in this region. Prerequisite: History 216 or African Studies 222. 3 hours or 1 unit.
333. **Intermediate Swahili, I.** Same as African Languages 333. See African Languages 333.
334. **Intermediate Swahili, II.** Same as African Languages 334. See African Languages 334.
335. **Advanced Swahili, I.** Same as African Languages 335. See African Languages 335.
336. **Advanced Swahili, II.** Same as African Languages 336. See African Languages 336.
343. **Intermediate Wolof, I.** Same as African Languages 343. See African Languages 343.
344. **Intermediate Wolof, II.** Same as African Languages 344. See African Languages 344.
354. **Social Structure of Southern Africa.** Same as Sociology 354. See Sociology 354.
450. **Seminar on Selected Topics in African Studies.** Topics vary with the disciplinary focus. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
499. **Thesis Research.** Individual direction in research and guidance in writing theses for advanced degrees. 0 to 2 units. May be repeated to a maximum of 2 units.

AFRO-AMERICAN STUDIES

Acting Director of Program: D. M. Pinderhughes
Program Office: 1204 West Oregon, Urbana

100. **Introduction to Afro-American Studies.** An interdisciplinary introduction to the basic concepts and literature in the disciplines covered by Afro-American studies; stresses the role of historical, political, and economic forces in shaping cultural expression. 3 hours.
161. **Black Folk Culture.** Same as Anthropology 161. See Anthropology 161.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
224. **Humanistic Perspectives of the Afro-American Experience.** A multidisciplinary study of major aspects, events, and periods of the Afro-American experience; includes a series of topics each focusing on one movement or historical event as reflected in Afro-American literature, art, and music. Prerequisite: Afro-American Studies 100 or consent of instructor. 3 hours.
234. **Afro-American Bibliography.** Provides information and practice in the identification and use of Afro-American research materials. Emphasizes the Black experience in the United States; also the experience of Afro-Americans in the rest of the western hemisphere. 3 hours.
244. **Social Science Perspectives in Afro-American Studies.** A multidisciplinary analysis of social science perspectives on the Afro-American experience; critically reviews traditional social

science literature, compared and contrasted with theory and research following more Afro-centric perspectives. Prerequisite: Afro-American Studies 100 or equivalent; or an introductory course in sociology, economics, anthropology, political science, or history; or consent of instructor. 3 hours.

- 253. **Afro-American History to 1877.** Same as History 253. See History 253.
- 254. **Afro-American History Since 1877.** Same as History 254. See History 254.
- 259. **Afro-American Literature, I.** Same as English 259. See English 259.
- 260. **Afro-American Literature, II.** Same as English 260. See English 260.
- 261. **Afro-American Societies and Cultures.** Same as Anthropology 261. See Anthropology 261.
- 298. **Special Topics in Afro-American Studies.** Advanced seminar on selected topics with particular emphasis on current research trends. Prerequisite: Junior status and one of the following: Afro-American Studies 224, or History 253 or 254, or English 259 or 260. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS).
- 327. **Black Political Participation in the American Political Process.** Same as Political Science 327. See Political Science 327.
- 368. **The South in American History.** Same as History 368. See History 368.
- 379. **Slavery and Race Relations in Latin America.** Same as History 379. See History 379.

AGRICULTURAL COMMUNICATIONS

Head of Office: J. F. Evans

Office: 67 Mumford Hall, 1301 West Gregory, Urbana

- 106. **Functional Writing.** Instruction and practice in functional writing related to unique interests of students in the College of Agriculture; designed primarily to be taken with freshman rhetoric by students with special needs for improvement in their use of English. Prerequisite: Restricted to students in the College of Agriculture. 2 hours.
- 110. **Introduction to Agricultural Communications.** Introduces agricultural communications as a professional field; examines the development, role, and potential of the professional agricultural communicator. Prerequisite: Registration in agricultural communications curriculum, or consent of instructor. 1 hour.
- 114. **Agricultural Communications Media and Methods.** Same as Journalism 114. Introduction to print, broadcast, visual, and other major communications media used to convey agricultural information; development of basic skills in communicating through those media. Prerequisite: Completion of rhetoric requirement. 3 hours.
- 214. **Agricultural Communications Strategy.** Same as Journalism 214. Coordinated approach to planning and carrying out programs of agricultural information and education using a variety of communications media; students apply principles of strategy to actual communications problems of their choice. Prerequisite: Agricultural Communications 114 or consent of instructor. 3 hours.
- 240. **Photography in Agriculture.** Application of visual communications principles to agriculture using the photograph as medium; emphasizes communicative, creative, and technical aspects. See *Timetable* for approximate cost of materials. Prerequisite: Agricultural Communications 114; consent of instructor. 4 hours.
- 270. **Agricultural Sales Communications.** Role, dynamics, and principles of personal sales communications as related to food and agriculture; methods for analyzing, setting objectives, planning, conducting and evaluating sales communications efforts; individual observation of principles applied by agricultural sales professionals. Prerequisite: Junior standing; enrollment preference to students in the College of Agriculture. 3 hours.
- 280. **Leadership Development.** Same as Human Resources and Family Studies 280. Examines leadership theory, styles and roles of leaders; includes exercises and activities to improve functional leadership skill, as adapted to career interests of the individual class member. Prerequisite: Rhetoric 105 and Speech Communication 101; or equivalent. 3 hours.

290. **Professional Seminar.** Professional developments and issues in agricultural communications; the agricultural communicator today; and avenues for continuing professional growth. Prerequisite: Junior-senior standing in agricultural communications. 1 hour.
300. **Special Problems in Agricultural Communications.** Special projects, research, and independent study in agricultural communications. Prerequisite: Agricultural Communications 114 or equivalent; written consent of instructor and authorized departmental approval prior to advance enrollment and registration; not open to students on probation. Specific approval of the associate dean is required in advance of registration for a second and/or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this academic unit subject to approval of the instructor. 1 to 5 hours, or 0 to 2 units.
310. **Information for Agriculture.** Examines the role, value, kinds, channels, sources, and uses of information in U.S. agriculture; changes in channels, emerging communications technologies and other forces that may affect them; also examines outlook and issues concerning information for agriculture. Prerequisite: Agricultural Communications 114 and 214. 3 hours or $\frac{3}{4}$ unit.
320. **Rural-Urban Communications.** Analysis of rural-urban relationships and the role of communications from the political, historical, philosophical, and communications perspectives; concepts and skills for improving interactions that involve U.S. agriculture and the food system. Prerequisite: 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
330. **Promotion of Farm Products.** Studies producer-sponsored efforts to promote consumption of farm products; includes consumption trends and forces, current promotion activities, uniqueness and effects of commodity promotion, funding and organization, export promotion, and principles in promotion planning. Prerequisite: Economics 101 or Agricultural Economics 100; Agricultural Communications 114. 3 hours or $\frac{3}{4}$ unit.
460. **Teaching of College-Level Agriculture.** Analysis and preparation for the problems encountered in the effective teaching of college-level agriculture and home economics; systems approach, including instructional objectives, preassessment of students, instructional strategies, materials, and student performance evaluation; and detailed study of individual problems supplements class work. Prerequisite: Master's standing. $\frac{1}{2}$ unit.
461. **Extension Communications Management.** Analysis and management of effective extension communications based on present communication and educational concepts. 1 unit.

AGRICULTURAL ECONOMICS

(Including Rural Sociology)

Head of Department: David L. Chicoine

Department Office: 304 Mumford Hall, 1301 West Gregory, Urbana

Agricultural Economics

100. **Introductory Agricultural Economics.** Principles of production, supply, and demand applied to economic problems of agriculture and agriculturally related industries and to decisions in farm management, marketing, foreign trade, and agricultural policy; the role in economic growth of natural resources, population, and capital. 3 hours.
161. **Microcomputer Use in Agriculture and Human Resources and Family Studies.** Studies selection and agricultural applications of microcomputer hardware and software; includes instruction and practice in solving data-related problems with microcomputers and general purpose software packages. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Problems in Agricultural Economics.** Individual research work under the supervision of senior members of the staff in the following fields: agricultural credit and finance; agricultural law;

- agricultural marketing; agricultural policy; agricultural prices; farm management; land economics; rural organization; and statistical analysis. Students may receive credit for research in preparing for intercollegiate debating and speaking on problems in agricultural economics when such opportunities exist. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
201. **The World Food Economy.** Examines global food production, consumption, and trade; problems of hunger and population; the role of agricultural development, trade, and aid in relieving hunger. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
 203. **Farm Taxation.** Federal, state, and local taxation with emphasis on their application to farm income, farm property, farm property transfers, and agricultural cooperatives; introductory material on the uses and sources of revenue. 2 hours.
 210. **Economics of Agriculture and the Environment.** Economic issues surrounding agriculture's relationship to the environment, including: water and land use; air and water pollution; waste disposal; chemicals and food safety; property rights; and related government policies. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
 220. **Farm Management.** Economic principles applied to management of farms; budgeting; crop and livestock systems; record analysis; financial management; farm leases; and problems in resource appraisal and business reorganization. Field trip required; see *Timetable* for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. Three hours credit without home farm problem or 4 hours credit with home farm problem. 3 or 4 hours.
 230. **Marketing of Agricultural Products.** Examines factors affecting the size of the market for agricultural products and the scope of marketing activities; functions and services performed; pricing agricultural products, including the nature and causes of price fluctuations; and costs of marketing and efforts to reduce costs and improve the marketing system. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
 250. **Agricultural Economics Internship.** A supervised, off-campus experience in a field directly pertaining to a subject matter in agricultural economics; typically the internship is with an agriculturally-oriented firm or governmental agency. Prerequisite: Junior standing, cumulative grade-point average of 3.4 or above at the time the internship is arranged, and consent of instructor. 1 to 4 hours.
 261. **Agricultural Economic Statistics.** Statistical methods applied to agricultural economics, including descriptive statistics, index numbers, statistical inference, hypothesis testing, sampling, introduction to analysis of variance, linear regression and correlation, multiple regression, time series analysis, and nonparametric methods. Prerequisite: Mathematics 124 or 125. 4 hours. Students may not receive credit for both this course and Economics 172 and 173, Agronomy 340, or Statistics 100.
 301. **Economics of Agricultural Development.** The economics of agricultural development and the relationships between agriculture and other sectors of the economy in developing nations; agricultural productivity and levels of living in the less developed areas of the world; and studies of agricultural development in different world regions including Africa, Asia, and Latin America. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
 302. **Agricultural Finance.** Introduction to agricultural finance including study of financial markets and institutions providing debt and equity capital to agricultural firms, development of skills in applying principles and methods of financial management to agricultural firms. Prerequisite: Agricultural Economics 220 or Accountancy 201, or equivalent. 3 hours or $\frac{3}{4}$ unit.
 303. **Agricultural Law.** Relation of common-law principles and statutory law to land tenure, farm tenancy, farm labor, farm management, taxation, and other problems involving agriculture. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
 304. **Intermediate Agricultural Finance.** Examines finance principles applied to commercial agriculture at an intermediate level; farm financial and investment analysis, risk and liquidity analysis, capital structure and leasing in agriculture; and organization, structure, and analysis of rural financial markets and institutions. Prerequisite: Agricultural Economics 302 and 261, or equivalent. 3 hours or $\frac{3}{4}$ unit.

305. **Agricultural Policies and Programs.** The problems of agriculture as an industry; analysis of past and current federal and state governmental policies and programs affecting agriculture; objectives and development of policies; the use of economic concepts in evaluating possible future agricultural policies and programs; and forces in policy formation. Field trip; see *Timetable* for approximate cost. Prerequisite: Economics 101. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **Rural Real Estate Appraisal.** Same as Soils 312. Valuation methods and value bases of rural real estate; legal aspects of property rights, appraisal theory and procedures, condemnation appraisal, characteristics of the rural land market, soil identification and productivity, and other legal, economic, agronomic, and engineering aspects of real estate valuation. Laboratory field trips, including a practice appraisal; see *Timetable* for approximate cost. Prerequisite: Soils 101 and Agricultural Economics 220, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
317. **Introduction to Natural Resource Economics.** Same as Environmental Studies and Forestry 317. Examines economic aspects of natural resources and their implications for public policy development; discusses economic growth, resource scarcity, property rights, stock vs. flow resources, conservation, investment decisions, discounting, and the institutional framework for decision-making; and applies the above to agricultural problems. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{3}{4}$ unit.
319. **Regional Environmental Management Simulation.** Same as Civil Engineering 341, Environmental Studies 341, Geography 341, and Urban and Regional Planning 375. See Civil Engineering 341.
324. **Decision Making for Farm Operators.** Analyzes decision procedures for common farm operation problems, decision making under uncertainty, control procedures for the farm firm, evaluation of farm investments, and labor management. Prerequisite: Agricultural Economics 220; credit or concurrent registration in Agricultural Economics 302. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Economics of Agricultural Production.** Examines economic theory relevant to the analysis of agricultural production, factor-product, factor-factor, and product-product relationships; technical versus economic efficiency concepts; cost functions, their use and derivation; time in the production process; risk and uncertainty; and the use of mathematical programming in production economic analysis. Prerequisite: Agricultural Economics 261 and 324; Economics 300, Mathematics 134. 3 hours or $\frac{3}{4}$ unit.
326. **Professional Farm Management.** Examines principles of farm management applied to problems of those managing farms for others as a profession; business practices and procedures; professional ethics; relationships with clients and farm operators; division of inputs and returns between owner and operator; and direct operation of farms with hired labor. Case studies and field trips; see *Timetable* for approximate cost. Prerequisite: Credit or concurrent registration in Agricultural Economics 324 or 325. 3 hours or $\frac{3}{4}$ unit.
330. **Economics of Commodity Marketing.** Examines the structure, operations and efficiency of grain and livestock markets; product demand and linkages between grain and livestock; problems in transportation and quality standards; price discovery and market performance; role of world trade and government policy in markets. Prerequisites: Economics 101 and Agricultural Economics 230. 4 hours or 1 unit.
335. **Economics of Food Marketing.** Same as Food Science 335. Economic performance of food system; marketing margins; transportation, processing, advertising, and retailing of food products; structure, conduct, and performance of food marketing firms and industries; government and public interest in the food system. Prerequisite: Economics 101; Agricultural Economics 230 recommended. 4 hours or 1 unit.
338. **Agribusiness Management.** Covers financial analysis, business operations, and management functions of agribusiness firms through the integration of lecture-discussions, field trips to agribusinesses, and a business management game in which the class divides into decision-making teams representing competing firms in an industry. Field trips; see *Timetable* for approximate cost. Prerequisite: Accountancy 200 or 201, and Economics 101 or Agricultural Economics 100. 3 hours or $\frac{3}{4}$ unit.
340. **Commodity Futures Markets and Trading.** Development of futures trading; operation and governance of commodity exchanges; economic functions of futures trading; operational procedures and problems in using futures markets; public regulation of futures trading; evaluation of market performance. Field trips required; see *Timetable* for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{3}{4}$ unit.

342. **Agricultural Prices.** Studies the factors affecting prices of agricultural products: longtime cyclical, seasonal, and other price movements; sources of information relating to production and demand factors; government activities as they relate to prices of agricultural products; and methods and problems in price analysis and forecasting. Prerequisite: Economics 101 and Agricultural Economics 261; or equivalents. 3 hours or $\frac{3}{4}$ unit.
352. **Economic Development in Latin America.** Same as Economics 352. See Economics 352.
353. **Economic Development in India and Southeast Asia.** Same as Economics 353. Analysis of plans and progress toward economic development in India and southeast Asia; economic characteristics of the area and their significance for economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
354. **Economic Development of Tropical Africa.** Same as Economics 354. Types of African economies and growth of the exchange economy; development of natural resources, industry, trade, finance, and education; analysis of economic integration, governmental planning, and development projects; and demographic, land tenure, and institutional influences on development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **International Agricultural Trade.** Examines trends and patterns of exports and imports of major agricultural commodities, and evaluates the economic and institutional factors having a bearing on this trade. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{3}{4}$ unit.
361. **Agricultural Surveys and Statistical Analysis.** Reviews methods of survey statistics used with agricultural producers and others in agriculture; studies survey instruments, interviewing, coding, sample design, sampling, survey statistics, and tests of significance; and includes a class problem survey conducted by students. Field trip to the Illinois Crop Reporting Service; see *Timetable* for approximate cost. 8 week course. Prerequisite: Agricultural Economics 261. 2 hours or $\frac{1}{2}$ unit.
362. **Applications of Regression Models in Agricultural Economics.** Emphasizes the application of single equation regression methods to problems in agricultural economics; techniques include ordinary least squares, maximum likelihood estimators, estimators with heteroskedastic, serially correlated, and multicollinear data; and uses of binary independent variables. Prerequisite: Agricultural Economics 261 and Mathematics 134, or equivalent. 2 hours or $\frac{1}{2}$ unit.
363. **Optimization Methods in Agricultural Economics.** Application of mathematical programming methods to discrete models in agricultural economics; Kuhn-Tucker theorem, Lagrange multipliers, duality, simplex method as applied to linear and quadratic programming, and input-output analysis models in agriculture. Prerequisite: Mathematics 124 and 134. 2 hours or $\frac{1}{2}$ unit.
370. **Family Economics.** Same as Economics 346 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
390. **Advanced Agricultural Marketing.** Examines applied research methodology and topics in risk management; allocational and locational problems; international trade; market structure; consumer demand; product quality; price analysis. Prerequisite: Economics 300; Agricultural Economics 261; and Agricultural Economics 330 or 335. 3 hours or $\frac{3}{4}$ unit.
401. **International Comparative Agriculture.** Agricultural and food problems of the world and of selected countries viewed in the world setting; resources and institutional factors affecting production; and national and international policies and plans for developing agricultural production and improving levels of living. Emphasis is given to a comparative approach to agricultural development of countries on different economic levels. 1 unit.
402. **Agricultural Finance.** Financial planning applied to farms and farm-related firms and sectors; financial aspects of risks and risk management in the food production/distribution system and related financial markets; and cash flow, capital budgeting, and liquidity management. Prerequisite: Agricultural Economics 302 or consent of instructor. 1 unit.
403. **Macro Agricultural Finance.** Analyzes farm sector financial statements, demand and supply of physical and financial assets and liabilities, effects of monetary and fiscal policies on agriculture, and effects of the structure of financial institutions on agriculture. Prerequisite: Agricultural Economics 302 and 362, or equivalent. $\frac{1}{2}$ unit. Offered every other year.
405. **Economic Policies and Programs Affecting Agriculture.** Economic analysis of state, national, and international policies and programs, including proposed legislation having important bearing on the well-being of farm people. Prerequisite: One semester of graduate work or consent of instructor. 1 unit.

406. **Research Methodology in Agricultural Economics.** The use of theory and observations in the formulation and resolution of research problems in agricultural economics, including criteria for choice in modeling options and observational methods. Prerequisite: Economics 300 or 301, or equivalent and Agricultural Economics 362. $\frac{1}{2}$ unit.
425. **Microeconomics of Agricultural Production.** Examines analysis of agricultural production at the enterprise or farm level; theory, estimation, and utilization of response analysis in agricultural production; estimation of firm production functions; evaluation of firm costs and size economies in agriculture; optimal replacement of durable assets; and theory of leasing and utilization of optimization techniques in firm level analysis. Prerequisite: Economics 300, and an introductory knowledge of multiple regression and linear programming. 1 unit.
426. **Macroeconomics of Agricultural Production.** Evaluation of efficiency in the use of agricultural resources at aggregate level; supply response analysis; evaluation of technological change in agriculture; concepts of productivity and capacity of agriculture and their application; externalities resulting from agricultural production; and research approaches to production analysis. Prerequisite: Economics 300 and 301, and an introductory knowledge of multiple regression and linear programming. 1 unit.
436. **Problems in Marketing Agricultural Products.** Examines selected economic problems in marketing agricultural products and discusses relevant theory and empirical methodologies for analyzing and interpreting research results; topics include: operational efficiency in marketing firms and industries; efficient allocation over space, form, and time; price making institutions; and research in demand stimulation and selected issues in trade. Prerequisite: Agricultural Economics 362 and 363, and Economics 400; or equivalent. 1 unit.
437. **Public Issues in Food Marketing.** Analyzes structure and economic behavior in food processing and distribution, including consideration of marketing costs, competition, food safety, consumer protection, and public regulation of the food industries. Prerequisite: Economics 400 or equivalent. 1 unit.
442. **Agricultural Price Analysis.** Studies the methods used to analyze factors affecting agricultural prices; analyzes agricultural prices and price movements with respect to time, space, and form; and examines methods of price forecasting and techniques of time series analysis. Prerequisite: Agricultural Economics 362 or Economics 471, and Economics 400; or equivalent. 1 unit.
461. **Multivariate Techniques in Agricultural Economics.** Basic theory and use of simultaneous systems of equations in agricultural economics, including identification, multipliers, and estimators; principal components, factor analysis, and models with limited dependent variables as these techniques apply to agricultural economics research. Prerequisite: Agricultural Economics 362 or equivalent. $\frac{1}{2}$ unit.
463. **Natural Resource Economics.** Same as Economics, Environmental Studies, and Forestry 463. Emphasizes the role of public policy in natural resource use: theory of allocating renewable and non-renewable natural resources over time; effects of institutions on resource use; causes and consequences of technological change; natural resources and economic growth; and applications of concepts to current natural resource issues. Prerequisite: Economics 300 or equivalent. 1 unit.
464. **Environmental Economics: Theory and Applications.** Same as Economics and Environmental Studies 464. See Economics 464.
470. **Seminar in Family and Consumption Economics.** Same as Family and Consumer Economics 470. See Family and Consumer Economics 470.
491. **Seminar and Special Topics.** All graduate students majoring in agricultural economics must register in the noncredit section of this course. In addition, students may register for credit for individual research or group instruction on special topics under the supervision of one or more staff members. 0 to 2 units.
499. **Thesis Research.** Individual research under supervision of members of the graduate teaching staff in their respective fields. 0 to 4 units.

Rural Sociology

110. **Introduction to Rural Society.** Basic concepts for understanding and analyzing rural society; topics include changes in major rural institutions, impacts of technological change on rural people and communities, demographic patterns and trends, migration, rural minorities and subcultures, the city-countryside relationship, emerging controversies and conflicts in rural areas, and cross-cultural comparisons of rural life. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
270. **Population Issues.** Same as Sociology 270. See Sociology 270.
277. **The Social Context of Agriculture.** Same as Sociology 277. Study of agriculture as it shapes and is affected by changes in society; topics include U.S. agriculture and its consequences for society, agricultural development in third world countries, food and hunger, and agriculture and environmental problems. Prerequisite: Sociology 100, Rural Sociology 110, or Agricultural Economics 100. 3 hours.
343. **Social Change in Developing Areas.** Same as Sociology 343. Description and analysis of recent social and cultural changes occurring in new nations and developing economies; special attention given to problems of traditional social structure undergoing modernization; and social factors in economic growth, caste and class, nation-building, urbanization and population composition, education, family, and religion. Prerequisite: Sociology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
344. **Social Impact Assessment.** Same as Environmental Studies and Leisure Studies 344. See Environmental Studies 344.
346. **Energy, Environment, and Society.** Same as Environmental Studies 346. See Environmental Studies 346.
378. **Sociocultural Factors in African Economic Development.** Same as Anthropology 378. See Anthropology 378.
407. **Techniques in Demographic Analysis.** Same as Sociology 407. See Sociology 407.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Landscape Architecture, Leisure Studies, and Urban and Regional Planning 440. See Environmental Studies 440.
477. **Seminar on Community Organization.** Same as Sociology 477. See Sociology 477.
487. **Special Problems in Rural Sociology.** Same as Sociology 487. Prerequisite: One unit of graduate credit in sociology; consent of instructor. $\frac{1}{2}$ or 1 unit.

AGRICULTURAL ENGINEERING

(Including Agricultural Mechanization)

Head of Department: Roscoe L. Pershing

Department Office: 338 Agricultural Engineering Science Building, 1208 West Peabody, Urbana

Agricultural Engineering

100. **Introduction to Agricultural Engineering.** Introduction to Agricultural Engineering discipline and career opportunities; class activities include familiarization with the laboratories, computer facilities, and network software available to Agricultural Engineering students. Classes emphasize and practice technical communication and problem solving skills as well as career planning. 1 hour.
126. **Engineering in Agriculture.** The role of agricultural engineering in the development and use of water and soil resources, diesel engine dynamometer testing, field equipment operations and calibrations, electric motors and controls, biosensors, psychrometrics, crop drying and storage, bin loads, structural beam and column design, ventilation, heat loads, solar energy,

- food engineering topics, and microcomputer simulations and spreadsheet usage. Prerequisite: Credit or concurrent registration in Mathematics 120. 4 hours. Students may not receive credit for both Agricultural Mechanization 100 and Agricultural Engineering 126.
127. **Production Systems in Agriculture.** Mathematical models of equipment performance; analysis of operational, power, weather, and economic constraints; and elementary design of equipment systems using concepts of probability and optimization. Prerequisite: Agricultural Engineering 126 and credit or concurrent registration in Computer Science 101. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
236. **Machine Characteristics and Mechanisms.** Design and development concepts of agricultural and industrial machines; analysis and synthesis of tillage, planting, harvesting, and material handling mechanisms. Includes laboratory. Includes laboratory. Prerequisite: Agricultural Engineering 127 and Theoretical and Applied Mechanics 212. 3 hours.
256. **Surveying Agricultural and Forest Lands.** Same as Forestry 256. Basic surveying procedures as applied to practices in soil and water conservation engineering, forest management, and forest engineering; water routing design. Includes laboratory. Prerequisite: Mathematics 114 and sophomore standing. 3 hours.
277. **Design of Agricultural Structures.** Design of timber, concrete, and steel agricultural structures; engineering properties of wood, concrete, and steel materials; design of compression members, tension members, beams, and connections; complete design of a few structural frames. Includes laboratory. Prerequisite: Credit or concurrent registration in Civil Engineering 261. 3 hours.
287. **Environmental Control for Plants and Animals.** Application of engineering and biological principles to controlling agricultural building environments. Design of environments to meet specific biological requirements are developed through the integration of fluids and thermodynamics principles for environmental control with the properties of animals and plants and their related biological needs. Includes laboratory. Prerequisite: Agricultural Engineering 127. 3 hours.
296. **Honors Project.** A special problem in engineering is selected for bibliographical, theoretical, and/or experimental research. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
298. **Undergraduate Seminar.** Professional engineering concepts; design methods; preparation and presentation of an undergraduate design thesis proposal. Thesis to be completed in Agricultural Engineering 299. Field trip. Prerequisite: Junior standing in engineering. 1 hour.
299. **Undergraduate Thesis.** The agricultural engineering problem selected in Agricultural Engineering 298 is investigated and a detailed engineering report is prepared. Prerequisite: Agricultural Engineering 298; senior standing in engineering. 2 to 4 hours.
311. **Instrumentation and Measurements.** Static and dynamic measurements; design of measurement systems; error and noise control; analog and digital signal processing; telemetry; measurement of agricultural and biological quantities. Prerequisite: Electrical Engineering 220 or 260. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. (Credit for optional lab is 1 hour or $\frac{1}{4}$ unit.) Credit is not given for both Agricultural Engineering 311 and either General Engineering 234 or Mechanical Engineering 261.
336. **Design of Agricultural Machinery.** Design projects which utilize the principles of machine design, engineering analysis, and functional operation of machinery systems; projects are selected, concepts visualized and tested, and design layouts made; emphasizes unique aspects of agricultural machinery design in selection of drive trains and material conveyors and in weldment design. Includes laboratory. Prerequisite: Agricultural Engineering 236; credit or concurrent registration in Mechanical Engineering 270. 3 hours or $\frac{3}{4}$ unit.
340. **Introduction to Applied Statistics.** Same as Agronomy, Animal Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
345. **Statistical Methods.** Same as Animal Science and Forestry 345. See Animal Science 345.
346. **Tractors and Prime Movers.** Engineering aspects of design and application of tractors for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; operator environment. Includes laboratory. Prerequisite: Mechanical Engineering 209 or equivalent. 3 hours or $\frac{3}{4}$ unit.
356. **Soil and Water Conservation Structures.** Hydrology, hydraulics, design, construction and cost estimating of structures for the conservation and quality control of soil and water

- resources; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality control of soil and water for agriculture. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **Land Drainage.** Design, construction, performance, and maintenance of surface, subsurface, and open ditch agricultural drainage systems. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $\frac{3}{4}$ or 1 unit.
383. **Engineering Properties of Food Materials.** Physical properties of foods and biological materials; design of processing equipment and the sensing and control of food processes; thermal, electromagnetic radiation, rheological, and other mechanical properties. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 and Chemical Engineering 371; or Theoretical and Applied Mechanics 221, Theoretical and Applied Mechanics 235, and Mechanical Engineering 209 or Mechanical Engineering 213; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
387. **Grain Drying and Conditioning.** Psychrometric principles of air modification for dehydration and conditioning of moist products, emphasizing the drying of cereal grains; design of drying, cooling, and aeration systems. Includes laboratory. Prerequisite: Agricultural Engineering 127 or consent of instructor; Mechanical Engineering 209 recommended. 3 hours or $\frac{3}{4}$ unit.
396. **Special Problems.** Individual investigation and report of any phase of agricultural engineering approved by the department. Prerequisite: Senior standing in engineering. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 16 hours or 4 units.
400. **Research Orientation.** Discussion of the philosophy and methods of research thesis preparation, and publication of research findings in Agricultural Engineering. 0 units.
434. **Computer Aided Kinematics.** Advanced study of kinematic and driving constraints, singular configurations of mechanical systems, constrained two dimensional motion of multi-body systems and the dynamic response of those systems; emphasis on modeling and numerical techniques for simulating machines and machine components. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 345 or equivalent; and Theoretical and Applied Mechanics 314 or consent of instructor. 1 unit.
436. **Dynamics of Farm Machine Elements.** Advanced study of the dynamics of farm machine elements with specific reference to functional operation, stresses, and fatigue life. Includes laboratory. Prerequisite: Agricultural Engineering 236 and 336, or equivalent. 1 unit.
490. **Seminar.** Presentation and discussion of current research and literature in agricultural engineering. $\frac{1}{4}$ unit.
496. **Topics in Agricultural Engineering.** Individual investigations or studies of any phases of agricultural engineering selected by the student and approved by the advisor and the faculty member who will supervise the study. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 4 units.
499. **Thesis Research.** 0 to 4 units. May be repeated.

Agricultural Mechanization

100. **Engineering Applications in Agriculture.** Examples, problems, discussions, and laboratory exercises pointing to present and potential engineering applications in agriculture; emphasis on farm power and machinery, soil and water control, farm electrification, and farm structures. Includes laboratory. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Agricultural Mechanics Shop: Construction Technology.** Selection, use, and maintenance of hand and power tools; shop safety; selection of building and roofing materials; concrete masonry construction; farm surveying. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
202. **Welding Processes, Metallurgy, and Materials.** Selecting and using metal-arc, inert-gas, submerged arc, oxyacetylene welding and cutting processes for construction and maintenance

- of agricultural equipment. Includes laboratory. See *Timetable* for materials charge. Prerequisite: Chemistry 101; junior standing or consent of instructor. 3 hours.
203. **Electric Wiring, Motors, and Controls.** Selecting and using wiring materials, electric motors and controls in agricultural lighting, heating, ventilation, and materials handling problems. Includes laboratory. See *Timetable* for materials charge. Prerequisite: Physics 140 or Agricultural Mechanization 100; junior standing or consent of instructor. 3 hours.
221. **Farm Power and Machinery Management.** Performance, costs, application, selection, and replacement of farm tractors and field implements; optimization of mechanized agricultural field operations. Includes laboratory. Prerequisite: Agricultural Mechanization 100. 4 hours.
250. **Agricultural Mechanization Internship.** Supervised off-campus learning experience with a business firm engaged in production or technological service to agriculture. Prerequisite: Junior standing with a 3.0 cumulative grade point average; Agricultural Mechanization 221, 252, 272, or 281; and consent of the coordinator of program. 2 hours.
252. **Mechanics of Soil and Water Conservation.** Principles of planning, constructing, and adapting soil conservation and drainage practices for Illinois farms, and the application of surveying to these practices. Includes laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
271. **Engineering Applications in Residential Housing.** Same as Family and Consumer Economics 276 and Interior Design 271. Study of principles and practices in residential housing; space planning, house types, structures, materials, utilities, environmental control, energy conservation, remodeling, and economic influences. Prerequisite: Interior Design 160, Agricultural Mechanization 100, or consent of instructor. 3 hours.
272. **Farm Buildings.** Planning principles for agricultural storage buildings and animal housing; building space planning, structural designs, ventilating systems, construction materials, costs, and livestock waste systems; includes laboratory. Prerequisite: Agricultural Mechanization 100 or 200, or consent of instructor. 3 hours.
281. **Grain Drying, Handling, and Storage.** Grain drying fundamentals, air-moisture relationships, grain drying systems for efficient energy use, fans, grain-handling devices and systems, planning of grain handling systems, grain standards, moisture measurement, grain storage, fungi and insect problems, aeration, processing and milling of corn and soybeans. Includes laboratory. Prerequisite: Junior standing. 3 hours.
299. **Agricultural Mechanization Seminar.** The role of the mechanization of agriculture in society and the part of the individual graduate in this role; directed toward the study of the interplay of developments in agriculture and agricultural mechanization; topics selected from technical and popular journals. A tour of farms, industry, and business is required. Prerequisite: Junior standing. 1 hour.
300. **Special Problems.** A technical agricultural problem is selected for study, investigation, and report, wherein a satisfactory solution does not require a background of engineering education. Prerequisite: Minimum grade point average of 3.5; consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
331. **Farm Machinery Technology.** The role of forces, motions, and strengths in the operation and performance of common farm machinery mechanisms; study of mechanism illustrations, machinery testing, service problems, and other aspects of the equipment distribution industry. Includes laboratory. Prerequisite: Physics 101 recommended. 4 hours or 1 unit.
333. **Agricultural Chemical Application Systems.** Hydraulic principles; liquid application systems including pumps, controls, and agricultural spray nozzles; granular application systems; safe storage, handling, and disposal of pesticides and fertilizers; federal and state legal requirements. Includes laboratory. Prerequisite: Agricultural Mechanization 221, or Agronomy 326, or Horticulture 242 or 262, or Plant Pathology 305 or 377, or Entomology 319 or 322. 3 hours or $\frac{3}{4}$ unit.
341. **Engine and Tractor Power.** Construction, performance and maintenance of internal combustion engines, power trains, and hydraulic systems for powered equipment; methods and equipment for performance testing. Includes a laboratory. Prerequisite: Agricultural Mechanization 221 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
372. **Livestock Waste Management.** Principles and practices of managing wastes from livestock production facilities; includes collection, storage, transport, runoff control, odor control,

aerobic and anaerobic treatment, utilization, crop nutrients, animal nutrients, fuels, and regulations. Prerequisite: Junior standing and one 200-level animal production course. 3 hours or $\frac{3}{4}$ unit.

- 381. Electrical and Microcomputer Controls for Agriculture.** Microcomputer and electrical control applications; electrical fundamentals; solid-state devices; relays; sensors; motor types and characteristics; three-phase power; logic devices; analog/digital convertors; single-board microprocessors and interfacing for agricultural control applications. Includes laboratory. Prerequisite: Agricultural Mechanization 100; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

AGRICULTURE

Program Administrator: W. R. Gomes

Program Office: 104 Mumford Hall, 1301 West Gregory, Urbana

- 100. Agriculture in Modern Society.** Analysis of agriculture in contemporary society and introduction to problems and challenges related to agriculture; includes a brief orientation to the University and the College of Agriculture. Required of all freshmen in agriculture. 1 hour.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Human Resources and Family Studies 268. Introduction to the organization, philosophy, financing, personnel, clientele, and programs of cooperative extension. Prerequisite: A course in the principles of psychology or sociology or consent of instructor. 3 hours.
- 269. Cooperative Extension: Summer Experience.** Same as Human Resources and Family Studies 269. Field experience to provide opportunity for students to become acquainted with the roles of county personnel, office organization, and programs in cooperative extension. A living allowance is paid to students during the course. Prerequisite: Agriculture 268 or consent of instructor. 4 hours. Offered in the summer session only.
- 298. International Experience.** Same as Human Resources and Family Studies 298. An international experience in agriculture or home economics related areas involving foreign travel and study without enrollment in another institution. Experience must be planned and approved in advance through consultation with a College of Agriculture faculty member. Prerequisite: Written consent of instructor; junior standing; not open to students on probation. 1 to 4 hours.
- 299. Agriculture Study Abroad.** Provides campus credit for study at accredited foreign institutions. Final determination of credit granted is made upon the student's successful completion of work. Prerequisite: Consent of major department, college, and Study Abroad Office. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 36 hours within one calendar year.
- 350. Education for Rural Development in Low Income Countries.** Same as Vocational and Technical Education 350. See Vocational and Technical Education 350.
- 369. Educational Programs in Cooperative Extension.** Same as Human Resources and Family Studies 369. The design and development of informal educational programs for youth and adults in an out-of-school setting. Prerequisite: Agriculture 268 or consent of instructor. 3 hours or 1 unit.

AGRONOMY

(Including Soils)

Acting Head of Department: C. M. Brown

Department Office: W-201 Turner Hall, 1102 South Goodwin, Urbana

Agronomy

121. **Principles of Field Crop Science.** An introductory course; kinds, origin, taxonomy, morphology, and physiological and ecological bases of growth, reproduction, improvement, and utilization of corn, soybeans, small grains, forage crops, and sorghums; cropping and tillage practices and principles; and field-crop production hazards. 4 hours.
190. **Field-Crop Scouting.** Workshop on the scouting of field crops for major pests and physiological problems; identification of major weeds, diseases, and insects of field crops. Lecture and lab. 1 hour. Offered during spring break.
220. **Plant and Animal Genetics.** Same as Animal Science 220 and Horticulture 220. The principles of heredity in relation to plant and animal improvement. Prerequisite: Biology 110 and 111, or Plant Biology 100 and Biology 104. 4 hours.
290. **Undergraduate Agronomy Seminar.** The course includes reports and discussions of crops and soils research. Prerequisite: Senior standing. 1 hour.
299. **Undergraduate Thesis.** Individual research problems in agronomy under the direction of a faculty member in agronomy. Normally the student enrolls during the summer between the junior and senior years and during the fall semester of the senior year, or during both semesters of the senior year. Recommended for those who plan to do research and/or graduate study. Thesis problems should be discussed with the supervising faculty member in the semester preceding enrollment and must be approved by the Agronomy Undergraduate Thesis Committee before enrollment. An approved thesis must be presented for credit to be given. Prerequisite: Junior standing; minimum grade-point average of 4.0; consent of instructor. 2 to 5 hours. A maximum of 5 hours may be counted toward graduation.
300. **Advanced Special Problems.** Individual problems in crops or soils. Graduate students majoring in agronomy do not receive graduate credit. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor. Approval of the agronomy teaching coordinator is required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours, or $\frac{1}{4}$ to 2 units.
318. **Crop Growth and Production.** Crop production and management as influenced by environment, plant species, and cropping system; relates plant growth processes to management practices. Prerequisite: Soils 101 and Agronomy 121 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
319. **Environment and Plant Ecosystems.** Same as Environmental Studies and Forestry 319. See Forestry 319.
321. **Biological Control of Insect Pests.** Same as Entomology 321. See Entomology 321.
322. **Forage Crops and Pastures.** Forages, their plant characteristics, ecology, and production; grasslands of farm and range as related to animal production and soil conservation. Prerequisite: Agronomy 121. 3 hours or $\frac{3}{4}$ unit.
323. **Principles of Plant Breeding.** Same as Horticulture 323. Genetic and cytological variation in crop plants; the production and control of such variation in developing varieties and hybrids; and the maintenance of high quality seed stocks. Field trips; see *Timetable* for approximate cost. Prerequisite: Plant Biology 100; Agronomy 220 or equivalent. 4 hours or 1 unit.
324. **Plant Breeding Methods.** Discussion of the application of current scientific tools and methods available to plant breeders for improving plants; emphasis on actual use of plant breeding methods and production of high quality seed. Field trip; see *Timetable* for estimated cost. Offered Summer Session only. Prerequisite: Agronomy 323. 2 hours or $\frac{1}{2}$ unit.

326. **Weeds and Their Control.** Methods of introduction, dissemination, reproduction, and control of weeds; includes laboratory discussion. Prerequisite: Agronomy 121 or Horticulture 100. 3 hours or $\frac{3}{4}$ unit.
330. **Plant Physiology.** Same as Plant Biology 330. See Plant Biology 330.
332. **Genetic Toxicology.** Same as Biology 332 and Environmental Studies 332. See Environmental Studies 332.
333. **Plant Physiology Laboratory.** Same as Plant Biology 333 and Horticulture 333. See Plant Biology 333.
336. **Perennial Grass Ecosystems.** Same as Horticulture 336. See Horticulture 336.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Animal Sciences, Food Science, Forestry, and Horticulture 340. Statistical methods involving relationships between populations and samples; collection, organization, and analysis of data; and techniques in testing hypotheses with an introduction to regression, correlation, and analysis of variance limited to the completely randomized design and the randomized complete-block design. Prerequisite: Mathematics 104, 112, or equivalent. 4 hours or $\frac{3}{4}$ unit.
368. **Biological Modeling.** Same as Biology 368 and Geography 368. See Geography 368.
377. **Diseases of Field Crops.** Same as Plant Pathology 377. See Plant Pathology 377.
400. **Seminar.** Discussions of current literature in crops and soils. Required of all graduate majors in agronomy. Prerequisite: Graduate standing. 0 or $\frac{3}{4}$ unit.
418. **Crop Growth and Development.** Study of the physiological processes involved in growth and development of crop plants and the interaction of physiological processes and the environment that influences productivity. Prerequisite: Agronomy 318 or 330. 1 unit.
422. **Forage Quality and Utilization.** Nutritional chemistry of forage plants and the genetic, environmental, and post-harvest factors that influence it. Emphasis placed in the evaluation of forage quality using laboratory methods and feeding experiments. Offered in alternate years. Prerequisite: Agronomy 322 and Biochemistry 350. 1 unit.
423. **Cytogenetic and Evolutionary Basis of Plant Breeding.** Nature and origin of crop species; genetic and cytogenetic basis for developing special plant materials and the use of such materials in breeding programs; and emphasis on discontinuous variation. Prerequisite: Agronomy 323 or equivalent, or consent of instructor. 1 unit.
424. **Plant Biochemistry.** Same as Plant Biology 424 and Horticulture 424. Enzymes and pathways involved in plant intermediary metabolism. Basic cell physiology, bioenergetics, and hormonal regulation of metabolism. Prerequisite: Plant Biology 330 and Biochemistry 350. 1 unit. Offered in alternate years.
425. **Membrane Transport and Mineral Nutrition in Plants.** Same as Horticulture and Plant Biology 425. Consideration of biochemical mechanisms for solute movement across plant cell membranes as related to nutrient acquisition, assimilation, and partitioning. Prerequisite: Agronomy 330; Biochemistry 350 recommended. $\frac{3}{4}$ unit. Offered in alternate years.
426. **Herbicide Behavior in Plants.** Study of the various chemicals used to inhibit plant growth, including mode of action, mechanisms of selective toxic action, relationship of chemical structure to toxicity, and fate and behavior in soils. Offered in alternate years. Prerequisite: Agronomy 330 and 326. 1 unit.
431. **Plant Cell Metabolism.** Same as Biology, Forestry, Horticulture, and Plant Pathology 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Biology, Forestry, Horticulture, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Biology, Forestry, Horticulture, and Plant Pathology 433. See Biology 433.
434. **Regulation of Plant Development and Reproduction.** Same as Biology, Forestry, Horticulture, and Plant Pathology 434. See Biology 434.
440. **Design and Analysis of Biological Experiments.** Statistical methods as tools for research; principles of designing experiments and methods of analysis for various kinds of designs, including factorial experiments, are considered from the viewpoint of when and how to use them. Prerequisite: Agronomy 340 or equivalent. $\frac{3}{4}$ unit.
441. **Advanced Design and Analysis of Biological Experiments.** Same as Animal Sciences 441. Design and analysis of complex experiments; considers confounded factorials, lattices, and other incomplete block designs in terms of their characteristics, usefulness in biological research,

- and methods of analysis; and computational aspects of both regression and analysis of variance. Prerequisite: Agronomy 440 or equivalent. $\frac{3}{4}$ unit. Offered in alternate years.
442. **Environmental Plant Physiology.** Same as Plant Biology 442. See Plant Biology 442.
444. **Quantitative Aspects of Plant Breeding.** Studies the theoretical bases for plant breeding procedures with special emphasis on the relationship between type and source of genetic variability, mode of reproduction, and effectiveness of different selection procedures. Prerequisite: Agronomy 323 and 440, or equivalent. 1 unit.
445. **Biochemical Genetics of Higher Plants.** The biochemical description of genetic phenomena including genetic systems, mutagenesis, selection methods, mutant characterization, evolution, maternal inheritance, ploidy, heterosis, tumors, and tissue culture genetics. Prerequisite: Agronomy 220 and Biochemistry 350, or equivalent. 1 unit. Offered in alternate years.
446. **Plant Gene Regulation.** Same as Forestry 446 and Horticulture 436. Current topics and literature concerning the function and regulation of higher plant genes with particular emphasis on transposable elements, their effect on gene expression and variation, and uses in gene tagging; the developmental, tissue specific, or environmental regulation of plant genes; use of genetic engineering to explore the regulation of plant genes or to alter traits of agricultural importance. Prerequisite: Agronomy 220, Biochemistry 350, or consent of instructor. $\frac{1}{2}$ unit. Offered first half of semester.
447. **Gene Expression During Seed Development.** Same as Forestry 447 and Horticulture 437. Comprehensive examination of current knowledge of gene expression and macromolecule synthesis in the developing plant seed; emphasis on: genetic control of synthesis and accumulation of storage reserves, aspects of gene structure and expression, and structural organization of proteins and carbohydrates at the subcellular level. Prerequisite: Agronomy 220, Biochemistry 350, or consent of instructor. $\frac{1}{2}$ unit. Offered first half of semester.
493. **Advanced Studies in Agronomy.** Directed and supervised detailed study of selected problems or topics. Prerequisite: Consent of instructor. Study may be in any one of the following fields: (a) soil chemistry; (b) soil fertility; (c) soil physics; (d) soil classification and pedology; (e) soil mineralogy; (f) soil microbiology; (g) plant breeding and genetics; (h) plant physiology; (i) weed control; (j) crop morphology; (k) crop production and ecology; or (l) statistical techniques and data processing. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

Soils

101. **Introductory Soils.** The nature and properties of soil including origin, formation, and biological, chemical, and physical aspects. Prerequisite: Chemistry 100 or equivalent. 4 hours.
301. **Soil Survey with Emphasis on Illinois Soils.** Properties and methods used in distinguishing soils; characteristics and distribution of different soils in Illinois; and the cause of these differences and their influence upon proper soil use and management. Laboratory work includes instruction in mapping soils and the use of soil maps, and field trips to examine representative soils. See *Timetable* for approximate cost. Prerequisite: Soils 101 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
302. **Soil Testing Practicum.** Chemical procedures useful in assessing soil/plant relationships for field crops; involves lectures on agronomic principles, field work on sampling, and laboratory time to perform soil tests, interpret the analytical results, and formulate a nutrient management program. Field trip; see *Timetable* for approximate cost. Prerequisite: Soils 101. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. 3 hours or $\frac{3}{4}$ unit credit requires additional laboratory work and consent of instructor.
303. **Soil Fertility and Fertilizers.** Factors affecting the supply of available major, secondary, and minor elements in soils and their influence on crop production; evaluating fertilizer and lime needs; and fertilizer manufacture, sources, and application methods. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
304. **Soil Conservation and Management.** Application of principles of soil conservation and management to the solution of land-use problems; influence of soil characteristics on erosion con-

- trol, cropping intensity, water management, and land-use planning. Field trip; see *Timetable* for approximate cost. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
305. **Biochemical Processes in Soil and Water Environments.** Metabolic processes leading to chemical transformations in soil and water environments; implications for soil fertility and environmental pollution. Prerequisite: Microbiology 100; Chemistry 102. 3 hours or $\frac{3}{4}$ unit.
307. **Soil Chemistry.** Emphasizes the inorganic reactions involved in soil development and plant nutrition in soils; topics discussed include colloid systems, properties of water, ion exchange equilibria, plant nutrient forms, and methods of analyses. Prerequisite: Soils 101; Chemistry 102. 3 hours or $\frac{3}{4}$ unit.
308. **The Physics of the Plant Environment.** The physics of transport processes in the soil and aerial environment of plants; exchanges of energy and gases in crop canopies and the retention of flow of water, gases, solutes, and heat in soils. Prerequisite: Physics 101 or 106; one semester of calculus; and Soils 101 or consent of instructor. 4 hours or 1 unit.
311. **Laboratory Methods for Soils Research.** Uses traditional wet chemical and instrumental techniques in the characterization of soil properties; includes atomic absorption spectroscopy, gas chromatography, specific ion electrodes, and other techniques in the study of soils. Lecture and laboratory. Prerequisite: Soils 101 and Chemistry 102. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
312. **Rural Real Estate Appraisal.** Same as Agricultural Economics 312. See Agricultural Economics 312.
313. **Soil Mineralogy.** Description and identification of common soil minerals and weathering of minerals; relationships of soil mineralogy to soil development, plant and animal ecology, and agricultural and technological use of soil. Prerequisite: Soils 101; Geology 101 or 107. 3 hours or $\frac{3}{4}$ unit.
402. **The Chemistry of Soil Fertility.** The chemistry of the essential plant nutrients in soils, their reactions, and their quantitative relationship to plant growth. Prerequisite: Soils 101; Chemistry 122. 1 unit. Offered in alternate years.
403. **Genesis, Morphology, and Classification of Soils.** Historical review of soil genesis and classification; morphology and genesis of diagnostic soil horizons and features; soil genesis processes and reactions; classification of soils; and characteristics, geography, and production potentials of major soil groups of the world. Prerequisite: Soils 301 or consent of instructor. 1 unit. Offered in alternate years.
411. **Soil Physics.** The derivation and application of the fundamental physical principles and laws which govern the behavior of soils; emphasis on transport phenomena and physical characteristics of soils. Prerequisite: Mathematics 345, Soils 308, or consent of instructor. 1 unit. Offered in alternate years.
412. **Soil Organic Matter.** Basic considerations in organic matter transformation; geochemistry of organic matter; nature and origin of humic substances; and reactions of organic matter in soils and sediments. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
414. **Physical Chemistry of Clays and Soils.** Same as Mining Engineering 414 and Ceramic Engineering 414. The application of physical-chemical principles and concepts to surfaces and adsorption on surfaces; emphasis on silicate surfaces and water adsorption. Prerequisite: Chemistry 245 or 344, or consent of instructor. 1 unit. Offered in alternate years.

AIR FORCE AEROSPACE STUDIES

Head of Department: Bernd McConnell

Department Office: 223 Armory Building, 505 East Armory, Champaign

102. **Leadership Laboratory.** Prerequisite: Concurrent registration in any Air Force Aerospace Studies course, or consent of professor of aerospace studies. No credit. May be repeated.
111. **The Air Force Role in National Security, I.** First-year survey designed to familiarize the student with the organization and mission of the U.S. Air Force and its relation to the total defense structure; examines resources and functions of the United States strategic forces,

general-purpose forces, and aerospace support organizations. Prerequisite: Concurrent registration in Air Force Aerospace Studies 102. 1 hour.

112. **The Air Force Role in National Security, II.** Continuation of Air Force Aerospace Studies 111. Examines resources and functions of United States, general-purpose military forces. Examines related field, such a defense policy, terrorism, flight, and military facilities. Prerequisite: Air Force Aerospace Studies 111 or consent of instructor, and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
121. **The Development of U.S. Air Power, I.** Introduces the history of the development of air power: the impact of technology, politics, controversy, and military conflict on the evolution of doctrine and concepts for military air power from man's first flights through the organization of a separate Air Force in 1947. Prerequisite: Air Force Aerospace Studies 112 or consent of professor of aerospace studies; and concurrent registration in Air Force Aerospace Studies 102. 1 hour.
122. **The Development of U.S. Air Power, II.** Introduces the history of U.S. air power since 1947: the peaceful uses of air power; the doctrine, concepts and role of U.S. air power in conflicts since 1947 through the international significance of the U.S. Air Force today. Prerequisite: Air Force Aerospace Studies 121 or consent of professor of aerospace studies; and concurrent enrollment in Air Force Aerospace Studies 102. 1 hour.
231. **Leadership and Management for the Professional, I.** Studies communication skills and their application in the Air Force; the human element in the work and military environment; management principles; problem solving; and management tools, practices, and controls. Prerequisite: Air Force Aerospace Studies 111, 112, 121, and 122, or consent of professor of aerospace studies; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
232. **Leadership and Management for the Professional, II.** Continuation of Air Force Aerospace Studies 231. Studies military leadership and management fundamentals using case studies to examine Air Force leadership/management situations; ethical theory and its application to the military environment; and the meaning of professionalism and professional responsibilities. Prerequisite: Air Force Aerospace Studies 231, or consent of professor of aerospace studies; and concurrent registration in Air Force Aerospace Studies 102. 3 hours.
241. **National Security Forces in Contemporary American Society, I.** Studies the military as a profession; military ethics; civil-military interaction; laws of armed conflict; the actual use of governmental and military power, the evolution of National Security Policy in the U.S.; the actors from military to Congress and the President, in the making of foreign policy and security policy; development of strategy; DOD planning/ budgeting; effective communication in the Air Force. Prerequisite: Air Force Aerospace Studies 232, or consent of professor of aerospace studies. 3 hours.
242. **National Security Forces in Contemporary American Society, II.** Indepth study of military justice system; Air Force organization and policy decision making system; Air Force operations organizations; acquisition systems; new officer orientation; effective communication techniques for Air Force officers. Prerequisite: Air Force Aerospace Studies 241 or consent of professor of aerospace studies. 3 hours.

ANIMAL SCIENCES

Acting Head of Department: David H. Baker

Department Office: 328 Mumford Hall, 1301 West Gregory, Urbana

100. **Introduction to Animal Sciences.** A survey of beef and dairy cattle, companion animals, horses, poultry, sheep, and swine. Includes the importance of product technology and the basic principles of nutrition, genetics, physiology, and behavior as they apply to breeding, selection, feeding, and management. Lecture and lab. 4 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students. 4 hours.
106. **Introduction to Horses.** Introductory class for non-Animal Sciences majors and Animal Sciences majors not in the Companion Animal Specialization; provides information for

students interested in horses and who have a primary species interest not related to companion animals; elementary material for students with a casual or recreational interest in horses; topics include gaits, breeds, uses, equipment, feeding, housing, and health care. 2 hours. Students may not receive credit for both Animal Sciences 106 and 206.

109. **Meat Purchasing and Preparation.** A general approach to meat utilization with emphasis on selecting, grading, cutting, and pricing meat for the home, restaurant, and food service industry; includes laboratory. When appropriate, field trips are taken to area commercial establishments; see *Timetable* for approximate cost. 2 hours. Offered in alternate years.
119. **Meat Technology.** Student participation in the transformation of live animals through slaughter and carcass fabrication into food products for human consumption; includes laboratory. Purchase of personal equipment and a field trip are required; see *Timetable* for approximate cost. Prerequisite: Consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Individual research in animal science. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor and head of department. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
201. **Principles of Dairy Production.** Surveys the dairy industry; examines principles of breeding, selection, reproduction, feeding, milking and management dairy cattle. Prerequisite: Animal Sciences 100. 3 hours.
202. **Domestic Animal Physiology.** A study of the basic physiology of domestic animals in relation to husbandry practices. Prerequisite: Animal Sciences 100 or one semester of animal biology, or equivalent. 4 hours.
203. **Behavior of Domestic Animals.** Same as Ecology, Ethology, and Evolution 203. Introduction to concepts of animal behavior with emphasis on domestic animals; lecture and lab. Prerequisite: Biology 104 and Animal Sciences 100, or equivalent. 3 hours. Credit is not given for both Animal Sciences 203 and Ecology, Ethology, and Evolution 346.
204. **Dairy Cattle Evaluation.** Evaluation of physical traits of dairy cattle in relation to economic value and genetic improvement; sire selection, mating systems, and breed families in relation to the organization of genetic improvement programs for dairy cattle; and lecture and laboratory. Prerequisite: Animal Sciences 100 or consent of instructor. 3 hours.
206. **Horse Management.** Focus on the principles of managing horses from birth through breeding; topics include reproductive physiology, breeding management, nutrition, diseases, parasites, herd health programs, genetics, facility design and exercise physiology. Prerequisite: Animal Sciences 220, 231, and credit or concurrent registration in Animal Sciences 221. 3 hours. Students may not receive credit for both Animal Sciences 106 and 206.
207. **Companion Animal Management.** Biological management of companion animals emphasizing the dog and cat as well as others such as the rabbit, the bird, and fish; subject matter includes anatomy, breeds and breed types, selection, nutrition, reproduction, genetics, training, health and disease, equipment needs, and showing of small animals. 3 hours.
209. **Meat Animal and Carcass Evaluation.** Principles and techniques of meat animal and carcass evaluation and their relationship to current practices in industry; includes demonstrations and student participation. Students planning to enroll in Animal Sciences 210 and 212 should take Animal Sciences 209 in their sophomore year. Prerequisite: Animal Sciences 100. 3 hours.
210. **Meat Selection and Classification.** Characteristics associated with the value of carcasses and wholesale cuts from meat animals; grading and classification. Field trips to meat packing plants are required; see *Timetable* for approximate cost. Prerequisite: Animal Sciences 209. 2 hours.
211. **Breeding Animal Evaluation.** The application of current scientific tools, methods, and performance programs available to livestock breeders for improving beef cattle, swine, sheep, and horses; emphasis on the changing nature of modern breeds of livestock as influenced by selection, economics, and consumer and market trends. Prerequisite: Sophomore standing; credit or concurrent registration in Animal Sciences 209 required for the food animal section only. 3 hours.

212. **Advanced Livestock Evaluation.** Advanced instruction in evaluating meat animals for slaughter and selection of breeding animals; laboratory-discussion. Prerequisite: Animal Sciences 211 or consent of instructor. 3 hours.
213. **Horse Appraisal.** Advanced course for students interested in improving their performance and conformation evaluation skills; provides exposure to the horse show industry and the career opportunities associated with this facet of the horse industry; students may compete in intercollegiate judging contests. Prerequisite: Animal Sciences 211. 1 hour. May be repeated to a maximum of 2 hours.
220. **Plant and Animal Genetics.** Same as Agronomy 220 and Horticulture 220. See Agronomy 220.
221. **Animal Nutrition.** Principles of animal nutrition and their application to farm livestock and man. Credit is not given for both Animal Sciences 221 and 325. Prerequisite: Chemistry 102 or equivalent. 4 hours.
231. **Comparative Physiology of Reproduction, Lactation, and Growth.** Introduces the growth, reproduction, and lactation of domestic animals with application to livestock production. Prerequisite: One course in animal biology, and Animal Sciences 100. 3 hours.
250. **Animal Sciences Internship.** Supervised off-campus learning experience in a dairy-related enterprise. Prerequisite: Junior standing in animal sciences or agricultural sciences with animal sciences emphasis; good academic standing; consent of department head; Animal Sciences 100 and a 200-level course in animal sciences. 2 to 4 hours.
283. **Beef Cattle and Swine Management.** Examines basic principles of beef cattle and swine management for students other than animal sciences majors. Prerequisite: Animal Sciences 100. 3 hours. Credit is not given for both Animal Sciences 283 and Animal Sciences 301 or 303.
290. **Introduction to Metabolism in Domestic Animals.** Principles and regulation of metabolism in animals, emphasizing energy derivation and its relationship to domestic animal production. Prerequisite: Chemistry 102 and credit or concurrent in Animal Sciences 221. 3 hours.
298. **Senior Seminar.** Reports and discussions of topics relevant to animal agriculture. Prerequisite: Senior standing in animal sciences. 1 hour.
299. **Animal Management Field Studies.** Field studies of farms and service industries; discusses and demonstrates management practices on commercial farms. Trip normally taken during spring break; see *Timetable* for approximate cost. Prerequisite: Credit or concurrent registration in Animal Sciences 100. 1 hour. May be repeated to a maximum of 4 hours.
300. **Dairy Herd Management.** The technology of modern milk production practices; application of principles in nutrition, physiology, economics, health and hygiene, waste management, and facilities design for efficient dairy herd management systems. See *Timetable* for approximate cost of field trip. Appropriate for students in veterinary medicine interested in large animal practice. Prerequisite: Animal Sciences 221 or equivalent. 3 hours or $\frac{3}{4}$ unit.
301. **Beef Production.** The principles of feeding and management of beef cattle; financial aspects of beef production; and diseases, parasites, and breeding difficulties of beef cattle. Lectures, demonstrations, and discussions. Prerequisite: Animal Sciences 221 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ or $\frac{3}{4}$ unit).
302. **Sheep Science.** A study of the sheep as a biological entity and of factors which influence its responses; examination of the industry which utilizes the sheep's productive potential and of the role of sheep and the industry in animal agriculture and world welfare. Students may register for 3 hours credit without laboratory, or 4 hours or $\frac{3}{4}$ unit with laboratory. Prerequisite: Animal Sciences 221 or equivalent. 3 or 4 hours, or $\frac{3}{4}$ unit.
303. **Pork Production.** Applies science and technology to the selection, breeding, feeding, housing and management of swine in a production enterprise; emphasizes use of research findings in decision making. Prerequisite: Animal Sciences 220, 221, and 307; and Animal Sciences 230 or 330. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Animal Sciences 283 and 303.
304. **Poultry Management.** The application of science and technology in solving the breeding, feeding, housing, and various management problems encountered in commercial egg and poultry meat production. 3 hours credit without, or 4 hours or $\frac{3}{4}$ unit with individual study and conference. Prerequisite: Animal Sciences 221 or 325, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ unit.
305. **Genetics and Animal Improvement.** Principles of heredity and their application to the problems of animal improvement. Prerequisite: Agronomy 220 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ unit).

306. **Equine Science.** Readings in scientific and trade publications on topics related to horse production and management. Emphasis on current research in exercise physiology, nutrition, and reproductive physiology. Prerequisite: Animal Science 202 and 206. 2 hours or $\frac{1}{2}$ unit.
307. **Environmental Aspects of Animal Management.** Animal-environmental interactions (including thermal, air, microbic, photic, sound, and behavioral factors) as bases for prescribing practical environments for production of animals. Prerequisite: Animal Sciences 202. Courses in physiology, nutrition, microbiology, and genetics respectively are recommended. 3 hours or $\frac{3}{4}$ unit.
308. **Physiology of Lactation.** Examines the anatomy, development, and physiology of the mammary gland; environmental, endocrine, and biochemical factors that affect milk yield and composition. Prerequisite: Animal Sciences 231. 4 hours or 1 unit.
309. **Meat Science.** Fundamental biological principles that influence growth, composition, processing, preservation, and quality of meat and meat products. Prerequisite: Chemistry 102; Microbiology 100 and 101, or 200 and 201. Field trip required; see *Timetable* for approximate cost. 4 hours or 1 unit.
310. **Immunogenetics and Immunophysiology.** Same as Biology 310 and Veterinary Pathobiology 310. Blood groups, genetics of immunoglobulins, the T-cell receptor, immunoevolution, lymphocyte differentiation, the major histocompatibility complex, disease resistance, immune-endocrine interactions, and involvement of the immune system in fertility, nutrition, and aging. Prerequisite: Biology 210 and 307 and Animal Sciences 202. 4 hours or 1 unit.
316. **Population Genetics.** Same as Biology 316. Mathematical theory of the genetics of populations: estimation of gene frequency, Hardy-Weinberg principle, systems of mating, relationship between relatives, and forces that change gene frequency; applications to man, animals, and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of population genetics. Prerequisite: Agronomy 220, or Biology 210 and college algebra, or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
317. **Quantitative Genetics.** Same as Biology 317. The mathematical theory of the genetics of quantitative traits: properties of random-mating populations; estimation of repeatability, heritability, and genetic correlation; genetic results of selection; selection methods; correlated response; and selection for more than one trait. Application to animals and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of quantitative genetics. Prerequisite: Animal Sciences 316; and credit or concurrent registration in Animal Sciences 345, or Agronomy 440, or Biology 373; or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
320. **Nutrition and Digestive Physiology of Ruminants.** Physiology and microbiology of digestion in the ruminant, and biochemical pathways of utilization of the absorbed nutrients for productive purposes. Prerequisite: Animal Sciences 221. 3 hours or $\frac{3}{4}$ unit.
325. **Principles of Animal Nutrition.** Principles of animal nutrition and their application to veterinary practice; designed primarily for students in veterinary medicine. Lecture and laboratory. Credit is not given for both Animal Sciences 325 and 221. Prerequisite: Biochemistry 350, or equivalent. 3 hours or $\frac{3}{4}$ unit.
331. **Physiology of Reproduction in Domestic Animals.** Examines anatomy and physiology of reproduction and application to animal production; discusses topics that include endocrinology, ovarian and testicular function, estrous cycles, fertilization, implantation, pregnancy, and environmental and management factors influencing reproduction. Prerequisite: Animal Sciences 231 or equivalent. 3 hours or $\frac{3}{4}$ unit.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
341. **Human Evolution, II.** Same as Anthropology 341. See Anthropology 341.
345. **Statistical Methods.** Same as Agricultural Engineering 345 and Forestry 345. Design and analysis of experiments: multiple regression, method of fitting constants, factorial experiments with unequal subclass numbers, analysis of covariance, experimental design; computer applications to agricultural experiments using statistical packages. Prerequisite: Agronomy 340, or Mathematics 263, or equivalent. 4 hours or 1 unit.
346. **Animal Behavior.** Same as Anthropology and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.

347. **Animal Behavior Laboratory.** Same as Anthropology 347 and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.
350. **World Animal Agriculture.** Surveys the role of animal agriculture and associated activity in relation to resources and environment in representative geographic and cultural areas of the world; provides orientation for agriculturally oriented study tours such as Agriculture 299 and similar international experiences. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
385. **Gastrointestinal and Methanogenic Microbial Fermentations.** Fundamental aspects of the ecology of microorganisms and their biochemical activities related to the anaerobic degradation of organic matter; emphasizes anaerobic ecosystems of the mammalian gastrointestinal tract and methanogenic organic residue fermentations (animal wastes, sediments). Prerequisite: Biochemistry 350 or Biochemistry 352 and 353, and Microbiology 100; or Microbiology 200 or 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
401. **Animal Bionomics.** Discussion of the current literature and research techniques pertaining to adaptation of domestic animals to their environments. Prerequisite: Animal Sciences 307 or consent of instructor. $\frac{1}{2}$ unit.
402. **The Microbiology and Physiology of Ruminant Nutrition.** Physiological and microbiological aspects of ruminant digestion and their influence on the metabolism of the extraruminal tissues; interpretation of nutritive requirements in terms of rumen microbial activities; and evaluation of research techniques. Prerequisite: Biochemistry 350 or equivalent. $\frac{3}{4}$ unit. Offered in alternate years.
403. **Techniques in Animal Nutrition Research.** Discusses and applies methods of laboratory analysis and animal experimentation frequently used in nutrition research. Prerequisite: Courses in nutrition, physiology, and biochemistry and consent of instructor. $\frac{3}{4}$ unit.
404. **Concepts in Nonruminant Nutrition.** A review of current literature in nonruminant nutrition. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
408. **Physiology and Biochemistry of Milk Secretion.** Biological structure and function of lactating mammary tissue, ruminant and nonruminant; emphasizes mammary secretory cell biochemical pathways, ultrastructure, and transport mechanisms pertaining to milk synthesis. Prerequisite: Animal Sciences 308 and Biochemistry 350, or equivalent; or consent of instructor. $\frac{3}{4}$ unit.
409. **Muscle Biology.** Microstructure and chemical composition of muscle tissue; chemistry and biosynthesis of muscle and connective tissue proteins; and biochemical aspects of muscle contraction and rigor mortis. Prerequisite: Biochemistry 350 and 355. $\frac{1}{2}$ unit.
410. **Current Topics in Nutritional Research.** Same as Food Science and Nutritional Sciences 410. See Nutritional Sciences.
411. **Chemistry of Nutritional Processes.** Same as Food Science 411 and Nutritional Sciences 411. See Nutritional Sciences 411.
412. **Advanced Endocrinology.** Same as Physiology 412 and Veterinary Biosciences 412. See Physiology 412.
414. **Computing Techniques in Animal Breeding.** Computing strategies; setting up and solving mixed linear model equations, including very large systems; and estimation of dispersion parameters by REML via the EM algorithm and derivative free methods. Discusses models with multiple traits, missing data, multiple design matrices, heterogeneous variances, and relationship matrices. Strategies include sparse storage methods and iterative procedures for solving equations. Implementation in FORTRAN. Prerequisite: Computer Science 101; Animal Science 345. Credit in Animal Sciences 415 is recommended or consent of instructor. 1 unit.
415. **Linear and Non-Linear Statistical Models for Biologists.** Same as Forestry 415. Studies advanced statistical methods: survey sampling; fixed, random, and mixed linear models with unequal numbers; categorical data; non-linear deterministic and stochastic models; growth curves and time series. Examines applications to biology and agriculture. Prerequisite: Mathematics 130 and Animal Sciences 345, or equivalent. 1 unit. Offered in alternate years.
416. **Statistical Genetics and Breeding Plans.** Selection theory, including maternal effects, multivariate selection, constrained and nonlinear cases, and retrospective indexes; estimation of genetic parameters from mixed and random models, including the unbalanced case; and

applications to economic and laboratory species. Prerequisite: Animal Sciences 317, Biology 373, or Agronomy 440; and Mathematics 315 or consent of instructor. $\frac{3}{4}$ unit. Offered in odd-numbered years.

417. **Advanced Quantitative Genetics.** Same as Biology 417. Advanced theory of the genetics of quantitative traits; lectures, student presentations, and discussions on selected readings; and application to biological systems. Prerequisite: Animal Sciences 317 or Agronomy 444; or consent of instructor. 1 unit. Offered in alternate years.
420. **Comparative Protein and Energy Nutrition.** Physiological aspects of protein and amino acids, fats and fatty acids, and carbohydrates as applied to higher animals; includes classification, digestion, absorption, utilization, metabolism, and dietary deficiencies and excesses. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. $\frac{3}{4}$ unit.
421. **Minerals and Vitamins in Metabolism.** Nutritional implications and metabolic roles of minerals and vitamins in animal metabolism. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. 1 unit.
431. **Advanced Reproductive Endocrinology.** Same as Physiology 431 and Veterinary Biosciences 431. The reproductive endocrinology of domestic and laboratory animals. Topics include neuroendocrinology; chemistry, metabolism, and action of hormones; regulation of gonadal function; endocrine changes during puberty, aging, pregnancy, and parturition; external factors affecting reproduction; infertility; and hormones and behavior. Prerequisite: Animal Sciences 331, Physiology 312, Biochemistry 350, or equivalent. $\frac{3}{4}$ unit.
432. **Advanced Reproductive Physiology.** Comparative physiology of production of domestic and laboratory animals, including gametogenesis, fertilization, embryonic development, and factors influencing reproduction. Prerequisite: Animal Sciences 331 and Biochemistry 350; or equivalent. $\frac{3}{4}$ unit.
433. **Laboratory Methods in Reproductive Physiology.** Same as Physiology 433 and Veterinary Biosciences 433. Laboratory methods used in reproductive physiology studies, such as blood sampling, large animal surgery, collection of tissues and gametes, embryo recovery, in vitro fertilization, tissue culture, hormone measurements, and directed individual research problems. Prerequisite: Animal Sciences 431 or 432. $\frac{1}{4}$ to $\frac{3}{4}$ unit.
441. **Advanced Design and Analysis of Biological Experiments.** Same as Agronomy 441. See Agronomy 441.
444. **Immunobiological Methods.** Same as Veterinary Pathobiology 444. See Veterinary Pathobiology 444.
463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Biophysics and Veterinary Biosciences 463. See Veterinary Biosciences 463.
481. **Animal Biochemical Laboratory Techniques.** Theory and application of biochemical laboratory techniques to research in the animal-oriented biological sciences; isolation, characterization, and analysis of biological compounds including enzymes, metabolic intermediates, and cellular components; and determination of metabolic pathways and processes. Offered in even-numbered years. Prerequisite: Biochemistry 355 and consent of instructor. 1 unit.
490. **Animal Sciences Seminar.** Discussions of current research and literature; registration for 0 to $\frac{1}{2}$ unit each semester is expected for animal sciences graduate students. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit for Masters students and 1 unit for PhD students.
492. **Advanced Topics in Animal Science.** Selected topics associated with teaching, research, and production related to the animal industry. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
493. **Research Studies in Animal Sciences.** Directed and supervised study of selected research topics in Animal Sciences. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 unit.
499. **Thesis Research.** 0 to 4 units.

ANTHROPOLOGY

Head of Department: Thomas J. Riley

Department Office: 109 Davenport Hall, 607 South Mathews, Urbana

102. **Introduction to Anthropology: The Origin of Man and Culture.** An introduction to and survey of human origins and early man, physical anthropology, race and racism, archaeology, and the beginning of human civilization. Recommended though not required to be taken with Anthropology 103 as a survey of the field of anthropology. 4 hours.
103. **Introduction to Cultural Anthropology.** Survey of cultural anthropology; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are manifest in contemporary traditional and Western societies; gives attention to distinctive theoretical anthropological approaches and to anthropological perspectives of culture change. 4 hours. Credit is not given for both Anthropology 103 and 104.
104. **Introduction to Cultural Anthropology (Honors).** Survey of cultural anthropology for honors students; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are seen among contemporary human societies with diverse ways of life; and also gives some attention to distinctive theoretical approaches and to problems of culture change. 4 hours. Credit is not given for both Anthropology 104 and 103.
105. **Introductory World Archaeology.** Using archaeological data, traces our prehistoric heritage and the processes which led to the evolution of agriculture, settled villages, and civilization in many areas of the world; lectures range from *Australopithecus* to *Homo sapiens* and from Sumeria and Egypt to Mexico, Peru, and the United States. 3 hours.
107. **Archaeology of Ancient Egypt.** Survey of Egyptian archaeology from prehistoric times through the New Kingdom; includes lectures on modern archaeological techniques developed in Egypt to presentations on the history, life, gods, and architecture of this ancient civilization. Anthropology 102 or 105 is recommended. 3 hours.
108. **Social Thought.** Same as Sociology 180. See Sociology 180.
109. **Sociobiology: The Evolution of Social Behavior.** Same as Ecology, Ethology, and Evolution 109. See Ecology, Ethology, and Evolution 109.
115. **Other Peoples' Calendars.** Reviews developments in the study of time, emphasizing archaeoastronomy, ethnoastronomy, and the comparative analysis of calendar systems and calendrical rituals. 3 hours.
141. **Race: The Concept in Anthropology.** Examines the biological concept of race as applied and misapplied to *Homo sapiens* by anthropologists and others from the 18th century to the present and of the origin, nature, and significance of so-called racial variation. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Ecology, Ethology, and Evolution and Human Development and Family Ecology 143. Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. 3 hours. Credit is not given for both Anthropology 143 and 144.
144. **Biological Bases for Human Behavior (Honors).** Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. Special for honors students — emphasizes a "hands on" laboratory-demonstration approach. 3 hours. Credit is not given for both Anthropology 144 and 143.
150. **Novel Archaeology.** Designed for non-anthropology majors; survey course of prehistory as seen through the eyes of novelists, science fiction writers, as well as visual media; covers 2 million years of prehistory examining what happened in the past as well as the interface between fact and fiction and past and present. 3 hours.
157. **The Archaeology of Illinois.** Traces the prehistory of Illinois from the first entry of people into the region more than 13,000 years ago until the 17th century and the beginning of historical records; examines subsequent cultural changes up to the 19th century and statehood from an archaeological and ethnohistorical perspective. 3 hours.

161. **Black Folk Culture.** Same as Afro-American Studies 161. A topical introduction to Pan-Africanist thought and ideology as expressed in the folklore, literature, music, and sociocultural movements of Afro-Americans in the New World. 4 hours. May be repeated to a maximum of 8 hours.
168. **Indian Civilization and Society.** Same as History 168. An introductory survey course on an interdisciplinary basis dealing with the evolution of Indian religion, politics, culture, and social organization. 4 hours.
179. **Culture and Ecology in Human Health.** An overview of health and illness in human societies emphasizing interactions among stress, adaptability, and culture. Case studies of differing cultural and ecological settings, past and present, and of differing health care systems are related to alternative theories of health and illness, including contemporary cosmopolitan medicine. 3 hours.
182. **Peoples and Cultures of South America.** South America considered as a theater of conflict and cultural experimentation among Native American, African, and Iberian peoples; their survival and transformation as reported in selected ethnographies and eyewitness sources; and some modern theories and controversies about their experience. 4 hours.
183. **Archaeology and the Public.** An examination of the roles of archaeology in society; topics include public service archaeology, "colonial" and "national" archaeologies, the role of the archaeologist in Euro-American conceptions of the American Indian, and the archaeologist as creator and dispeller of myths. 3 hours.
186. **Southeast Asian Civilizations.** Same as Asian Studies 186 and History 172. Overviews the cultural and institutional history of the Indianized states and Vietnam, with attention to dominant commercial, political, religious, artistic, and social traditions of Southeast Asia. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Comparative Family Organization.** Same as Human Development and Family Ecology 210. See Human Development and Family Ecology 210.
220. **Introduction to Archaeology.** An introduction to the problems of studying past cultures; special attention given to the ranges of techniques available and the adequacy of various methodologies as bases for sound inference about the structure of extinct cultures. Prerequisite: Anthropology 102, or consent of instructor. 3 hours.
221. **Materials and Civilization.** Same as Science, Technology and Society 204. Interdisciplinary treatment of the nature and role of materials from the Stone Age to the Renaissance; faculty and staff from the program on Ancient Technologies and Archaeological Materials share presentations with campus museums and materials laboratories; student projects emphasized. Prerequisite: Sophomore standing; student in Campus Honors Program; or consent of instructor and the Director of Campus Honors Program. 3 hours.
222. **Introduction to Modern Africa.** Same as African Studies, Political Science, and Sociology 222. See African Studies 222.
230. **Introduction to Social Anthropology and Ethnology.** An introduction to the anthropological study of contemporary human societies; emphasis on the comparative study of social organization, interpersonal relations, cultural ecology, and processes of sociocultural change, but also includes some consideration of the method and theory of ethnological field research. Prerequisite: Anthropology 103, or consent of instructor. 3 hours.
240. **Introduction to Biological Anthropology.** The past and present evolution of man and his populational and individual biological variation; topics include genetic principles relevant to human evolution, primate phylogeny and behavior, fossil evidence for human evolution, and the origin and significance of biological diversity in modern man. Prerequisite: Anthropology 102, or 143; or an introductory life sciences course; or consent of instructor. 3 hours.
243. **Natural History and Social Behavior of the Great Apes.** Same as Ecology, Ethology, and Evolution 243. Examines the social organization, mating patterns, and group structure of free-ranging chimpanzees, gorillas, and orangutans. Presents historical perspective focusing on misconceptions which have colored our understanding of ape social behavior; addresses questions concerned with learning potential, food sharing, social cooperation, aggressive behavior, self-awareness, and the appropriateness of the apes as models for understanding human behavior. Prerequisite: Anthropology 102, 143, or an equivalent course in animal behavior; or consent of instructor. 3 hours.
244. **Anthropology of Play.** Same as Kinesiology 244. See Kinesiology 244.

246. **Vertebrate Social Organization.** Same as Ecology, Ethology, and Evolution, Psychology, and Sociology 246. See Ecology, Ethology, and Evolution 246.
250. **Introduction to Primitive Technology.** Introduction to the technology of nonindustrial societies; relationships of technology to society; and influence of social and cultural factors on technological innovation. Uses ethnographic, historical, and archaeological data. 3 hours.
258. **People of the Ice Age.** Explores a vast period of human prehistory—2 million to 10,000 years ago—before the first cities arose and before people domesticated plants and animals in the Old World; uses archaeological and paleoanthropological data to understand past life ways as well as reasons for change through time in human adaptation. Prerequisite: Anthropology 102. 3 hours.
259. **Spanish-Speaking Peoples in the United States.** Introduction to the Spanish-speaking population of the United States, including demography, history, economics, and aspects of the sociocultural milieu; emphasis on Mexican-Americans and Puerto Ricans, although other Spanish-speaking groups are also considered. Prerequisite: Anthropology 103, or consent of instructor. 3 hours.
260. **Peoples of the World: Introduction to Ethnography.** The study and criticism of ethnographic descriptions of exotic ways of life, both as scientific reporting and as a literary art form. Readings include examples from several major culture areas: Africa, the Americas, the Middle East, Oceania, southern and eastern Asia, and Western civilization. Prerequisite: Anthropology 102, 103, or consent of instructor. 3 hours.
261. **Afro-American Societies and Cultures.** Same as Afro-American Studies 261. Designed to examine the breadth of the black Americas in South America, Central America, the Caribbean (including Spanish, Gallic, Dutch, and English subareas), and Canada, with specific comparisons to rural and urban United States; the African slave trade with reference to black-white relations in the trade; the development of Creole cultures in West Africa and in Spain and subsequent cultural elaboration in the New World; conditions of slavery, slave revolts, migrations of black people in the New World; and examination of selected ethnographic material. Prerequisite: Anthropology 102, 103, or consent of instructor. 4 hours.
262. **Cultural Images of Women.** Same as Women's Studies 262. Perceptions of women, their perceptions of themselves, and their varying roles and statuses in several contemporary societies in diverse countries; supervised ethnographic observation of women's behavior. 3 hours.
263. **Cultural Dynamics of Modern Asia.** Same as Asian Studies 263. Analyzes patterns of cultural and social continuity and change in major areas of contemporary life in East, South, and Southeast Asia; emphasis placed upon the social and cultural adjustments that the various Asian regions are making in the mid-20th century, viewed in light of their histories and their positions in contemporary global culture. 3 hours.
270. **Introduction to Linguistic Anthropology.** Introduction to linguistic anthropology as a major subdiscipline within the field of anthropology; problems of elicitation and analysis of language as faced by anthropologists; and the role of language in the other major subdisciplines: biological, archaeological, and social anthropology. Prerequisite: Anthropology 103 or Linguistics 200, or consent of instructor. 3 hours.
278. **Hunter-Gatherers Today.** Introduces students to contemporary hunter-gathers with a particular emphasis on critical evaluation of ethnographic, ethnohistoric, and ethnoarchaeological sources; examines economic, social, and political aspects of this lifestyle in different environments, and emphasizes questions of cultural change. Prerequisite: Anthropology 103. 3 hours.
280. **Personal Anthropology.** Anthropological approaches and methods related to the student's everyday life situation; explanation and use of ritual, ideology, myth, communication, media images, rites of passage, structure, symbols, and other concepts so that the student may develop a more critical understanding of contemporary American society and his or her position in it. 3 hours.
289. **Comparative Muslim Societies.** Same as History 289 and Religious Studies 289. See Religious Studies 289.
290. **Individual Study.** Supervised reading and research on anthropological topics chosen by the student with staff approval. Especially (but not exclusively) for students who are preparing for a summer field-work project, or who have some justifiable reason for doing independent

- study, but who do not qualify for the honors (departmental distinction) courses. Prerequisite: Junior or senior standing; 12 hours in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 291 or 293.
291. **Honors Individual Study.** Individual study and research projects for those students who are candidates for departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Preparation and completion of a senior honors thesis, research paper, or equivalent project for those students who are candidates for high or highest departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
296. **Special Topics.** Topics are given on a one-time only, experimental basis. Faculty offer special topics in their areas of expertise that provide an opportunity for undergraduates to be exposed to some of the most current developments in faculty research. 1 to 3 hours.
297. **Honors Seminar.** Each seminar considers a topic or issue of current interest in anthropology. Prerequisite: Anthropology 102 and 103, two additional anthropology courses, a grade-point average of 4.25 in anthropology courses, and consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours. (Counts for advanced hours in LAS.)
300. **Introduction to Linguistic Structure.** Same as Linguistics 300. See Linguistics 300.
307. **Introduction to Mathematical Linguistics.** Same as Linguistics 307. See Linguistics 307.
308. **Comparative Primate Anatomy.** Same as Veterinary Biosciences 307. See Veterinary Biosciences 307.
315. **Area Studies in Ethnomusicology.** Same as Music 317. See Music 317.
316. **Anthropology of Music.** Same as Music 316. See Music 316.
318. **Anthropological Research Design.** Lecture and laboratory on the design and implementation of anthropological research; emphasizes different approaches to framing questions and designing research, sampling, questionnaire design, research ethics, data collection techniques, coding and general problems of quantification. Prerequisite: Anthropology 220, 230, 240, or 260 and a course in statistics; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
319. **War and Peace in Cross-Cultural Perspective.** Examines theories and case studies of the causes, functions, meanings, and pursuit of war and peace, conflict and cooperation, in diverse cultures; gives attention to the roles of culture contact, ethnicity, imperialism, colonization, and emerging nationalism in promoting conflict and cooperation. Prerequisite: Anthropology 103. 3 hours or $\frac{3}{4}$ unit.
320. **Political Anthropology.** The analysis of political behavior and the comparison of political systems from an anthropological perspective; emphasis on local-level political processes and the evolution of governmental forms. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
321. **Social Organization and Structure.** An introduction to anthropological concepts of social organization and structure; considers kinship theory, descent and alliance systems, social stratification, nonkin association, social networks, group identification and boundaries, structural-functional interpretations of society, and the meaning of social or cultural structure. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
323. **Economic Anthropology.** Covers the emergence of economic anthropology as a subdiscipline; considers various definitions of economics with their implications for the study of human society; emphasizes the relationship between social organization and economic life from the perspectives of classical studies in anthropology and their contemporary interpretations. Prerequisite: Anthropology 230. 3 hours or 1 unit.
324. **Late Cenozoic Geology.** Same as Geology 324. See Geology 324.
328. **North American Archaeology.** Methods, techniques, and results of archaeology in North America; focuses on divergent approaches to the regional archaeology of North America; and surveys and synthesizes the archaeology of the subcontinent. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
329. **The Philosophy of Social Science.** Same as Philosophy 375 and Sociology 325. See Philosophy 375.

331. **Aboriginal North America.** Deals with three major topics: the nature and structure of aboriginal North America as a cultural province and its ecological base; distinctive and common features of American Indian cultures; and responses to the stresses of white contact. Selected type cultures and their adaptations to varying ecological situations are examined in detail. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
333. **South American Indians of the Andean Region.** A survey of Andean cultures at the time of the Spanish conquest, of their subsequent history, and of modern Indian culture in the Andean countries. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Ethnography of Local Cultures.** Same as Educational Psychology and Sociology 335. See Educational Psychology 335.
336. **Native Peoples and Cultures of Greater Amazonia.** Develops cross-cultural understanding of contemporary native peoples around the rim of and within Amazonia; examines culture history, history, and ecology prior to study of selected cases; deals with adaptive versatility of contemporary native peoples as well as with radical change. Prerequisite: Anthropology 103, 182, 230, or consent of instructor. 3 hours or 1 unit.
337. **Behavior Genetics Laboratory.** Same as Psychology 347 and Ecology, Ethology, and Evolution 352. See Psychology 347.
338. **Exploring and Analyzing Data.** Same as Statistics 300. See Statistics 300.
339. **Anthropological Theory in Contemporary Perspective.** An exploration of current theory in social and cultural anthropology, with emphasis on examining theories in the light of contemporary ideas about theoretical adequacy and of the historical development of anthropological thought; designed especially for anthropology concentrators and anthropology graduate students. Prerequisite: Anthropology 230 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
340. **Human Evolution, I.** Principles of evolution and a survey of the evolution of man and his progenitors from the early primates through the Pleistocene epoch; emphasis on evolutionary theory as applied to man and interpretation of the fossil record. Prerequisite: Anthropology 240 or an introductory life sciences course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Human Evolution, II.** Same as Animal Science 341. The principles of human genetics; anthropological aspects of race and race formation; and hereditary and environmental factors in the biological variation of modern man. Prerequisite: Anthropology 240 or an introductory life sciences course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
342. **Behavior-Genetic Analysis.** Same as Ecology, Ethology, and Evolution 350 and Psychology 342. See Psychology 342.
343. **Introduction to Primate Morphology and Behavior.** Same as Ecology, Ethology, and Evolution 344. Survey of primate social behavior and the classification, morphology, and distribution of living and extinct species; emphasis on interrelationships with aspects of anthropological study. Prerequisite: Anthropology 240 or Ecology, Ethology, and Evolution 246; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
344. **Field and Laboratory Techniques in Biological Anthropology.** Supervised participation in biological anthropology research projects; techniques, methods, and procedures discussed and practiced under actual field or laboratory working conditions. Normally taken concurrently with Anthropology 345. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
345. **Analysis of Research Data in Biological Anthropology.** Analysis, interpretation, evaluation, and organization of field and laboratory data in biological anthropology; preparation of written reports on research. May be taken concurrently with Anthropology 344 or subsequently. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
346. **Animal Behavior.** Same as Animal Science and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
347. **Animal Behavior Laboratory.** Same as Animal Science and Ecology, Ethology, and Evolution 347. See Ecology, Ethology, and Evolution 347.

348. **The Prehistory of Africa.** The study of cultural development in Africa from the appearance of hominids to the time of European domination. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
349. **South American Culture History, I.** An examination of the factors influencing the initial peopling of South America; the spread and diversification of hunting and gathering economies; and the development and spread of the tropical forest cultural pattern. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
350. **South American Culture History, II.** An examination of the factors leading to the rise of civilization in the central Andes, including the evolution of agricultural systems, the elaboration of technology, and the emergence of extensive and complex political units. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **Archaeological Surveying: Techniques and Applications.** Familiarization with methods used in the location and recording of archaeological sites, including techniques of mapping especially adapted to the needs of archaeology; attention given to means of presenting results and interpreting data derived from this work; and work both in the field and in the laboratory. Prerequisite: Anthropology 102 or consent of instructor. 3 hours or 1 unit.
352. **Theory and Methods of Lithic Analysis.** Lecture and laboratory on the principles and techniques of stone and bone artifact manufacture, identification, classification, metrical analysis, interpretation, and integration with other classes of archaeological evidence. Emphasis on the use of lithics to test human behavioral models. Prerequisite: Anthropology 220. 3 hours, or $\frac{3}{4}$ or 1 unit.
353. **Field Work in Cultural Anthropology: Theory and Methods.** Major philosophical, theoretical, and methodological issues that arise in conducting cultural-oriented anthropological field work today; application of class knowledge to an actual field experience; emphasis on field work as a reflexive experience and as a mutually creative and frustrating endeavor. Prerequisite: Anthropology 230 or graduate standing. 3 hours or 1 unit.
354. **Field Techniques in Archaeology.** Participation in archaeological excavations; techniques, methods, and procedures discussed and practiced under actual working conditions. Normally taken concurrently with Anthropology 355. Prerequisite: Anthropology 102, or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
355. **Laboratory Techniques in Archaeology.** Laboratory work including processing, classifying, dating, interpretation, evaluation, and preparation of written reports of archaeological research. May be taken concurrently with Anthropology 354 or subsequently. Prerequisite: Anthropology 102 or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
356. **Human Osteology.** Identification of human skeletal material and basic techniques of measurement; methods of determining age, sex, race, and stature from the human skeleton; and analysis of skeletal populations. Prerequisite: Anthropology 102 or a course in anatomy, physiology, or introductory life sciences and consent of instructor. 3 hours or 1 unit.
357. **Midwestern Archaeology.** A detailed study of the midwestern archaeological area covering the broad cultures with regional variations considered chronologically and stressing their interrelationships. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
360. **Peoples and Cultures of Oceania.** Same as Asian Studies 360. A survey of the Pacific Islands; regional geography, human ecology, culture history, and ethnography of Melanesia, New Guinea, Polynesia, New Zealand, Micronesia, and Australia; and some consideration of Pacific ethnohistory and the role of Oceania in the modern world. Prerequisite: Anthropology 102 and 103, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
361. **Peoples and Cultures of Mexico and Guatemala.** A survey of the peoples and cultures of Middle America with special emphasis upon Mexico and Guatemala; begins by placing Middle America geographically, historically, and culturally within the broader Latin American scene; countries first viewed as a whole and then selected ethnographic studies of specific communities considered for comparative purposes. The Caribbean is not included in this survey. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
363. **Religion in Anthropological Perspective.** Same as Religious Studies 363. An introduction to the study of magical and religious beliefs and practices in tribal and peasant societies; considers theories of the nature, origin, and function of magic and religion; myth, ritual,

- and symbolism; the relationship between great folk religious traditions; and socioreligious movements. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
364. **Field Work in Cultural Anthropology.** Supervised participation in field research in ethnography, ethnology, linguistics, or social anthropology; techniques, methods, and procedures discussed and practiced under actual working conditions. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. Normally taken concurrently with Anthropology 365. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
365. **Analysis of Field Data in Cultural Anthropology.** Analysis, interpretation, evaluation, and organization of field data in cultural anthropology; preparation of written reports on research in ethnography, ethnology, linguistics, or social anthropology. May be taken concurrently with Anthropology 364 or subsequently. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
367. **Cultures of Africa.** Culture and social organization in traditional African societies with emphasis on the politics, kinship, and religion of a small sample of societies illustrating the main cultural variations found in sub-Saharan Africa; some discussion of ecological factors and ethnic group relations in precolonial times. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
368. **Peoples and Cultures of India.** Same as Asian Studies 368. A description and analysis of the social, economic, and religious life of the tribal and peasant peoples of contemporary India considered against the background of Indian geography, population, language distribution, the caste system, and highlights of Indian cultural development. Prerequisite: Anthropology 168 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
369. **Asian Systems of Social Stratification.** Same as Asian Studies 369. Explores the characteristics of traditional processes of social stratification in the principal regions of high civilization in Asia: South Asia (India, Sri Lanka, Nepal), Southeast Asia (Burma, Thailand, Vietnam, Indonesia), and East Asia (China, Japan, Korea). Prerequisite: Anthropology 168 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
370. **Language, Culture, and Society.** Same as Communications 370 and Linguistics 370. An examination of the social and cultural functions of language with particular emphasis on the application of linguistic methods and findings to selected problems in the social sciences. Prerequisite: Anthropology 230, or one course in communications or linguistics, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
372. **The Anthropological Study of Art.** A review of the anthropological approach to art with emphasis on structural analysis and the relationship of the artist to his culture; consideration of problems of stylistic development within the framework of cultural dynamics and a survey of the major art styles outside of the Western tradition and the Orient. Prerequisite: Three hours of anthropology or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
373. **Theory and Method in the Cross-Cultural Study of Individual Behavior.** Same as Psychology 373. See Psychology 373.
375. **The Prehistory and Archaeology of Mexico.** Discusses the ancient cultures and civilizations of Mexico as reconstructed from archaeological data; begins with the earliest evidence of human occupation and traces the development of agricultural societies and ultimately large urban civilizations to c. 1300 A. D. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
376. **The Aztec and Maya Civilizations.** Discusses two ancient civilizations, the Aztecs of Mexico and the Maya of Guatemala; uses archaeological data and documentary sources to reconstruct political and social organization, religion, writing systems, calendars, agricultural techniques, and aspects of the daily life of the people. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
378. **Emergence of Old World Civilizations.** Uses archaeological data to trace the transition from egalitarian hunter-gatherer societies to food producing hierarchical states in the Old World between 14,000 and 3,000 years ago; focuses on economic, social, and political change in Mesopotamia, Egypt, the Indus Valley, and China that gave rise to ancient empires. Prerequisite: Anthropology 102 or 105; Anthropology 220 or 258. 3 hours, or $\frac{3}{4}$ or 1 unit.

379. **Medical Anthropology: The Culture of Health and Illness.** An introduction to concepts and social aspects of health, illness, and curing in different cultures with consideration also of the interaction between folk and modern medicine in developing nations and the delivery of health care as an international social problem. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
380. **Symbolic and Interpretive Anthropology.** Focus on recent developments in symbolic and interpretive anthropology; topics covered include writing the ethnographic text, subject-object relations, critical reflection on fieldwork, construction of the self, dialogism, practice, performance, narrative, power, and representation. Prerequisite: Anthropology 321 and 363, or similar courses in anthropology, the social sciences, or the humanities, and consent of instructor. 4 hours or 1 unit.
382. **Siberian Culture History and Ethnology.** Same as Geography 382. An ecological analysis of historic and present-day Siberian cultures, with comparisons to arctic America. 3 hours, or $\frac{3}{4}$ or 1 unit.
383. **Self and Society in Japan.** Same as Asian Studies 383. The lifecourse and the growth of the self in modern Japanese civilization. Prerequisite: Anthropology 230 or a course in East Asian history, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
384. **Modern Chinese Society and Culture.** Same as Asian Studies 384. See Asian Studies 384.
385. **Anthropology of Education.** Same as Educational Psychology 385 and Educational Policy Studies 385. See Educational Policy Studies 385.
386. **Peoples and Cultures of Mainland Southeast Asia.** Same as Asian Studies 386. The culture, cultural history, and social systems of mainland Southeast Asia: Burma, Thailand, Cambodia, Vietnam, Laos, Assam Hills, upland southwestern China, and Malaya; emphasis on the interaction of complementary ethnic types in the context of local ecology and the Hindu-Buddhist systems of religion and politics of the lowland states. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
387. **Peoples and Cultures of Insular Southeast Asia.** Same as Asian Studies 387. A survey of the cultures and social systems of Indonesia, Malaysia, and the Philippines in the context of the region's history and geographical, economic, political, and religious situation. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
388. **Prehistory of Oceania.** Same as Asian Studies 388. Archaeology and physical anthropology of the Pacific Islands; early hominids in Australia and New Guinea; evolution and genetics of Oceania populations; origins of Pacific Islanders; traditional voyaging; and settlement and culture history of aboriginal Australia, Melanesia, Micronesia, and Polynesia. Prerequisite: Anthropology 220, 240, or 360. 3 hours, or $\frac{3}{4}$ or 1 unit.
389. **Hominid Evolution in East Asia.** Examines human evolution and prehistory in the Far East (China and Southeast Asia); considers paleontological, paleocultural, and geologic data in order to reconstruct the anatomical and paleocultural adaptation of Pleistocene hominids in Asia. Prerequisite: Anthropology 240. 3 hours or $\frac{3}{4}$ unit.
394. **Human Paleopathology.** Comprehensive study of the evidence of human disease in antiquity, emphasizing diagnosis of skeletal pathologies, and the anthropological interpretation of historic and prehistoric disease patterns. Prerequisite: Anthropology 356, a course in human anatomy, or equivalent. 3 hours or $\frac{3}{4}$ or 1 unit.
398. **Combined Graduate and Undergraduate Seminar.** A research seminar on specialized topics in anthropology. Prerequisite: Consent of instructor. 4 hours or 1 unit. May be repeated.
400. **Introduction to General Linguistics.** Same as English as an International Language 402 and Linguistics 400. See Linguistics 400.
440. **Problems in Physical Anthropology.** A seminar designed to involve students in the theoretical and methodological approaches to problem areas in physical anthropology. May be repeated for additional credit. Prerequisite: Anthropology 340, 341, or 343; consent of instructor. 1 unit.
443. **Problems in Primate Behavior and Ecology.** Same as Ecology, Ethology, and Evolution 443. Group discussions and individual presentations of research reports and problems in fields of primate ethology, ecology, evolution, and related subjects; topics vary each semester. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated.
450. **Seminar in Anthropology.** Analysis of selected topics of special interest in anthropology. $\frac{1}{2}$ or 1 unit. May be repeated for up to 2 units per semester.

451. **Social Structure.** Intended to deepen training of advanced students in the descriptive techniques and methods of structural and functional analysis currently employed by social anthropologists. Prerequisite: Consent of instructor. 1 unit.
452. **Research Problems in Archaeology.** Seminar oriented to current research problems in archaeology, designed to acquaint students with theoretical and methodological aspects of particular problems and to develop a critical perspective of archaeological research. May be repeated. Prerequisite: Consent of instructor. 1 unit.
453. **The Formal Analysis of Kinship Systems.** A survey of a variety of the world's systems of kinship, marriage, and family organization; concentration on the distinctive properties of kinship systems as a species of social structure, on the formal apparatus for describing and understanding them and their functions, and on the theory of kinship that arises from the use of such formal apparatus. Prerequisite: Consent of instructor. ½ to 1 unit.
454. **Ritual and Power in Social Life.** A systematic examination of the relationship between power structure and ritual by reference to anthropological theory and through consideration of select ethnographies; social stratification, social networks, cultural symbolism, and ethnicity. Prerequisite: Consent of instructor. 1 unit.
467. **Kinship and Social Organization in Africa.** Explores a variety of systems of kinship and social organization in sub-Saharan Africa; covers classic statements on African kinship, which provide a foundation of modern kinship theory, as well as contemporary critiques. Then explores the nature of political authority and stratification systems; presents topical and theoretical issues as well as selected case studies. Prerequisite: Graduate standing. 1 unit.
489. **Readings in Anthropology.** Individual guidance in intensive readings in the literature of one or more subdivisions of the field of anthropology, selected in consultation with the adviser in accordance with the needs and interest of the student. Prerequisite: One semester of graduate work in anthropology; consent of adviser. ½ or 1 unit.
490. **Individual Topics in Anthropology.** Supervised individual investigation or study of a topic not covered by regular courses. The topic selected by the student and the proposed plan of study are approved by the adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. 1 to 4 units.
499. **Thesis Research.** Preparation of theses. 0 to 4 units.

ARCHITECTURE, SCHOOL OF

Director of School: R. Alan Forrester

School Office: 106 Architecture Building, 608 East Lorado Taft, Champaign

171. **Architectural Design, I.** Formal fundamentals of architectural design; formal vocabulary, principles, and concepts of architectural design; basic design methods; skills development in sketching, drafting, rendering, layout, diagramming, modeling, and lettering; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: General Professional Courses in Art and Design 187 or equivalent and sophomore standing. 3 hours.
172. **Architectural Design, II.** Functional fundamentals of architectural design; functional vocabulary, principles, and concepts of architectural design; basic design and programming methods; skills development in drafting, modeling, layout, rendering, and sketching; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: Architecture 171; General Professional Courses in Art and Design 188 or equivalent. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Senior Honors in Architecture.** For candidates for honors in architecture. Independent guided study and research in a selected area of architecture. Prerequisite: Senior standing in architecture, a University grade-point average of 4.0 or, in special cases, consent of Director of School. 3 hours (summer session, 1 to 3 hours). May be repeated to a total of 6 hours with consent of Director of School.
210. **Introduction to the History of Architecture.** Visual and cultural analysis of selected buildings, urban spaces, and cities, from ancient Greece to modern times; emphasizes the architec-

- tural traditions of Western Civilization, especially as they affect the built environment of America and the Middle West. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
220. **Introduction to Architectural Theory.** Overview of the purpose and means of architecture in relation to other human endeavors and the goals of society; professional alternatives; introduction to research, cognitive processes in design, information handling, communication, and evaluation. Prerequisite: Consent of instructor. 3 hours.
231. **Anatomy of Buildings.** First course in Administration, Communication, and Technology; introduces building science and the profession of architecture; emphasizes the anatomy of buildings, including function, physical makeup, and working principles of various building systems, components and materials, their inter-relationships and design implications. Prerequisite: Sophomore standing or consent of instructor. 4 hours.
232. **Construction of Buildings.** Second course in Administration, Communication, and Technology; emphasizing the processes of project execution from the initiation of design to completion of construction; includes in-depth study of construction of the building and its systems, materials and methods, and their implications for decision-making. Prerequisite: Architecture 231 or consent of instructor. 4 hours.
241. **Environmental Technology, I.** The integration of environmental control systems in architecture. Includes factors affecting comfort, health, safety, and energy conservation; the fundamentals of atmospheric conditioning of buildings and the equipment and controls systems for varying functions and sizes of buildings; and water supply, waste sewage, and storm-water disposal systems for buildings. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
242. **Environmental Technology, II.** The integration of environmental control systems in architecture. Includes the nature of light illumination and vision, quality and quantity, and sources; integration of illumination and architecture; power distribution systems and equipment; and the nature of sound and architectural acoustics, room acoustics, and sound isolation. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
251. **Statics and Dynamics.** Introduction to basic statics and dynamics with emphasis on architectural applications. Prerequisite: One year of calculus and analytical geometry. 4 hours.
252. **Strength of Materials and Design Applications.** Introduction to strength of materials with emphasis on architectural applications. Prerequisite: Architecture 251. 4 hours.
271. **Architectural Design, III.** The building in its environmental setting; introductory building design and site planning theory; principles of energy efficient building design; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 172; General Professional Courses in Art and Design 189 or equivalent. 3 hours.
272. **Architectural Design, IV.** Buildings in the community setting; introductory urban design and site planning theory; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 271. 3 hours.
299. **Study in Versailles, France.** Study in the University of Illinois Architectural Program at Versailles, France. Prerequisite: Concurrent registration in the full-time program at Versailles through the Chicago or Urbana-Champaign Campus. 0 hours.
300. **Independent Studies in Urban Design.** The individual study of selected topics involving the history, design, and function of significant European cities. Prerequisite: One year of history of architecture or history of art; consent of instructor. 3 hours or $\frac{3}{4}$ unit.
301. **Independent Study.** Independent guided study and investigation in a selected area of architecture. Prerequisite: Junior standing in architecture, written proposal approved by sponsoring faculty member and approval of Director of School. 0 to 4 hours, or 0 to 1 unit.
310. **Ancient Architecture.** Architecture and urban design in ancient Egypt, Greece, and Rome. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Early Christian and Byzantine Architecture.** Architecture and urban design of the early Christian era, the Byzantine Empire, southeastern European lands under Byzantine cultural influence, and medieval Russia; from circa 300 to circa 1500. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
312. **Medieval Architecture.** The development of Romanesque and Gothic architecture and urban design. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

313. **Renaissance Architecture.** Developments in architecture, urban design, and garden art in Italy and northern Europe in the fifteenth through the sixteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Baroque and Rococo Architecture.** Developments in architecture, urban design, and garden art in Italy, France, Germany, and England in the seventeenth and eighteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Modern European Architecture.** The evolution of continental and British architecture and urban planning from 1750 to the present; includes some allusion to Japanese and American architecture of the same period. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
316. **Modern American Architecture.** The development of American architecture and urban planning from the seventeenth century to the present. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
317. **Seminar on Great Modern Architects and Their Work.** Seminar on selected topics addressing the philosophy, theory, personality, and work of famous architects since the mid-eighteenth century. Prerequisite: Architecture 210; and Architecture 315 or 316, or equivalent; and consent of instructor. 3 hours or 1 unit.
318. **History of the Urban Environment.** Examines the evolution of town planning and urban design in Western civilization from prehistory to the present; studies cultural and technical advancements affecting the form of the urban environment. 3 hours or $\frac{3}{4}$ unit.
319. **Historic Building Preservation.** Introduces historic preservation: legal, financial, and administrative assistance, graphic examination of restored buildings and sites, and application of conservation technology. 3 hours or $\frac{3}{4}$ unit.
323. **Social and Behavioral Factors for Design.** A research-oriented introduction to existing social and behavioral knowledge, methods, and tools for relating man to his physical and social environment, with implications for theories and a philosophy of architectural design. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
330. **Architectural Practice.** Roles of the architect and other participants in the design/construction process, conduct of professional practice, professional ethics, legal aspects of architectural practice and building construction, business and practice management, financial planning, cost control, administration of construction contracts, and construction management. Prerequisite: Senior standing in architecture and consent of instructor. 4 hours or 1 unit.
331. **Design Development and Construction Documents.** Network diagram scheduling of professional services; preliminary project investigations of site conditions and facilities, building law, and economic considerations; the integration of materials, structure, mechanical equipment, illumination, and acoustics; design development outline specifications and drawings; the production planning, scheduling, and budgeting for working drawings and specifications; and preparation of portions of these documents. Prerequisite: Architecture 241, 242, and 352. 3 hours or $\frac{3}{4}$ unit.
335. **Computer Applications in Architecture, I.** Introduces the application of computer-aided design to architecture: programming methods using FORTRAN, database concepts using the Relational Information Management (RIM) system, and basic computer graphics concepts using the Graphic Compatibility System (GCS) graphic package. Prerequisite: Computer Science 102 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.
336. **Computer Applications in Architecture, II.** Applies advanced computer-aided design to architecture: advanced programming methods using FORTRAN, advanced database concepts using the Relational Information Management (RIM) system, and advanced computer graphics concepts using the Graphic Compatibility System (GCS) graphic package. Prerequisite: Architecture 335 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.
342. **Energy Management in Architecture.** Energy management; energy alternatives; and the influence of energy regulation on the architectural design, operation, maintenance, use, and re-use of buildings. Prerequisite: Architecture 241 and 242. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. Students seeking 4 hours or 1 unit credit must participate in research teams pursuing prearranged topics related to the course of study.
351. **Theory and Design of Metal Structures.** Analysis and design of structures in metal. Beams; open-web joists; metal deck; columns; riveted, bolted, and welded trusses; plate girders and

- connections; lateral loads and bracing; and design of a simple steel frame building. Prerequisite: Architecture 252. 4 hours or 1 unit.
352. **Theory of Reinforced Concrete.** Concrete materials; behavior of reinforced concrete construction; behavior and design of structural elements, one-way slabs, beams, and girders; columns; ACI code requirements; and introduction to continuity in reinforced concrete structures. Prerequisite: Architecture 252. 4 hours or 1 unit.
353. **Reinforced Concrete Design.** Selection, design, and comparison of reinforced concrete floor systems for buildings; study and design of columns and footings; and prestressed concrete. Prerequisite: Architecture 352. 4 hours or 1 unit.
354. **Structural Planning.** General problems in the selection and design of structural systems for buildings; methods of analysis; site explorations, soils, and foundations; bracing; and special systems. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
355. **Structural Analysis.** Advanced problems in the analysis of statically determinate structures; general theories and methods of analysis of statically indeterminate structures by geometric and energy methods; and introduction to theory of plastic design. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
371. **Architectural Design V.** Intermediate building and environmental design; issue-oriented building problems; urban design theory; intermediate building design and site planning theory; human-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 272. 6 hours. No graduate credit.
372. **Architectural Design and Construction Documentation.** Schematic design, design development, and construction documents of a small scale (10,000 square feet) public building emphasizing the integration of the basic elements of building, structural, and environmental technologies. Prerequisite: Architecture 371; credit or concurrent registration in Architecture 241 and 242. 6 hours. No graduate credit.
373. **Architectural Design Studio.** Design studies of intermediate size building types; planned communities; civic and social facilities at the community and urban scale; and collaboration among the several disciplines involved in planning the human habitat: urban planning, landscape architecture, sociology, and economics. Prerequisite: Architecture 372. 6 hours or 1 ½ units.
374. **Architectural Design Studio.** Research and individual comprehensive design study for a selected architectural project; special emphasis on site development and the integration of construction technology, structure, and environmental systems. Prerequisite: Architecture 373, or consent of instructor. 6 hours or 1 ½ units.
379. **Urban Housing.** Examines issues affecting the design of urban housing including the perceptions and needs of residents, the needs of special user groups, and the roles of governments; reviews selected principles of housing in other countries. Prerequisite: Consent of instructor. 2 hours or ½ unit.
398. **Directed Research in Architecture.** Participation in on-going research projects which may include energy management, environmental perception, facilities development, building science, and other topics. Prerequisite: Approval of written proposal by instructor and Director of School. 4 hours or 1 unit. Students may register in different sections of this course to a maximum of 8 hours or 2 units.
399. **Off-Campus Study.** Provides opportunity for approved off-campus study. A detailed proposal for study off campus must be submitted for approval to the appropriate committee in the School prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the Director of School. Prerequisite: Senior or graduate standing in architecture and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.
411. **Seminar in History of Ancient and Medieval Architecture.** Seminar on topics in ancient, early Christian, Byzantine, and Medieval Architecture. Prerequisite: Architecture 310, 311, or 312, or equivalent as determined by the instructor. 1 unit.
413. **Seminar in History of Renaissance and Baroque Architecture.** Seminar on topics in European architecture from the fifteenth through the eighteenth centuries. Prerequisite: Architecture 313 and 314, or equivalent as determined by the instructor. 1 unit.
415. **Seminar on the Architectural History of American Communities.** Advanced historic study of the architectural design and aesthetics of individual buildings and their relationship to

each other in selected small-scale American communities. Prerequisite: Architecture 316 or equivalent, and consent of instructor. 1 unit.

417. **Seminar in the Development of Contemporary Architectural Thought.** An examination of the development of the philosophy of significant modern and contemporary architectural writers and architects in relation to their projects and executed work. Prerequisite: Architecture 315 and 316, or equivalent as determined by the instructor. 1 unit.
418. **Recording Historic Buildings.** Examines techniques for recording historic buildings and sites: measuring, photographing, and drawing to Historic American Building Survey standards; taking field notes and investigating public records to document reports. Prerequisite: Architecture 319 and demonstrated ability in architectural graphics; or consent of instructor. $\frac{3}{4}$ unit.
430. **Architectural Management Theory.** Application of the systems approach and organization theory to the study of organizational behavior in the architectural process; the sources and objectives of dynamic change in that process; and the effects of the change. 1 unit.
431. **Administration of Construction.** Critical analysis of that phase of architectural practice related directly to the construction of buildings; the building industry; policy, organization, procedures, and techniques for construction management; the architect, engineer, management and cost consultants, contractor, and the owner; and administration of the construction contract and professional construction management. Prerequisite: Architecture 330 or consent of instructor. $\frac{3}{4}$ or 1 unit. Students taking the course for 1 unit are required to perform independent study which results in a written paper and formal class presentation.
432. **Architectural Administration.** Critical analysis of that part of professional practice related to the organization of the architectural firm and the conduct of the internal aspects of business; administrative policy, management functions, and procedures; and general development, contract negotiation, production, personnel, insurance, financial planning, accounting, and cost control. Prerequisite: Architecture 330 or consent of instructor. $\frac{3}{4}$ or 1 unit.
434. **Building Economics.** Principles of economics as they apply to individual and large-scale building projects; factors affecting the cost of buildings, including the building market, building investment and finance, land acquisition, government assistance, and taxation; first costs, operating costs, and ultimate costs; cost analysis and cost models; and construction costs, estimates, and cost control. Prerequisite: Architecture 330 or consent of instructor. 1 unit.
438. **Architectural Problems in Organization Theory.** Individual or group examination and analysis of the application of the theory of complex organizations in the architectural process; analysis of the interaction of architectural and other building organizations as subsystems; and investigation of this interaction through research or project analysis. Prerequisite: Architecture 430 or consent of instructor. Concurrent registration in an architectural studio course not permitted. 1 or 1 $\frac{1}{2}$ units.
439. **Architectural Process Internship.** Individual internship for one summer session or one semester in an approved office of practice in the architectural process; analysis of this work in coordinated university coursework. Residence at the university is not required during internship. Prerequisite: Consent of joint program advisory committee. 1 or 1 $\frac{1}{2}$ units.
451. **Advanced Structural Analysis.** Advanced theory and methods of analysis of statically indeterminate structures; secondary stresses; torsion; buckling and stability; and advanced theory and application of plastic design in building structures. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
452. **Foundation Engineering.** Soil mechanics and site exploration; design of spread footings, combined footings, piles, and caissons; and foundation walls and retaining walls in reinforced concrete. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
453. **Advanced Reinforced Concrete Design.** Critical review of the analysis, methods, and specifications involved in the design and behavior of reinforced concrete structures for buildings, including tall buildings, plates, and shells; computer applications. Prerequisite: Architecture 355; credit or concurrent registration in Architecture 451 or consent of instructor. 1 unit.
454. **Advanced Steel Design.** Advanced topics in the design of steel structures; critical study of the AISC specification; design of steel members and their connections; composite structures; and the analysis and design of continuous structures and tall buildings. Prerequisite: Architecture 451 or consent of instructor. 1 unit.
455. **Prestressed Concrete Design.** Theory and design of prestressed concrete structures; and suspension shell structures. Prerequisite: Architecture 453 or consent of instructor. 1 unit.

456. **Advanced Structural Planning.** Study of the loads, functional and spatial requirements, and construction problems in the selection and design of structural systems for buildings; cost estimates; and integration of mechanical and electrical equipment. Prerequisite: Architecture 452 and 453; credit or concurrent registration in Architecture 454 and 455, or consent of instructor. 1 unit.
461. **Housing Environments Design Studio, I.** Emphasizes comprehensive design studies on individually selected housing problems; the study process includes programmatic development, environmental analysis, definitive design development and comprehensive project documentation. Prerequisite: Architecture 374 and 466. 1 to 2 units.
462. **Housing Environments Design Studio, II.** Terminal design studio studies on individually selected housing problems; emphasizes definitive design development and process documentation for final project in the Master of Architecture Housing Environments option. Prerequisite: Architecture 461. 1 to 2 units.
463. **Methods of Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 463. Introduction to methods and techniques of systematically generating social and behavioral information relevant to the programming, design, and evaluation of physical environments. Prerequisite: Graduate standing in architecture, landscape architecture, or urban and regional planning. 1 unit.
464. **Conducting Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 464. See Landscape Architecture 464.
465. **Design/Behavior Studio.** Same as Landscape Architecture 465. See Landscape Architecture 465.
466. **Problems and Processes in Housing Design.** Analyzes issues confronting architects in the design of housing environments; emphasizing new and emerging problems; examines processes in problem solutions. Prerequisite: Concurrent registration in Architecture 374 or consent of instructor. 1 unit.
467. **Critical Issues in Designing for the Elderly.** Examines issues related to the design of housing and community facilities for older people; stresses the development of strategies for design decision-making and a comprehensive theoretical knowledge base for understanding how the design of the environment affects the aged. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
468. **Site and Environmental Issues in Housing Design.** Examines issues involving housing environments as related to site, landscape, land planning, and buildings; also examines design values, processes, analysis techniques, and standards involving natural and human-made interactions. Prerequisite: Architecture 374 or consent of instructor. 1 unit.
471. **Architectural Design Studio.** Definitive design of various building types with optional choices related to the student's particular interests, talents, and capacities; emphasis on human need, structural, mechanical, and tectonic integration. Prerequisite: Architecture 374 or consent of instructor. 1 to 2 units.
472. **Architectural Design Studio.** Continuation of Architecture 471. Prerequisite: Architecture 471 or consent of instructor. 1 to 2 units.
476. **Architectural Design Seminar.** Presentations and discussions relative to various areas of architectural and environmental design concerns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 3 units.
477. **Theory of Architecture.** A review of principles of architectural design; factors in programming architectural requirements; design development; and evaluation and criticism. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 1 unit.
478. **Architectural Criticism.** Analysis and criticism of selected buildings; individual reports and discussions. Prerequisite: Architecture 477 or consent of instructor. $\frac{3}{4}$ to 1 unit.
479. **Architectural Design Methods.** Examination of the architectural design process; identification, investigation, and evaluation of design methods. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 1 unit.
481. **Urban Design Studio, I.** Same as Landscape Architecture 481. Design of large building types and building complexes; megastructures; and collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 374; credit or concurrent registration in Urban Planning 326 or consent of instructor. 1 to 2 units.
482. **Urban Design Studio, II.** Same as Landscape Architecture 482. Design development studies of central business districts, movement systems, and residential communities; collaboration

- with other disciplines in research related to urban development. Prerequisite: Architecture 481, Urban Planning 326, or consent of instructor. 1 to 2 units.
488. **Urban Design Seminar.** Analysis and criticism of urban development projects; individual reports and discussions. Prerequisite: Architecture 374, Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 1 unit.
491. **Special Problems in Architectural History and Preservation.** Individual investigation of the work of particular architects, of specific buildings, and of the architecture of periods or regions; comparative studies; and aesthetic problems. Prerequisite: 12 hours of architectural history or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
493. **Special Problems in Architectural Administration and Building Construction.** Studies of building projects at large and small scales; investigations in feasibility and cost control, material and system selection, construction techniques and processes, legal and business procedures, and related aspects of professional practice; and independent study or study in conjunction with architectural and urban design projects. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
495. **Special Problems in Structural Theory and Design.** Individual or group investigation and study in architectural engineering application; research in economy and design in correlation with architectural, mechanical, and structural requirements. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 3 units. May be repeated to a maximum of 3 units.
496. **Special Problems in Housing Environments.** Individual investigation or research in housing environments involving special issues such as energy conscious design, human-environmental relations, aesthetic theory, government policy, and cultural patterns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
497. **Special Problems in Architectural Design.** Individual investigation of building types and systems, aesthetic theories, and other problems in architectural design. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 4 units.
498. **Special Problems in Urban Design.** Individual investigation of problems at the community and urban scale; collaboration with other disciplines. Prerequisite: Credit or concurrent registration in Architecture 481 or Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
499. **Thesis Research.** Prerequisite: Consent of instructor and graduate program coordinator. 0 to 4 units. May be repeated to a maximum of 4 units.

ART AND DESIGN, SCHOOL OF

(Including Introduction to Art and Design, General Professional Courses in Art and Design, Art Education, Cinematography, Crafts, Graphic Design, History of Art, Industrial Design, Painting, Photography, Printmaking, and Sculpture)

Director of School: Theodore Zernich

School Office: 143 Art and Design Building, 408 East Peabody, Champaign

Introduction to Art and Design

103. **Introduction to Studio Arts.** Introductory studio experiences with a variety of art materials and techniques accompanied by visitations to artists' studios and museum tours. Not open to students majoring in art and design. 3 hours. Credit is not given for both Introduction to Art and Design 103 and 190.
105. **Introduction to Watercolor Painting.** A basic watercolor class that includes an introduction to the tools, materials, and techniques of the medium; landscape, still life, and figure experiences. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.

106. **Introduction to Oil Painting.** Elementary oil and acrylic painting and sketches from still life and landscape; includes basics such as stretching canvas, preparing surfaces, and varied painting techniques. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
107. **Elementary Drawing.** A basic drawing course using a variety of media and techniques, including charcoal, conte, pencil, pen and india ink, and studies in perspective, line, value, composition, and the figure. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
108. **Ikebana: The Japanese Art of Flower Arrangement.** Introduces Japanese arts and cultural heritage through Ikebana (Japanese flower arranging). 2 hours.
109. **Sumi-E (Japanese and Chinese Black-ink Painting).** Introduction to the ancient abstract Chinese art of black-ink painting; through the study and practice of Chinese and Japanese Sumi-E students discover the foundation of twentieth-century visual arts and discuss the philosophy of Chinese and Japanese art. 2 hours.
140. **Introduction to Art.** A broadly based conceptual foundation for a critical understanding of the visual arts in contemporary society. Not open to students in art and design and architecture. 3 hours.
150. **Beginning Sculpture.** Clay modeling from the human figure; casting in plaster and other materials as well as production of sculpture involving materials other than plaster and clay. Not open to students majoring in art. 2 hours.
185. **Design, I.** Design elements and principles with emphasis on color and painting exercises; uses a variety of media to explore the different aspects of design, emphasizing two-dimensional problems. Not open to students majoring in art and design. 3 hours.
186. **Design, II.** A second course in design with emphasis on graphic communication; students gain experience using modern graphics equipment. Not open to students majoring in art and design. Prerequisite: Introduction to Art and Design 185. 3 hours.
190. **Recreational Crafts, I.** Introduction to design and execution in crafts particularly adapted to work with children in schools, playgrounds, and summer camps. Primarily for recreation majors in physical education. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
209. **Japanese Tea Ceremony and Zen Aesthetics.** The tea ceremony and culinary arts of Japan practiced as the physical discipline necessary for Zen aesthetic experience. Prerequisite: Introduction to Art and Design 108 or 109. 2 hours. May be repeated to a maximum of 4 hours.
301. **Children's Artistic Development.** Historical and contemporary perspectives on children's artistic development emphasizing relationships between general intellectual growth and the ability to create and respond to works of art. Prerequisite: Junior standing, and Psychology 100 and Educational Psychology 211. 3 hours, or $\frac{3}{4}$ or 1 unit.

General Professional Courses in Art and Design

113. **Orientation to Art and Design.** An overview of art and design professions in today's society. 0 credit.
117. **Drawing, I.** Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
118. **Drawing, II.** Continuation of General Professional Courses in Art and Design 117. Theory and practice in the elements of drawing. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 117. 3 hours.
119. **Design, I.** Theory and practice in the elements of two-dimensional design and the study of color. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.

120. **Design, II.** Theory and practice in the elements of three-dimensional design. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. Prerequisite: General Professional Courses in Art and Design 119. 3 hours.
121. **Drawing Theory.** Orthographic, oblique, and isometric projections and perspective. 2 hours.
122. **Drawing Theory.** Continuation of General Professional Courses in Art and Design 121, including the science of shades, shadows, and reflections in perspective drawing. Prerequisite: General Professional Courses in Art and Design 121. 2 hours.
187. **Freehand Drawing.** For students in architecture: drawing three dimensional form and space. Intense investigation of perspective in freehand drawing; drawing in class and outside sketchbook assignments from nature, including the human figure in pencil, pen, and other media. Prerequisite: Enrollment in Architecture curriculum. 2 hours.
188. **Watercolor.** For students in architecture. Introduction to watercolor and color theory; continued practice of freehand drawing, composition, and outside sketching from nature. Prerequisite: General Professional Courses in Art and Design 187 and enrollment in architecture curriculum. 2 hours.
189. **Art Studio.** For students in architecture. Introduction to ideas in art, different media, art experiences from representational to abstract; flat and three dimensional; continued work in sketchbook from nature. Prerequisite: General Professional Courses in Art and Design 188; enrollment in architecture curriculum. 2 hours.
191. **Unit One Studio/Seminar in Art and Design.** Topics vary; consult *Timetable* or Unit One office. 1 to 3 hours. May be repeated as topics vary.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
391. **Individual Studio Problems.** Directed independent creative activity or research. Prerequisite: Junior or graduate standing; consent of instructor, student's advisor, and Associate Director of the School. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
398. **Art and Design Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see *Timetable* for medium/topic. Prerequisite: Junior, Senior, or Graduate standing in art and design, or consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topics vary.
493. **Seminar: Introduction to Methods and Criticism.** Prerequisite: Graduate standing in art. $\frac{1}{4}$ to 1 unit.

Art Education

203. **Art in the Elementary Grades, I.** Introductory laboratory experiences with the elements of design in the visual arts and with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. 3 hours.
204. **Art Education Laboratory.** Examines methods and studio activities for elementary and secondary schools with a variety of appropriate materials and processes; includes techniques, art activities and practical application for teaching exceptional students, including learning disabled. 2 hours. Must be repeated for a total of 4 hours.
205. **Art in the Elementary Grades, II.** A continuation of laboratory experiences begun in Art Education 203 with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. Prerequisite: Art Education 203. 3 hours.
206. **Practicum in Teaching Art.** Supervised teaching of art to children augmented by a seminar; includes classroom preparation and evaluation. Prerequisite: Art Education 207 or consent of instructor. 4 hours.
207. **Art Curriculum Development and Practicum in the Elementary Schools.** Early field experience in local elementary schools one half day weekly; includes identification, instruction, methods, and practicum on the psychology of the exceptional child. Prerequisite: Art education major; sophomore standing. 3 hours.
208. **Organization of Public School Art Programs.** The selection and arrangement of content for different educational levels; study and evaluation of curricula, equipment, and supplies; and

program supervision. Prerequisite: Art Education 207 or junior standing in art, or consent of instructor. 3 hours.

280. **Professional Seminar in Art Education.** Examines responsibilities, methods, and techniques specific to teaching art in elementary and secondary schools; includes the psychology of the exceptional child in conjunction with methods of instruction and student teaching experience. Prerequisite: Art Education 204 and 207; concurrent registration in Educational Practice 238 and 242, art education sections only. 4 hours.
290. **Senior Honors in Art Education.** Independent guided research and study for honors. Prerequisite: Senior standing in art education, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Problems in Art Education.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
389. **Aesthetic Inquiry and Criticism in Art Education.** Studies the theories of art, techniques of criticism, the meaning of artistic expression, and their relationship to the visual arts and art education. Prerequisite: Advanced standing in art education curriculum or consent of instructor. 4 hours or 1 unit.
390. **Advanced Art for Elementary Grades.** Advanced laboratory experiences in two-dimensional visual art techniques for elementary teachers, supervisors, and principals. Prerequisite: Art Education 205 or consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated for a maximum of 4 hours or 2 units.
489. **Issues in Art Education.** A study of fundamental issues affecting education in the visual arts; examines and explores the educational implications of the nature and value of art, the nature of the artist, and the development of the child as an artist and connoisseur. 1 unit.
490. **Curriculum Development in Art.** An analysis of curriculum organization in the visual arts; particular emphasis given to a range of curriculum positions in education and general research related to curriculum design. Prerequisite: Consent of instructor. 1 unit.
491. **Special Problems in Art Education.** Individual direction in research and in creative activity; thesis. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in art education. 0 to 4 units.

Cinematography

180. **Introduction to Cinematography.** Introduction to the principles and techniques of cinematography as applied to individual expression. 3 hours.
280. **Basic Cinematography.** Fundamentals of the theory and practice of motion pictures as an art form, with emphasis on principles, tools, and techniques. Prerequisite: Cinematography 180 or consent of instructor. 3 hours.
291. **Individual Cinematography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
380. **Cinematography.** Theory and practice of motion pictures as an art form; emphasis on individual creative production. Anticipated cost to the student for each semester is \$75 to \$200. Costs should be discussed with the instructor before enrollment. Prerequisite: Cinematography 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 12 hours or 4 units.
491. **Special Problems in Cinematography.** Directed individual creative activity or research. Prerequisite: Cinematography 380. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Crafts

160. **Jewelry, I.** The design and execution of simple jewelry and related metal forms, including study of characteristics of base and precious metals through forming, fabrication, decoration, and finishing processes. 2 hours.
161. **Jewelry, II.** Continuation of Crafts 160; further experience and experimentation with manipulative techniques, materials, and processes, emphasizing the lost wax casting technique. Prerequisite: Crafts 160. 2 hours.
170. **Ceramics, I.** The design and production of pottery by hand methods. Work covers the basic processes of forming, decorating, and firing. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
171. **Ceramics, II.** Advanced work in studio pottery, including expanded experience in forming methods and glaze compounds. Prerequisite: Crafts 170. 2 hours.
260. **Jewelry, III.** The design and production of jewelry and metal work for majors in crafts with further experience in manipulative techniques such as casting, electroforming, surface decoration, enamelling, complex construction and forming. Prerequisite: Crafts 160 and enrollment in the crafts curriculum. 3 hours.
261. **Jewelry, IV.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style through advanced techniques of holloware, complex construction, enamelling, electroforming and plating, forging and the use of varied materials. Prerequisite: Crafts 260. 3 hours.
262. **Metal Technology.** Understanding of the working properties of a number of nonferrous metals, their alloys, and their patination; such areas as electroforming on organic and inorganic materials, working with rigid and thermosetting plastics, and experimentation with little known processes of metalwork to be subjects of individual research. Prerequisite: Junior standing in crafts or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
264. **Jewelry, V.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style and ability to work independently with regular faculty consultation. Prerequisite: Crafts 261. 5 hours.
265. **Jewelry, VI.** Continuation of Crafts 264; emphasis on experimentation and development of personal style, a portfolio, and a senior exhibition. Prerequisite: Crafts 264. 5 hours.
270. **Ceramics, III.** Introduction to ceramic design for developing basic skills in designing and producing clay products by various hand processes including throwing, handbuilding, and casting. Prerequisite: Junior standing in curriculum in crafts. 3 hours.
271. **Ceramics, IV.** Introduction to ceramic glaze calculation; concern with the understanding and application of the knowledge of glaze calculation in a creative way and with applications of creative experiments in glaze and clay bodies. Prerequisite: Crafts 270. 3 hours.
274. **Ceramics, V.** The application of the combined skills of throwing and creative glaze procedures to produce thrown ceramic products with the emphasis on creative experimentation; also covers plaster and mold making as a creative procedure in producing clay products. Prerequisite: Crafts 271. 5 hours.
275. **Ceramics VI.** Technical and creative research in ceramic design, with emphasis on reappraisal of the traditional media and the traditional limited production method used by artist potters. Prerequisite: Crafts 274. 5 hours.
288. **Glass, I.** The design and production of glasswork by the offhand methods; work covers the basic processes of blowing and molding. Prerequisite: Industrial Design 134; junior standing in art or consent of instructor. 2 hours.
289. **Glass, II.** Advanced work in glassworking by the offhand methods including blowing, casting, fuming, and acid etching. Prerequisite: Crafts 288. 2 hours.
290. **Senior Honors in Crafts.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in crafts, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Crafts Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.

364. **Metal.** For graduate students not specializing in crafts; an additional creative experience for students who are aesthetically advanced in another medium. Prerequisite: Consent of instructor and associate director of School; open only to seniors and graduate students in art and design curricula other than crafts. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
374. **Ceramics.** Ceramic design with emphasis on the development of professional style and personal expression. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 2 units. May be repeated to a total of 6 hours.
384. **Glass.** Advanced glass design with emphasis on professional development and personal style. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
491. **Special Problems in Crafts.** Directed individual creative activity or research. Prerequisite: Graduate standing in crafts. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
498. **Ceramic-Glass-Metal Laboratory.** Individually directed research and personal expression in ceramic, glass, or metal medium. Prerequisite: Enrollment in the M.F.A. program with a major in ceramics, glass, or metal, or consent of departmental graduate committee. $\frac{1}{2}$ to 2 units. May be repeated.

Graphic Design

100. **Design History Survey.** Studies the history of design from 1850 to the present, showing the relationships between graphic design, industrial design, interiors, and architecture; gives attention to major historical movements as well as to the emergence of modern and contemporary design. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 120 by students in graphic design. 3 hours.
120. **Visual Organization.** Introduces the discipline and function of graphic design; explores the organization and structure of two-dimensional space as context for visual communication; includes practical exercises in visual perception, visual organization, and visual communication. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 100 by students in graphic design. 3 hours.
130. **Production.** Basic information and current methods in the production of multiple printed communications, including printing processes, papermaking, binding and other practices, and the preparation of art work for the various methods of reproduction; field trips required. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 140 by students in graphic design. 3 hours.
140. **Typography.** Introduces the discipline, function, and tradition of typography as it relates to visual/verbal communication; explores both technical and formal aspects. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 130 by students in graphic design. 3 hours.
210. **Photo/Graphics.** Explores the design potential of photographic and related processes in the generation of imagery for visual communication, employing in-camera, darkroom, and graphic arts equipment manipulations. Prerequisite: Concurrent registration in Graphic Design 230 or 240. 3 hours.
220. **Image Making.** The understanding and application of the image making process in graphic design, with emphasis on hand-generated images; covers historical, cultural, and technological influences on concept, content, and visual style. Prerequisite: Graphic Design 130 and 140; concurrent registration in Graphic Design 230 or 240. 3 hours.
230. **Advanced Typography.** Further exploration of typographic form and manipulation of variables which affect content, stresses the importance of typographic composition as an integral component of contemporary visual communication design. Prerequisite: Junior standing in graphic design curriculum, and Graphic Design 130 and 140. 3 hours.
240. **Methodology.** Goal-directed graphic design problem-solving with emphasis on the methods of thinking and research which precede the making of design; development of systems for objective problem-solving. Prerequisite: Graphic Design 230. 3 hours.
290. **Senior Honors in Graphic Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in graphic design, a cumulative grade point aver-

age of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.

- 291. **Individual Graphic Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 370. **Advanced Graphic Design, I.** Research in, and analysis and synthesis of, complex visual problems; emphasizes modular sequence, symbolic systems, and image making for visual communication. Students prepare comprehensive portfolio and consider professional requirements encountered by the designer in the visual communications industry. Prerequisite: Graphic Design 240; for graduate credit, consent of graphic design program chair. 3 hours or $\frac{3}{4}$ unit.
- 380. **Advanced Graphic Design, II.** Continuation of Graphic Design 370. Prerequisite: Graphic Design 370; for graduate credit, consent of graphic design program chair. 3 hours or $\frac{3}{4}$ unit.
- 467. **Graphic Design Laboratory.** Individually directed research in the studio with concentration in graphic design. Prerequisite: Enrollment in the M.F.A. program in graphic design or consent of departmental graduate committee. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
- 491. **Special Problems in Graphic Design.** Directed individual creative activity or research. Prerequisite: Graduate standing in graphic design. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

History of Art

- 101. **Introduction to Non-Western Art: East Asia.** Cultural analysis of the interrelated fields of architecture, sculpture, and painting, and other humanistic studies of East Asian civilizations; emphasizes India, China, and Japan. 3 hours.
- 110. **Introduction to Non-Western Art: Africa, the Americas, and Oceania.** Highlights of visual arts traditions in black Africa, pre-Columbian America, and the South Pacific; a cross-cultural analysis of non-Western aesthetic systems and forms with a focus on thematic problems rather than style surveys. 3 hours.
- 111. **Ancient and Medieval Art.** The development of the visual arts in Western Europe and the Near East in their cultural contexts from prehistoric times until the early fifteenth century; includes Egyptian, Greek, Roman, and medieval art and architecture. 4 hours.
- 112. **Renaissance and Modern Art.** The development of the visual arts in Western Europe and the United States in their cultural contexts from the early fifteenth century to the present. 4 hours.
- 115. **Art Appreciation.** A broad introduction to the visual arts; surveys media representing the major cultural and historical periods, both Western and non-Western. In addition to required lectures and readings, campus art collections and exhibitions are visited periodically. 3 hours.
- 116. **Masterpieces of Art.** Studies selected Western and non-Western masterpieces of art and architecture, considered both as aesthetic objects and as expressions of the ideals and beliefs of the societies for which they were created. 3 hours.
- 210. **African Art and Society, I.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multi-media framework and a social-religious context; surveys the art styles of the Dogon, Senufo, Mende, and Ashanti peoples. 3 hours.
- 211. **African Art and Society, II.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multi-media framework and a social-religious context; focuses on Yoruba art and surveys the art traditions of southeastern Nigeria, Cameroons, Gabon, Central Africa, and East Africa. 3 hours.
- 215. **Greek Art.** Same as Classical Civilization 217. Survey of architecture, sculpture, and painting of the Greek world from the geometric period to the beginning of the Christian era. 3 hours.
- 216. **Roman Art.** Same as Classical Civilization 218. Survey of architecture, sculpture, and painting of the Roman world from republican times to the age of Constantine, with brief treatment of later Roman art leading to Byzantine. 3 hours.

217. **The Development of the Ancient City.** Same as Classical Civilization 231. See Classical Civilization 231.
218. **Ancient Greek Sanctuaries.** Same as Classical Civilization and Religious Studies 232. See Classical Civilization 232.
219. **The Classical Tradition in Art from the Renaissance to the Modern Age.** Examines the effect of the art of classical antiquity upon the works of some of the greatest artists from the Renaissance to the modern age; discusses works of art as much as possible in the language of comparison employed by their creators and the poets and critics of their time. 3 hours.
222. **Medieval Art.** The arts of Byzantium and Western Europe from the early Christian era to the Renaissance. 3 hours.
230. **Italian Renaissance Art.** Architecture, painting, sculpture, and minor arts of Italy during the Renaissance. 3 hours.
231. **Northern Renaissance Art.** Architecture, painting, sculpture, and minor arts of Europe outside Italy in the fifteenth and sixteenth centuries. 3 hours.
235. **Baroque and Rococo Art.** Studies European painting, sculpture, and graphic work during the period 1580 to 1750 with emphasis on major masters such as Bernini, Caravaggio, Poussin, Rembrandt, Rubens, Velazquez, and Watteau. 3 hours.
240. **Art of the Nineteenth Century.** Architecture, painting, sculpture, and minor arts of France, Germany, Spain, and England in the nineteenth century. 3 hours.
241. **Twentieth-Century European Art.** A survey of the major artists and artistic movements in European painting and sculpture from postimpressionism to the present. 3 hours.
250. **American Art.** Surveys American art and architecture from the colonial period to the present. 3 hours.
289. **Senior Honors in Art History-BA.** Independent guided research and study in a selected area of art history for candidates for the Bachelor of Arts in Art History with departmental distinction. Prerequisite: Senior standing in the Art History curriculum, a cumulative grade point average of 4.25, an art history grade point average of 4.5, and consent of instructor, department advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours. (Counts for advanced hours in LAS.)
290. **Senior Honors in Art History-BFA.** Directed independent research and study for honors. Prerequisite: Senior standing in FAA art history, a cumulative grade point average of 4.0, and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Art History Topics.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
301. **Chinese Art.** History of Chinese art from earliest times to the present. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Japanese Art.** History of Japanese art from earliest times to the twentieth century. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
303. **Intellectual Artists of China.** Studies selected artists including struggling recluses, fanatics, eccentrics, and individualists; examines the aesthetic and expressive content of their works within the content of their social and intellectual environment. 3 hours, or $\frac{3}{4}$ or 1 unit.
304. **Space and Design in Japanese Art and Architecture.** Studies basic design principles in Japanese painting, pottery, costumes, architecture, gardens, and other crafts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
310. **West African Art.** A study in depth of West African art styles in time perspective and cultural context, with a special interest in the use of interdisciplinary source materials. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Traditional Art of Pacific Ocean Cultures.** A survey of traditional art in Polynesia, Melanesia, and Micronesia, including New Zealand and Australia; emphasizes major style areas and their historical and cultural significance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
315. **The Archaeology of Greece.** Same as Classical Civilization 343. See Classical Civilization 343.
316. **The Archaeology of Italy.** Same as Classical Civilization 344. See Classical Civilization 344.
317. **The Ancient Ideal in Art and Literature.** Same as Classical Civilization 332 and Comparative Literature 306. See Classical Civilization 332.

321. **Early Christian and Early Medieval Art.** Christian art of the Roman Empire, the art of early Medieval Europe (including England and Ireland), and of the Eastern Mediterranean from the third to the eighth centuries. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
322. **Byzantine and East Christian Art.** The arts of Byzantine, the Crusader States, and Russia from the ninth to the fifteenth centuries. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
323. **Romanesque Art.** Art and architecture of the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
324. **Gothic Art.** The arts of western Europe from the end of the Romanesque period until the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Medieval Manuscripts and Early Printed Books.** Surveys manuscript illumination and early book production from 300 to 1500 A.D.; topics include techniques of manuscript illustration and printing production in such masterpieces as the Vatican Virgil, the Utrecht Psalter, the Book of Kells, the Tres Riches Heures, the Gutenberg Bible, and Brant's *Ship of Fools*. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
330. **Problems in Italian Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of Italy during the Renaissance selected for intensive study; special emphasis given to the study of the lives of artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
331. **Problems in Northern Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of France, Germany, Spain, and England during the Renaissance selected for intensive study; special emphasis given to the study of the lives of the artists and problems in style or iconography. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
332. **Italian Art of the Sixteenth Century.** Painting, sculpture, and minor arts in Italy from 1520 to 1590. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Baroque Art in Italy and France.** Studies painting, sculpture, and graphic work in Italy and France during the period 1580-1700 emphasizing such major masters as Bernini, Caravaggio, the Carracci, Cortona, La Tour, and Poussin. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
336. **The Age of Rembrandt and Rubens.** Studies seventeenth-century art in the Low Countries with extensive treatments of the careers of Rubens and Rembrandt. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
337. **Spanish Art from El Greco to Goya.** Studies art and architecture in Spain from the sixteenth through the nineteenth centuries, with emphasis on the masters of the Golden Age; includes El Greco, Velazquez, Zurbaran, Montanes, Ribera, Cano, Murillo, and Goya. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
339. **English Art of the Eighteenth Century.** The rise and development of the pictorial arts in eighteenth century England with particular emphasis on such major artists as Hogarth, Gainsborough, Reynolds, and Wilson. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit.
340. **Romantic Art.** Studies English, French, and German art from the end of the eighteenth century through 1840; focuses on revivalist movements, historicism, landscape art, and changing conceptions of art and artist during the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Realism to Post-Impressionism.** Studies European art from 1850 to 1900, with emphasis on French painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
342. **German and Austrian Painting of the Late Nineteenth and Early Twentieth Centuries.** A survey of modern German and Austrian painters and pictorial movements from the 1890s to the period of Hitler, with special emphasis on the expressionist period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
343. **The Art Nouveau in Europe.** A survey of the principal artists and artistic currents in the applied arts during the 1890s in Europe; emphasis on individual figures, with an attempt to define the common stylistic and theoretical assumptions of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

344. **The Beginnings of Modernism: European Art from Post-Impressionism to World War I.** The pioneer movements in modern painting and sculpture, emphasizing the work and ideas of individual major figures. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Twentieth-Century Art in Europe: 1915-1945.** A study of the leading personalities and movements in European painting, sculpture, and architecture, with emphasis on painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
346. **Recent American Painting and Sculpture.** A critical survey of developments since World War II with emphasis on questions of quality and personal content and with consideration of the most current tendencies. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
350. **Realism and Romanticism in American Art, 1776-1876.** Studies the two major directions of art in the United States from independence to the centennial, with focus on major figures and the scientific and philosophical movements which influenced them. Prerequisite: One year of art history or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **Early American Modernism.** Examines American art, particularly painting and sculpture, 1876-1940, against its cultural background and the relation of the American artist to Europe in an attempt to isolate the roots of Modernism in the United States. Prerequisite: One year of art history or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **History of Photography.** Examines a history of photography from its origin to the present, including both documentary and artistic approaches; considers relationships with other arts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Historiography of Art and the History of Art Criticism.** Origins and the development of the history of art criticism. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
366. **Introduction to Art Museology.** Survey of the art museum as a professional institution, its history, and present orientation; designed to acquaint prospective graduate students with the field of museum operation and to serve as background for students entering graduate courses in special fields of art museum practice (museology). Prerequisite: Consent of instructor. 4 hours or 1 unit.
391. **Topics in Art History.** Variable content; consult the *Timetable* for current topics. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated as topics vary.
401. **Seminar in Chinese Art.** Investigation of selected phases, concepts, and problems of the art of China; intensive reading and reports. Prerequisite: History of Art 301 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
402. **Seminar in Japanese Art.** Investigation of selected phases, concepts, and problems of the art of Japan; intensive reading and reports. Prerequisite: History of Art 302 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
410. **Seminar: African Art.** An intensive investigation of selected problems in the sculpture and other arts of Negro Africa. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
422. **Studies in Medieval Art.** Research seminar in subjects selected from the art and architecture of the medieval period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
430. **Seminar in Renaissance Art.** Special problems in the history of Renaissance art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
435. **Seminar in Baroque Art.** Research seminar in problems selected from the art of seventeenth-century Europe. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
440. **Seminar in the Art of the Period 1750-1900.** An intensive study of selected problems in European art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
441. **Seminar in Modern Art.** Investigation of special problems in the history of twentieth-century art. Students present reports of their research. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
446. **Seminar in Contemporary Art.** Intensive study of selected problems or artists. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.

450. **Seminar in American Art.** Investigation of selected problems in the history of American art. Prerequisite: History of Art 350 and 351, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
465. **Seminar: Studies in the Development of Art History and Criticism.** The relation of art history and criticism: changing standards and criteria; intensive reading of selected critical works; and the writing of art criticism. Prerequisite: Consent of instructor. 1 unit.
466. **Art Curatorial Techniques.** An intensive course in the role, responsibilities, and duties of the art museum curator; demonstration and practice of curatorial techniques in researching, documenting, acquiring, transporting, handling, and conservation of works of art. Prerequisite: History of Art 366. 1 unit.
467. **Art Museum Administration and Education.** Two aspects of art museum work: (1) administration, covers trustee relations, methods of serving the public, fund raising, budgeting, staff organization, and program planning; (2) museum education. Students receive practice in the preparation of educational exhibitions and related educational materials. Prerequisite: History of Art 366. 1 unit.
468. **Art Museum Internship.** Introduction to actual supervised practice in one specialized department in an art museum: curatorial, educational, or administrative department. Prerequisite: History of Art 466 and 467. 1 unit.
492. **Individual Readings in the History of Art.** Directed readings in special fields or aspects of history of art not provided in depth by the current course offerings. Prerequisite: Consent of instructor. Sections A and B may be taken simultaneously. Registration allowed for each section is $\frac{1}{2}$ to 1 unit.
499. **Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in history of art. 0 to 4 units.

Industrial Design

133. **Design Workshop.** Fundamentals of three-dimensional design. Primarily for students majoring in the industrial design curriculum. Prerequisite: General Professional Courses in Art and Design 118, 120, and 121. 2 hours.
134. **Introduction to Industrial Design.** Fundamentals of two and three dimensional design as applied to industrial design. Prerequisite: Industrial Design 133 and General Professional courses in Art and Design 122. 3 hours.
175. **Design Methodology.** Introduction to problem solving methods, project organization, and project programming for designers; lectures and discussions include techniques for stimulating creative problem solving and task analysis; research paper required. Prerequisite: Sophomore standing in industrial design, or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
270. **Drawing and Rendering.** Perspective drawing using color pastels, markers, and other media with emphasis on quick delineation. Prerequisite: Concurrent registration in Industrial Design 275, 276, 277, or 278; or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
271. **Materials and Processes, I.** Use and manipulation of basic materials in modern industry. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
272. **Materials and Processes, II.** Continuation of Industrial Design 271. Prerequisite: Industrial Design 271. 3 hours.
275. **Industrial Design, I.** Designing of objects for manufacture by the machine industries. Field trip required. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
276. **Industrial Design, II.** Continuation of Industrial Design 275. Field trip required. Prerequisite: Industrial Design 275. 3 hours.
277. **Advanced Industrial Design, I.** Prerequisite: Industrial Design 276. 4 hours.
278. **Advanced Industrial Design, II.** Prerequisite: Industrial Design 277. 4 hours.

280. **Professional Practices.** Focuses on the preparation of a design portfolio and resume; examines operations of professional design offices; and includes presentations and discussions by visiting designers. 2 hours.
290. **Senior Honors in Industrial Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in industrial design, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Industrial Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
371. **Computer Applications in Design, I.** Concepts and methods used in computer-aided design using interactive paint programs, computer-aided design and drafting programs, and three-dimensional solids modeling programs; emphasizes the use of the computer as a tool in the designer's developmental process. Prerequisite: Junior or graduate standing in industrial design curriculum or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
372. **Computer Applications in Design, II.** Continuation of Industrial Design 371 with emphasis on applying computer applications programs to solving product, graphic, and communications problems in design; uses of networking and high quality output devices (plotters, printers, and video media). Prerequisite: Industrial Design 371 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
477. **Industrial Design Laboratory.** Individually directed research in the drafting room or workshop with concentration on industrial design. Prerequisite: Enrollment in the M.F.A. program in industrial design or consent of departmental graduate committee. $\frac{1}{2}$ to 3 units. May be repeated.
491. **Special Problems in Industrial Design.** Directed individual creative activity or design. Prerequisite: Graduate standing in industrial design. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Painting

125. **Life Drawing.** Prerequisite: General Professional Courses in Art and Design 118. 2 hours.
126. **Life Drawing.** Prerequisite: Painting 125. 2 hours.
141. **Beginning Painting, I.** Painting in oil from arranged groups. Prerequisite: Freshman standing in art. 2 hours.
142. **Beginning Painting, II.** Continuation of Painting 141. Prerequisite: Painting 141. 2 hours.
143. **Painting Composition, I.** Problems of non-literal content for painters, with special consideration of materials and techniques. Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
144. **Painting Composition, II.** Continuation of Painting 143 with special emphasis on formal organization in painting. Prerequisite: Painting 143. 2 hours.
201. **Watercolor, I.** Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
202. **Watercolor, II.** Continuation of Painting 201. Prerequisite: Painting 201. 2 hours.
225. **Intermediate Drawing.** Study from life in drawing media. Prerequisite: Painting 126 and junior standing in art. 2 hours.
226. **Intermediate Drawing.** Continuation of Painting 225. Prerequisite: Painting 225. 2 hours.
229. **Anatomical Drawing.** Advanced drawing emphasizing human anatomy including the skeletal and muscular structure of the human figure. Prerequisite: General Professional Courses in Art and Design 118 and Painting 126. 3 hours.
231. **Intermediate Composition.** Prerequisite: Painting 126, 142, and 144. 3 hours.
232. **Intermediate Composition.** Prerequisite: Painting 231. 3 hours.
233. **Advanced Composition.** Prerequisite: Painting 226, 232, and 244. 3 hours.
234. **Advanced Composition.** Prerequisite: Painting 233. 3 hours.
243. **Figure Painting.** Painting in oil from the head and full figure. Prerequisite: Painting 126 and 142. 2 hours.

244. **Figure Painting.** Continuation of Painting 243. Prerequisite: Painting 243. 2 hours.
245. **Advanced Painting and Drawing.** Advanced creative study from nature and the model in various painting and drawing media. Prerequisite: Painting 226, 232, and 244. 3 hours.
246. **Advanced Painting and Drawing.** Continuation of Painting 245. Prerequisite: Painting 245. 3 hours.
290. **Senior Honors in Painting.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in painting, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Painting Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
380. **Drawing.** Advanced drawing in several media. Prerequisite: For undergraduates, consent of instructor; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.
381. **Painting.** Advanced painting in oil and other media. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Painting 142 or equivalent; for graduates, consent of departmental graduate committee. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a total of 2 units.
382. **Painting Materials and Techniques.** Study of the materials and techniques used in the various media: oil, watercolor, tempera, gouache, encaustic, etc. Prerequisite: Painting 142 or graduate standing in art. 2 hours or $\frac{1}{2}$ unit.
491. **Special Problems in Painting and Drawing.** Directed individual creative activity or research. Prerequisite: Graduate standing in painting. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
495. **Painting Laboratory.** Professional and experimental painting with emphasis on the development of maturity of style and personal expression. Prerequisite: Enrollment in the MFA program in painting. $\frac{1}{2}$ to 3 units.

Photography

115. **Basic Photography.** Investigates basic elements comprising a photograph; explores the photograph, tone, and texture as expressive media; and works with the camera, exposure meter, and film and print developing in black and white. See *Timetable* for average cost; student must furnish camera. Prerequisite: Freshman standing in art and design; open to others during on-campus registration. 3 hours.
215. **Photography, II.** Uses hand held cameras (35mm and $2\frac{1}{4}$ ") and black and white processes to express ideas and emotions with emphasis on the development of a personal aesthetic. See *Timetable* for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
216. **View Camera and Studio.** Includes work with camera movements, black and white exposure, and development relationships as tools of creative expression; covers basic lighting techniques and studio procedures. Most equipment furnished. Prerequisite: Photography 215 or consent of instructor. 3 hours.
220. **Color Photography.** Explores the potential of color prints and transparencies as media for creative expression. See *Timetable* for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
290. **Senior Honors in Photography.** Independent creative activity, guided study, or research. Prerequisite: Senior standing in photography, cumulative grade point average of 4.0, consent of instructor, advisor, and associate director of school. 2 to 5 hours. May be repeated to a maximum of 6 hours.
291. **Individual Photography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.

315. **Photography, III.** Explores creative expression through the medium of photography. Students select format and process (i.e., black and white, color, mixed media) based on prior experience; group critiques held frequently; initial opportunity to experiment in personally selected directions which will be refined and amplified in Photography 316. Prerequisite: Photography 215; History of Art 357; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ unit.
316. **Advanced Photography.** Concentrated use of photographic processes for creative expression with emphasis on professionalism and the production of a photographic portfolio. Prerequisite: Photography 216 and 315; and minimum one other photography elective course. 3 hours or 1 unit.
330. **Alternative Processes.** Explores cyanotype, Van-Dyke Brown, Bichromate Printing and other historical processes. Additional work will utilize offset lithography and electrostatic equipment. Prerequisite: Two art photography course including Photography 215 or consent of instructor. Background in drawing, design, and art history courses will be expected. 3 hours or 1 unit.
331. **Digital Photography.** Problem solving using digital photographic technology. Projects will include the production of slides and/or video with additional graphic arts techniques, electrostatics and computer typesetting. Prerequisite: Photography 115 and enrollment in a BFA or Graduate Curriculum in Art and Design, or consent of instructor. 3 hours or 1 unit.
332. **Experimental Visualization Technologies.** Exploration and problem solving in visual communication using the Renaissance Experimental Lab at the Beckman Institute. Students will use computers, and sometimes collaborate with peers in the sciences and humanities, to create projects and scientific visualizations. Prerequisite: Photography 331 and/or consent of instructor. 3 hours or 1 unit.
350. **Photography Seminar.** Advanced study of photographic issues and literature. Discusses aesthetics, criticism, and current imagery, as well as photography's relationship to other media. Prerequisite: Photography 115, or History of Art 357; or consent of instructor. 3 hours or 1 unit.
360. **Video for Artists, I.** Explores the potential of video as a medium for creative expression and communications within the context of visual art. See current *Timetable* for average student materials cost; camera, recording, and editing equipment are furnished. Prerequisite: Junior standing in art; Photography 115 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
361. **Video for Artists, II.** Explores advanced concepts and techniques of video as a medium of creative expression and communication within the context of visual art. See current *Timetable* for average student material cost; camera, recording, and editing equipment are furnished. Prerequisite: Photography 360. 3 hours, or $\frac{3}{4}$ or 1 unit.
486. **Photography Studio.** Individually directed research; personal expression through the photographic medium. Prerequisite: Enrollment in M.F.A. program and major in photography, or consent of the departmental graduate committee. $\frac{1}{2}$ to 2 units. May be repeated.
491. **Special Problems in Photography.** Directed individual creative activity or research. Prerequisite: Graduate standing in photography. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

Printmaking

271. **Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Sophomore standing in art and design or consent of instructor. 2 hours.
272. **Etching.** A studio course in intaglio, including the complete development from sketch to printing stages. Prerequisite: Printmaking 271. 2 hours.
281. **Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Sophomore standing in art and design or consent of instructor. 2 hours.

282. **Lithography.** A studio course in lithography comprised of black and white and multiple-color printing on both stones and metal plates; work includes complete development of a lithographic print from idea to the final print. Prerequisite: Printmaking 281. 2 hours.
291. **Individual Printmaking Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
371. **Etching.** Advanced work in various printmaking techniques. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Printmaking 272 or equivalent; for graduates, consent of departmental graduate committee. 2 hours, or ½ to 1 unit.
381. **Lithography.** Laboratory course in lithography. Course of study includes a complete development of the process, exploiting its potential as a fine art medium. Prerequisite: For undergraduates, Printmaking 282; for graduates, consent of departmental graduate committee. 2 hours, or ½ to 1 unit.
491. **Special Problems in Printmaking.** Directed individual creative activity or research. ½ to 2 units. May be repeated to a maximum of 5 units.
497. **Print Workshop.** Intaglio, relief, and planographic print media; includes etching, engraving, aquatint, wood, paper, and plastic relief printing, and lithography. Prerequisite: Graduate standing in art. ½ to 3 units.

Sculpture

151. **Sculpture.** Anatomical and ornamental forms; plaster molds and models; and wood and stone sculpture. Prerequisite: Freshman standing in art. 2 hours.
152. **Sculpture.** Continuation of Sculpture 151. Prerequisite: Sculpture 151. 2 hours.
228. **Introduction to Handmade and Cast Paper.** Introduces the techniques of handmaking paper of various materials and of casting paper as sculpture, including molding techniques, investigations into various uses, and applications of the two techniques. 3 hours.
253. **Intermediate Sculpture, I.** A free, experimental, and creative use of permanent and impermanent sculpture materials; clays, wood, pastelines, and plasters. Prerequisite: Sculpture 152. 2 hours.
254. **Intermediate Sculpture, II.** Special projects in stone carving and malleable sheet metal; lead, copper, brass, and aluminum. Prerequisite: Sculpture 253. 2 hours.
255. **Sculpture Materials and Techniques, I.** Special projects for cast bronze; model preparations, investments, melting, pouring, chasing, and developing of patinas. Prerequisite: Sculpture 152; junior standing in curriculum in sculpture. 3 hours.
256. **Sculpture Materials and Techniques, II.** Special projects in terra cotta; use of various clays; preparation and construction methods; special problems in casting methods and materials; kiln operation; fuels; and glazing. Prerequisite: Sculpture 255. 3 hours.
257. **Advanced Sculpture, I.** Introduction to plastics and welded metals; projects utilizing the special qualities of these materials. Prerequisite: Sculpture 254. 2 hours.
258. **Advanced Sculpture, II.** Projects in permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 257. 2 hours.
259. **Advanced Sculpture Materials and Techniques, I.** Projects in various permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 256. 3 hours.
260. **Advanced Sculpture Materials and Techniques, II.** Continuation of Sculpture 259. Prerequisite: Sculpture 259. 3 hours.
290. **Senior Honors in Sculpture.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in sculpture, a cumulative grade point average of 4.0; and consent of instructor, advisor, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Sculpture Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, advisor, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.

- 328. **Handmade and Cast Paper.** Examines advanced techniques of handmaking paper of various materials and of casting paper as sculpture; includes sheet forming, studies of molding techniques, plant fibers, and dyes appropriate for papermaking. Prerequisite: Sculpture 228 or graduate standing in art and design curricula. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 391. **Advanced Sculpture Techniques.** Advanced work in various sculptural media. Prerequisite: Consent of instructor. 2 hours, or ½ to 1 unit.
- 428. **Advanced Papermaking.** Artistic applications of hand paper making with emphasis upon individual aesthetic expressions. Prerequisite: Sculpture 328 or graduate standing in art and design. ½ to 1 unit. May be repeated to a maximum of 3 units.
- 491. **Special Problems in Sculpture.** Directed individual creative activity or research. Prerequisite: Graduate standing in sculpture. ½ to 2 units. May be repeated to a maximum of 5 units.
- 496. **Sculpture Laboratory.** Experience at a professional level in sculptural techniques including metals casting, welding, stone carving, wood carving, clay modeling, and ceramic sculpture, with emphasis on the development of creative achievement. Prerequisite: Enrollment in the M.F.A. program in sculpture or consent of departmental graduate committee. 1 to 3 units.

ART EDUCATION

(See Art and Design)

ASIAN STUDIES

(Including Chinese, Japanese, and Korean)

Director of Center for East Asian and Pacific Studies: B. Karsh
Center Office: Room 201, 1208 West California, Urbana

All 200-level language courses, Chinese 301 and 302, and Japanese 301 and 302, are open to freshmen.

Asian Studies

- 104. **Asian Mythology.** Same as Religious Studies 104. See Religious Studies 104.
- 122. **History of East Asian Religions.** Same as Religious Studies 122. See Religious Studies 122.
- 132. **Zen.** Same as Religious Studies 132. See Religious Studies 132.
- 135. **Korean Personalities.** Same as Korean 135. See Korean 135.
- 150. **Introduction to Japanese Culture.** Same as Japanese 150. See Japanese 150.
- 175. **Masterpieces of East Asian Literature.** Same as Chinese 175, Japanese 175, and Comparative Literature 175. Study of major works in the literary traditions of China and Japan, including haiku, Noh, Tale of Genji, kabuki, Tang poetry, Dream of the Red Chamber, Ming theatre, and the colloquial tale. No knowledge of Chinese or Japanese language required. 3 hours.
- 185. **Kabuki.** Same as Fine and Applied Arts 185. See Fine and Applied Arts 185.
- 186. **Southeast Asian Civilizations.** Same as Anthropology 186 and History 172. See Anthropology 186.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. **Japanese Literature in Translation, I.** Same as Comparative Literature 211 and Japanese 205. See Japanese 205.

206. **Japanese Literature in Translation, II.** Same as Comparative Literature 212 and Japanese 206. See Japanese 206.
207. **Classical Chinese Literature.** Same as Chinese 207. See Chinese 207.
208. **Chinese Popular Literature.** Same as Chinese 208. See Chinese 208.
218. **Japanese Hero Types.** Same as Comparative Literature and Japanese 218. See Japanese 218.
219. **Women in Japanese Literature.** Same as Comparative Literature and Japanese and Women's Studies 219. See Japanese 219.
225. **Gods and Man in Modern Japanese Drama.** Same as Comparative Literature 225 and Religious Studies 225. An approach to modern Japanese culture through drama. Special emphasis is given to the postwar period. Readings in English supplemented by films and videotapes; no knowledge of Japanese required. 3 hours.
238. **Hiroshima/Nagasaki and the Literature of Survival.** Same as Comparative Literature and Japanese 238. See Japanese 238.
261. **Family and Community in China and Japan.** An introduction to Chinese and Japanese societies at the family, village, and city levels; examines traditional marriage, child-rearing, women's roles, farming, and community leadership as well as modern trends in these areas using a variety of documentary, fictional, and visual sources. 3 hours.
262. **Popular Culture in China and Japan.** An introduction to the popular cultural traditions of China and Japan; examines popular morality, cosmology, religion, secret societies, the "way of the samurai," body and health (acupuncture, meditation, Zen, T'ai-chi chuan), aesthetics (poetry, painting, tea ceremony), and the world of the courtesan using a variety of documentary, fictional, and visual sources. 3 hours.
263. **Cultural Dynamics of Modern Asia.** Same as Anthropology 263. See Anthropology 263.
265. **Contemporary Korean Society.** Same as Sociology 265. Introduces contemporary Korean society: the twentieth century struggle of Korea for an individual identity; the Korean road to modernization and its significance for the United States and the developing world. 3 hours.
266. **Tracing Turkish Traditions.** Examines tradition formation among Turkish-speaking peoples over the past 2,000 years with varied cultural contexts, from China to the Balkans, Siberia to India, Central Asia to Asia Minor and North Africa. Interdisciplinary in nature—including, but not limited to anthropology, fine arts, history, literature, religion—with selected topics. 3 hours.
267. **History of Korea.** Same as History 267. An historical examination of the Korean experience, from the earliest times to the present day: basic political, social, economic patterns; examination of the cultural and intellectual tradition; Korea's historical role in Asia; the Korean colonial experience; Korea in the modern world. 3 hours.
285. **Premodern Japanese History.** Same as History 285. See History 285.
286. **Modern Japanese History.** Same as History 286. See History 286.
287. **Introduction to Buddhism.** Same as Religious Studies 287. See Religious Studies 287.
288. **Religion in Asian Society.** Same as Religious Studies 288 and Sociology 288. A comparative study of the inter-influences of religion and society of Asian countries concentrating on the problems of social change and development with special attention to the religions and social systems of major Asian nations such as Iran, India, China, and Japan. 3 hours.
290. **Individual Study.** Directed readings in the languages and literatures of East Asia, South Asia, Southeast Asia, or the Near East. The area selected depends on the student's interest. Prerequisite: Consent of instructor. 2 to 4 hours.
291. **Honors Tutorial.** A tutorial in the civilizations of East Asia, South Asia, Southeast Asia, or the Near East. The geographical area or nation and discipline depend on student interests. All students submit a substantial paper. Prerequisite: Prior completion of two honors activities, prior completion of work in Asian studies, and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 6 hours.
295. **Topics in Asian Religions.** Same as Religious Studies 295. See Religious Studies 295.
298. **Colloquium in Asian Studies.** Prerequisite: Junior standing. 3 hours. (Counts for advanced hours in LAS.)
303. **Japanese Society.** Same as Sociology 327. See Sociology 327.
311. **The Chinese Novel.** Same as Chinese and Comparative Literature 311. See Chinese 311.
312. **Modern Chinese Literature in Translation.** Same as Chinese and Comparative Literature 312. See Chinese 312.

315. **Modern Japanese Fiction in Translation.** Same as Comparative Literature and Japanese 315. See Japanese 315.
328. **Sociology of Asian Religions.** Same as Religious Studies and Sociology 328. See Sociology 328.
337. **Government and Politics of China.** Same as Political Science 337. See Political Science 337.
338. **Governments and Politics in the Middle East.** Same as Political Science 338. See Political Science 338.
345. **Tutorials in East and Southeast Asian Languages.** Tutorials at the elementary, intermediate, and advanced levels in special Asian languages not regularly offered are available with the consent of the director of the Center for East Asian and Pacific Studies. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of director of the Center for East Asian and Pacific Studies. 2 to 5 hours, or $\frac{1}{2}$ to 1 unit. May be repeated up to six semesters successively, but no more than 4 units of graduate credit may be accumulated in any one language.
347. **Governments and Politics of Southeast Asia.** Same as Political Science 347. See Political Science 347.
348. **Government and Politics of Japan.** Same as Political Science 348. See Political Science 348.
349. **Governments and Politics of South Asia.** Same as Political Science 349. See Political Science 349.
350. **East Asian Bibliography and Research Methods.** Introduces research methods and reference works for East Asian studies through practical exercises and assignments. Students registering for 2 hours or $\frac{1}{2}$ unit (Part I) use only Western sources; students registering for 4 hours or 1 unit (Parts I and II) use Chinese or Japanese sources for the second part of the course. Prerequisite: (Part II) Chinese 204 or Japanese 204; Part I requires no prerequisite. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
360. **Peoples and Cultures of Oceania.** Same as Anthropology 360. See Anthropology 360.
362. **Asian Prehistory.** Same as Anthropology 362. See Anthropology 362.
366. **Japanese Cinema.** Same as Humanities 366. See Humanities 366.
368. **Peoples and Cultures of India.** Same as Anthropology 368. See Anthropology 368.
369. **Asian Systems of Social Stratification.** Same as Anthropology 369. See Anthropology 369.
371. **Comparative Social Institutions.** Same as Sociology 371. See Sociology 371.
380. **Buddhist Meditation.** Same as Religious Studies 384. See Religious Studies 384.
383. **Self and Society in Japan.** Same as Anthropology 383. See Anthropology 383.
384. **Modern Chinese Society and Culture.** Same as Anthropology 384. Studies the culture and society of modern China and its socialist transformation after 1949; emphasizes rural society and peasant culture. Prerequisite: One course in East Asian Studies or Anthropology; or consent of instructor. 3 hours or 1 unit.
385. **Chinese Foreign Policy.** Same as Political Science 389. See Political Science 389.
386. **Peoples and Cultures of Mainland Southeast Asia.** Same as Anthropology 386. See Anthropology 386.
387. **Peoples and Cultures of Insular Southeast Asia.** Same as Anthropology 387. See Anthropology 387.
388. **Prehistory of Oceania.** Same as Anthropology 388. See Anthropology 388.
437. **Problems in Chinese Politics and Government.** Same as Political Science 437. See Political Science 437.
448. **Problems in Japanese Politics and Government.** Same as Political Science 448. See Political Science 448.
450. **Seminar in Asian Studies.** Seminar on selected Asian and Middle Eastern topics. The topic will vary with the instructor and the seminar may be repeated for a maximum of 3 units. Prerequisite: Consent of instructor. 1 unit.
490. **Individual Study and Research in Special Topics.** Supervised individual investigation or study of a topic not covered by regular course offerings. The topic selected by the student and the proposed plan of study must be approved by the Asian Studies curriculum adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 3 units.

Chinese

101. **Elementary Chinese, I.** An introduction to Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Chinese, II.** Second term of spoken Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Chinese. Prerequisite: Chinese 101. 5 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175, Japanese 175, and Comparative Literature 175. See Asian Studies 175.
203. **Intermediate Chinese, I.** First term of second year of the Chinese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Chinese 102 or 301, or equivalent. 5 hours.
204. **Intermediate Chinese, II.** Concentration on ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on ability to read ordinary simple text in Chinese. Prerequisite: Chinese 203 or equivalent. 5 hours.
207. **Classical Chinese Literature.** Same as Asian Studies 207. Surveys Chinese literary works from the classical tradition (history, philosophy, poetry, literary criticism) with attention to intellectual and artistic values. No knowledge of Chinese is required. 3 hours.
208. **Chinese Popular Literature.** Same as Asian Studies 208. Surveys Chinese popular literary works written in the vernacular language (short story, novel, and drama), with attention to cultural and artistic values. No knowledge of Chinese is required. 3 hours.
211. **Chinese Calligraphy.** Brief history of Chinese calligraphy; practice of regular and grass forms with Chinese brush pens. Prerequisite: Chinese 102 or equivalent. 1 hour.
301. **Intensive Chinese, I.** Intensive introduction to the spoken and written Chinese language; emphasizes the introduction of basic vocabulary and sentence patterns. This course is equivalent to Chinese 101 and 102. For all students who have no previous Chinese and who want to learn at a rapid rate. 10 hours or 2 units.
302. **Intensive Chinese, II.** Continuation of Chinese 301. Emphasizes conversation and reading. This course is equivalent to Chinese 203 and 204. Prerequisite: Chinese 102 or 301, or equivalent. 10 hours or 2 units.
305. **Advanced Chinese, I.** Continuation of intermediate-level Chinese with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 204 or 302. 5 hours or 1 unit.
306. **Advanced Chinese, II.** Continuation of Chinese 305 with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 305. 5 hours or 1 unit.
307. **Introduction to Literary Chinese.** An introduction to literary language, style, and structural patterns as reflected in the Confucian classics and other literary, philosophical, and historical texts. Prerequisite: Chinese 102 or equivalent. 3 hours or 1 unit.
308. **Readings in Literary Chinese.** Readings in texts selected from the Confucian classics and other literary, philosophical, and historical texts. Attention is given to linguistic and intellectual patterns and to problems of translation. Prerequisite: Chinese 307 or equivalent. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
309. **Social Science Readings in Chinese.** Reading and translation of selected Chinese texts in the social sciences with emphasis on specialized terminology and prose style. Prerequisite: Three years of modern Chinese. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
311. **The Chinese Novel.** Same as Asian Studies and Comparative Literature 311. Reading and analysis of representative pieces of Chinese fiction from the fourth century B.C. to 1900 with emphasis on the development of Chinese fiction, its place in the literary tradition, and its role in society. No knowledge of Chinese is required. 3 hours or 1 unit.
312. **Modern Chinese Literature in Translation.** Same as Asian Studies and Comparative Literature 312. Reading and analysis of representative selections from Chinese literature since the May 4 Movement, with special attention to the relationship between literature and ideology in twentieth-century China. No knowledge of Chinese is required. 3 hours or 1 unit.

321. **Oral Chinese, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 204 or 302, or equivalent. 3 hours or 1 unit.
322. **Oral Chinese, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 321 or consent of instructor. 3 hours or 1 unit.
330. **Introduction to Far Eastern Linguistics.** Same as Japanese, Korean, and Linguistics 330. See Linguistics 330.
390. **Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
399. **Study Abroad.** Lectures, seminars, and practical work in Chinese language, literature, and civilization and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5. 0 credit.
415. **Premodern Fiction and Drama.** Close readings and analysis of selected pre-20th century Chinese works written in the pre-modern vernacular language. Prerequisite: Chinese 308. 1 unit.
417. **Studies in Literary Chinese Texts.** Close reading and analysis of selected Chinese texts written in the Chinese literary language with emphasis on poetry and artistic prose. Prerequisite: Chinese 308. 1 unit.

Japanese

101. **Elementary Japanese, I.** An introduction to Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Japanese, II.** Second term of spoken Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Japanese. Prerequisite: Japanese 101. 5 hours.
150. **Introduction to Japanese Culture.** Same as Asian Studies 150. A topical introduction to Japanese cultural and aesthetic life with attention to cultural and aesthetic patterns as they are reflected in literature, language, and the arts. 3 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175 and Comparative Literature 175. See Asian Studies 175.
203. **Intermediate Japanese, I.** First term of second year of the Japanese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Japanese 102 or 301, or equivalent. 5 hours.
204. **Intermediate Japanese, II.** Concentration on ability to engage in reasonably fluent discourse in Japanese, on comprehensive views of formal grammar, and on ability to read simple ordinary written Japanese. Prerequisite: Japanese 203 or equivalent. 5 hours.
205. **Japanese Literature in Translation, I.** Same as Asian Studies 205 and Comparative Literature 211. A survey of Japanese literature from earliest times to around 1600 A.D.; readings in prose, poetry, and drama in English translation. 3 hours.
206. **Japanese Literature in Translation, II.** Same as Asian Studies 206 and Comparative Literature 212. A survey of Japanese literature from around 1600 A.D. to recent times; readings in prose, poetry, and drama in English translation; and lectures and papers. 3 hours.
218. **Japanese Hero Types.** Same as Asian Studies and Comparative Literature 218. Analysis of Japanese hero and heroine archetypes in comparison with their Western counterparts: from shaman ruler, Don Juan, samurai romantics, feudal paragons, to modern superfluous hero and self-destructive hollow man; no knowledge of Japanese required. Discussion with readings and films. 3 hours.
219. **Women in Japanese Literature.** Same as Asian Studies and Comparative Literature and Women's Studies 219. Critical study of Japanese women's history as represented in literature, emphasizing religio-social-literary significance, male view of women, female roles, and

universal experience of growing up female; no knowledge of Japanese required. Readings and discussion. 3 hours.

238. **Hiroshima/Nagasaki and the Literature of Survival.** Same as Asian Studies and Comparative Literature 238. Examination of the ways in which the Japanese have tried to come to terms with the experience of nuclear war through a study of memoirs, novels, essays, plays, and films; draws comparison with other literature of survival like that produced after the Nazi Holocaust. Readings in English. 3 hours.
301. **Intensive Japanese, I.** An intensive introduction to spoken and written Japanese; emphasis on basic grammatical patterns and vocabulary. Equivalent to Japanese 101 and 102; for students who have no previous Japanese and who want to learn at a rapid rate. 10 hours or 2 units.
302. **Intensive Japanese, II.** Continuation of Japanese 301. Emphasis on conversation and reading. Equivalent to Japanese 203 and 204. Prerequisite: Japanese 102 or 301, or equivalent. 10 hours or 2 units.
305. **Advanced Japanese, I.** Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 204 or 302; or consent of instructor. 5 hours or 1 unit.
306. **Advanced Japanese, II.** Continuation of Japanese 305. Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 305 or equivalent. 5 hours or 1 unit.
309. **Social Science Readings in Japanese.** Readings in Japanese social science materials, including articles from newspapers, periodicals, and learned journals. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
315. **Modern Japanese Fiction in Translation.** Same as Asian Studies and Comparative Literature 315. Critical study of selected 20th century writers with an emphasis on cultural background, world view, human relationships, esthetic theories, Japanese and Western traditions, and universal literary issues. Requires no knowledge of Japanese; readings and films. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
321. **Oral Japanese, I.** Conversational practice for the development of facility in spoken Japanese with emphasis on contemporary usage and style. Prerequisite: Japanese 204, 302, or equivalent. 3 hours or $\frac{3}{4}$ unit.
322. **Oral Japanese, II.** Conversational practice for the development of facility in spoken Japanese with emphasis on contemporary usage and style. Prerequisite: Japanese 321 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
330. **Introduction to Far Eastern Linguistics.** Same as Chinese, Korean, and Linguistics 330. See Linguistics 330.
360. **Teaching Japanese as a Second Language, I.** Introduction to basic theory of Japanese pedagogy; teaching methods, and theory and practice of teaching Japanese grammar. Prerequisite: Japanese 322 or equivalent. 3 hours or 1 unit.
361. **Teaching Japanese as a Second Language, II.** Application of pedalinguistics of Japanese; theory and method of instructional exercise development for teaching Japanese in practice teaching of Japanese in the classroom. Prerequisite: Japanese 360 or equivalent. 3 hours or 1 unit.
390. **Readings in East Asian Literature.** Guided readings in an East Asian literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of an East Asian language and consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
399. **Study Abroad.** Lectures, seminars, and practical work in the Japanese language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.50. 0 to 16 hours, or 0 units.

Korean

101. **Elementary Korean, I.** An introduction to Korean, including conversation with a native Korean-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Korean, II.** Second term of spoken Korean, including conversation with a native Korean-speaking tutor under the direction of linguist instructor; studies formal grammar based on conversational materials; and includes some work on written Korean. Prerequisite: Korean 101. 5 hours.
135. **Korean Personalities.** Same as Asian Studies 135. Surveys Korean culture as exemplified by celebrated legendary, fictional, and historical personalities: founding heroes, virtuous generals, fighting monks, fanatics, martyrs and rebellious rulers, queens, concubines and courtesans, poets, kings, and mad princes; illustrates recurring themes and patterns in Korean culture. No knowledge of Korean required. 3 hours.
203. **Intermediate Korean, I.** First term of second year of the Korean language, including drill for advanced conversational fluency; introduces a variety of styles and levels of discourse and usage; and increases study of the written language and formal grammar. Prerequisite: Korean 102. 5 hours.
204. **Intermediate Korean, II.** Second term of second year of the Korean language including drill for more advanced conversational fluency; more variety of styles and levels of discourse and usage; more formal grammar and an introduction of basic Chinese characters. Prerequisite: Korean 203. 5 hours.
305. **Advanced Korean, I.** Concentrates on the ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on the ability to read ordinary texts in Korean, including some Chinese characters. Prerequisite: Korean 204. 3 hours or $\frac{3}{4}$ unit.
306. **Advanced Korean, II.** Continuation of Korean 305; emphasizes rapid reading, fluent conversation, learned vocabulary and idiom acquisition, and reading of newspapers. Prerequisite: Korean 305. 3 hours or $\frac{3}{4}$ unit.
309. **Social Science Readings in Korean.** Reading and analysis of selected Korean texts in the social sciences, emphasizing specialized terminology and prose style. Prerequisite: Korean 306 or equivalent; registration in a program of studies dealing with East Asia. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
330. **Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Linguistics 330. See Linguistics 330.
399. **Study Abroad.** Lectures, seminars, and practical work in Korean language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5; Korean 102 or equivalent, or consent of the Asian Studies advisor. 0 to 16 hours, or 0 units. May be repeated to a maximum of 32 hours per academic year.

ASTRONOMY

Chair of Department: Ronald F. Webbink

Department Office: 103 Astronomy Building, 1002 West Green, Urbana

100. **Perspectives in Astronomy.** A one-semester introduction to astronomy. The nature of science; sun, planets, and moons; origin of the solar system; nature and evolution of stars; exploding stars; stellar remnants, including dwarfs, neutron stars, and black holes; molecules in space; galaxies and quasars; past and future of the universe; and life in the universe. Lectures and observation. 3 hours. Credit is not given to students with credit in Astronomy 101, 102, or 300; not open to students with credit in Physics 102, 107, or equivalent.
101. **Descriptive Astronomy.** The first semester of a two-semester introduction to astronomy. Introductory survey of the universe; structure and motions of the earth and moon; planetary motions; physical nature of the planets; comets and meteors; and origin and evolution

of the solar system. Lectures, discussion, and observation. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300; not open to students who have credit in Physics 102, 107, or equivalent.

102. **Descriptive Astronomy.** The stars: distances, motions, and dimensions; atoms and radiation; structure, origin, and evolution of stars; structure of the Milky Way; and galaxies and the structure of the universe. Lectures, discussion, and observation. Prerequisite: Astronomy 101, or consent of instructor. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300.
111. **Life in the Universe.** Reviews the nature and evolution of the physical Universe emphasizing the constraints thus imposed on possible abodes of life; the nature, origin, and evolution of life on Earth and implication for the possibility of extraterrestrial life; the search for life on other planets of the solar system; and the possibility of and search for life beyond the solar system. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
113. **The Sky.** Examines the visual aspects and phenomena of the sky; astronomical lore and history. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
140. **Astronomy and Civilization.** Examines the importance of astronomy in early western cultures; studies the impact of developing astronomical and physical discoveries and theories on western civilization, as well as the reverse impact of society on astronomy and physics. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **General Astronomy.** A survey of astronomy for students having some background in physics. The approach is primarily descriptive, but mathematical techniques are used where needed. The chief topics are orbits and gravitation; the bodies of the solar system; the nature and evolution of the stars; galaxies; and the structure of the universe. Prerequisite: Physics 102, 107, or equivalent; or consent of instructor. 3 hours. Credit is not given to students who have credit in Astronomy 101, 102, or 300.
290. **Individual Study.** Individual study at an advanced undergraduate level. Prerequisite: Consent of adviser and of staff member who supervises the work. 2 to 4 hours.
300. **Astronomy for Teachers.** A general course in astronomy designed for teachers which includes classical astronomy, modern developments, and aspects of the space program; discussion of available curriculum materials for elementary and secondary teaching and some practice given in telescopic observation. 4 hours or 1 unit. Credit is not given to students with credit in Astronomy 100, 102, or 210, or to astronomy majors. Graduate credit is given only to students in elementary and secondary teacher training programs.
304. **Astrophysics, I.** Introduction to astrophysical problems, with emphasis on underlying physical principles; includes the nature of stars, equations of state, stellar energy generation, stellar structure and evolution, astrophysical neutrinos, binary stars, white dwarfs, neutron stars and pulsars, and novae and supernovae. Prerequisite: Physics 108, or consent of instructor. 3 hours or 1 unit.
305. **Astrophysics, II.** Introduction to astrophysical problems; includes fundamentals of solar system astrophysics, elements of physical cosmology, and such additional topics as galactic nuclei, quasars, cosmic ray nuclei, the interstellar medium, and cosmic electrodynamics. Prerequisite: Astronomy 304, or consent of instructor. 3 hours or 1 unit.
314. **Observational Astronomy.** Introduction to astronomical equipment; optical photography, photometry, and spectroscopy; radio astronomy; astronomical coordinate systems and transformations; determination of latitude, longitude, and time; and introduction to error theory and data analysis. Practical experience with the 12-inch refractor. Lectures and laboratory. Prerequisite: Astronomy 102 or 210; Mathematics 240, 241, or 245; or consent of instructor. 4 hours or 1 unit.
321. **Galactic Astronomy.** Galactic structure: the observational data; stars in the solar neighborhood; the solar motion; stellar statistics and distribution; stellar populations; interstellar matter and spiral structure; and the whole galaxy. Prerequisite: Astronomy 102 or 210; Astronomy 305 or consent of instructor. 3 hours or 1 unit.
322. **Extragalactic Astronomy.** Galactic dynamics. Galaxies; distances; structural features; groups and clusters; radio galaxies and quasars; and spatial distribution and motions. Prerequisite: Astronomy 321 or consent of instructor. 3 hours or 1 unit.

333. **Solar System Astrophysics.** Planetary orbits and perturbations; physical perturbations; physical parameters of the planets; planetary interiors, atmospheres, magnetospheres, and surface layers; the satellites; asteroids and comets; meteors, meteorites, and tektites; interplanetary grains and gas; and problems of origin and evolution. Prerequisite: Consent of instructor. 3 hours or 1 unit.
396. **Seminar in Astronomy.** Lectures on topics of current interest in astronomy and astrophysics; for advanced undergraduates and graduates. See *Timetable* for current topics. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
401. **Stellar Atmospheres.** Physical characteristics of stellar atmospheres as derived from spectroscopic observations; radiation transfer; theory and observations of the continuous spectrum; limb darkening; formation of absorption lines; line profiles; curves of growth; relative chemical abundances; and emission features. Prerequisite: Consent of instructor. Desirable background includes some familiarity with atomic physics, advanced calculus, and general astronomy. 1 unit.
402. **Theoretical Astrophysics.** Same as Physics 402. See Physics 402.
403. **Observational Astronomy.** Techniques and basic results of observational astronomy; gamma ray, x-ray, ultraviolet, visible, infrared, and radio astronomy; data handling; coordinate systems, time, astrometry; detectors; telescopes; imaging; photometry; spectroscopy; polarimetry. Prerequisite: consent of instructor. 1 unit.
404. **Stellar Structure and Evolution.** Same as Physics 404. Relationship between observable features of stars and the physical processes that occur in their interiors; topics include matter and radiation in stars (equations of state, modes of energy flow, nuclear energy production, and element synthesis); structure of stars during all phases prior to the supernova or planetary nebula stage; stellar pulsations with reference to Cepheids and RR Lyrae variables; and properties of white dwarfs, neutron stars, and contact binaries. Prerequisite: Physics 361 and 382, Physics 402, or consent of instructor. 1 unit.
405. **Diffuse Matter Astrophysics.** Same as Physics 405. Interstellar gas: balance of microscopic processes, large scale structure, interaction with stars, dynamics, heating, ionization, and cooling; continuous and discrete radiation processes, excitation mechanisms, propagation of radiation, molecule formation, dust grains, star formation, magnetic fields, and cosmic rays. Prerequisite: Consent of instructor. 1 unit.
406. **High Energy Astrophysics.** Same as Physics 406. Survey of nuclear processes in astrophysical environments; topics include nuclear energy generation, thermonuclear reactions, weak interactions and neutrino astrophysics, nucleosynthesis, superheavy nuclei, cosmochronology, and mechanisms of nova and supernova explosions. Prerequisite: Physics 402 or consent of instructor. 1 unit.
407. **Radiation Hydrodynamics.** Dynamics of radiating fluids, i.e., fluids in which radiation dominates energy and/or momentum transport in the flow; emphasis on underlying physical principles with examples from astrophysics; numerical methods. Prerequisite: Astronomy 401 or consent of instructor. Familiarity with basic concepts of radiation transport, fluid mechanics, and tensors desirable. 1 unit.
424. **General Relativity and Cosmology.** Same as Mathematics 460 and Physics 424. See Physics 424.
490. **Individual Study.** Individual study or nonthesis research. Prerequisite: Consent of adviser and of staff member who supervises the work. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 4 units.
496. **Seminar in Special Topics.** Prerequisite: Consent of instructor. 0 to 4 units.
499. **Thesis Research.** 0 to 4 units.

ATMOSPHERIC SCIENCES

Head of Department: M. Mak

Department Office: 101 Atmospheric Sciences Building, 105 South Gregory, Urbana

100. **Introduction to Meteorology.** Introduces the student to the basic concepts and principles of atmospheric science in a descriptive format; emphasizes the physics responsible for changes in the weather; uses current weather information to illustrate textbook material. 3 hours. Credit may not be received for both Atmospheric Sciences 100 and 222.
101. **Weather Analysis Laboratory.** Introduces the scientific tools used by the meteorologist to diagnose current weather conditions and to forecast the weather; includes data analysis, map exercises, and the preparation of real-time weather forecasts. Prerequisite: Credit or concurrent registration in Atmospheric Sciences 100. 1 hour.
120. **Severe and Unusual Weather.** Analyzes the world's most extreme weather-related events in terms of their scientific basis and their economic, human, and historical consequences; examples include blizzards, major cold waves, hurricanes and tornadoes, flash floods, droughts, and major air pollution events. Utilizes the department's weather data and computational facilities when appropriate. 3 hours.
199. **Undergraduate Open Seminar.** Special topics each semester. 1 to 5 hours. May be repeated.
222. **Weather Processes.** Introduction to the mean state of the atmosphere, the fundamental physics of weather processes, and the mechanisms producing daily weather changes, both qualitative and quantitative in nature. Prerequisite: Mathematics 242. 3 hours. Credit may not be received for both Atmospheric Sciences 222 and 100.
301. **Principles of Atmospheric Physics.** Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere, and the formation of clouds and precipitation. Prerequisite: Mathematics 242 or 245; consent of instructor. 4 hours or 1 unit.
302. **Principles of Atmospheric Dynamics.** Same as Physics 302. An introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of the neutral atmosphere. Prerequisite: Mathematics 343; consent of instructor. 4 hours or 1 unit.
310. **Satellite Meteorology.** Reviews the theory and practice of observing the atmosphere using satellite-borne instrumentation; applications include weather analysis and forecasting using visible and infrared images, and the measurement of basic atmospheric variables such as temperature, moisture, wind, and precipitation. Prerequisite: Atmospheric Sciences 222 or 301; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **Radar Meteorology.** Basic principles of radar and references to other ground based remote sensing systems, with emphasis on radar. Discusses principles of conventional and Doppler radar, data processing, and use of Doppler radar in meteorology. Emphasizes thunderstorms and wind shear. Students use CHILL National Radar Facility on campus for data collection and analysis experience. Prerequisite: Atmospheric Sciences 222 or consent of instructor. 4 hours or 1 unit.
390. **Individual Study.** Individual study or reading at an advanced undergraduate level in a subject not covered in normal course offerings. Prerequisite: Consent of advisor and of staff member supervising work. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units. May not be used to satisfy requirements for an MS or PhD degree in Atmospheric Sciences.
397. **Topics in Atmospheric Sciences.** Special topics in atmospheric sciences at an advanced undergraduate level. Prerequisite: Advanced undergraduate standing and consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
401. **Synoptic Meteorology.** Examines the observed behavior of the atmosphere through the application of physical and hydrodynamical principles to analyses of real meteorological data; develops concepts for studying atmospheric circulations, particularly extratropical cyclones and anticyclones. Laboratory work includes the development of diagnostic techniques suitable for a better understanding of the current weather. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.

405. **Numerical Methods in Fluid Dynamics.** Same as Computer Science 405. Intended to give the student practical numerical techniques for solving those linear and nonlinear differential equations which appear frequently as initial and boundary value problems in hydrodynamics and dynamic meteorology. Prerequisite: Mathematics 343 or consent of instructor. 1 unit.
406. **Dynamical Weather Prediction.** Describes the principles and methods of simulating and predicting large-scale atmospheric motions on the basis of hydrodynamics and thermodynamics. Prerequisite: Atmospheric Sciences 302. 1 unit.
408. **Atmospheric General Circulation.** Reviews the observed general circulation of the earth's atmosphere; discusses the balance requirements of mass, momentum, and energy conservation; illustrates, by means of different mathematical modelings and laboratory physical modeling, the important processes which determine the earth's and other planets' general circulation; and considers theories of climatic changes. Prerequisite: Atmospheric Sciences 301 or equivalent, and Atmospheric Sciences 302. 1 unit.
411. **Atmospheric Convection.** Atmospheric convection processes from the classical Benard-Rayleigh theory of convection to the structure and dynamics of isolated clouds, organized cloud systems, and ensembles of cumulus clouds; interactions of cumulus clouds with their environment. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
421. **Precipitation Physics.** Develops an understanding of precipitation processes through cloud observations, microphysics, dynamics, and comprehensive theoretical models; includes growth by condensation, coalescence, and riming; and studies ice crystals, hail, and weather modification. Prerequisite: Atmospheric Sciences 301. 1 unit.
431. **Boundary Layer Meteorology.** Comprehensive review of processes in the lowest layer of the atmosphere based on the statistical mechanics of turbulent motions; emphasizes the effects of earth's rotation, mean wind shear, stratification, thermal stability, interaction with the free atmosphere, and surface roughness; and includes applications for the numerical prediction of diurnal changes of the boundary layer structure, transports of momentum, heat, and moisture and pollution dispersion. Prerequisite: Atmospheric Sciences 302, Theoretical and Applied Mechanics 335, or equivalent. $\frac{1}{2}$ or 1 unit.
441. **Dynamics of Climate and Climate Change.** Global aspects of climate and climate change; empirical studies of the observed climate system; the heat budget, general circulation of the atmosphere, role of oceans and cryosphere, interannual variability, and causes of climate change; climate modeling; and long range forecasting and possible future trends. Prerequisite: Atmospheric Sciences 301 and 302, or consent of instructor. 1 unit.
451. **Atmospheric Radiation.** Physical concepts and various methods of analysis of radiation scattering by atmospheric molecules, particulates, and clouds; infrared radiative transfer in a stratified inhomogeneous atmosphere; radiation and ozone photochemistry in the stratosphere; and remote temperature and composition sensing techniques using satellite radiation data. Prerequisite: Atmospheric Sciences 301 or Astronomy 380. 1 unit.
490. **Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
491. **Seminar in Atmospheric Sciences.** Seminar on topics of current interest; see *Timetable* for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
497. **Special Topics in Atmospheric Sciences.** Lecture course in topics of current interest; subjects such as tropical meteorology, aerosol physics and geophysical fluid dynamics will be covered in semester offerings on a regular basis. Prerequisite: Consent of instructor. 0 to 1 unit.
499. **Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units.

AVIATION

Director of Institute: H. L. Taylor

Institute Office: Terminal Building, University of Illinois-Willard Airport, Savoy 61874

101. **Private Pilot, I.** An introductory course in partial preparation for FAA Private Pilot certification; includes instruction in aerodynamics, airplane systems, airport and airplane operations, federal regulations, and airplane safety; and includes 27 hours of inflight training (21 hours dual, 5 hours solo, 1 hour flight exam) and 6 hours in a flight simulator. Private Pilot certification requires completion of Aviation 120. 3 hours.
102. **Orientation Refresher.** An intermediate course to provide additional aeronautical proficiency in the primary trainer and serve as an introduction to other types of aircraft; emphasis on airplace utility and safety; eighteen hours of flight, four hours of flight simulator training, and five hours of flight discussion directed to airplane operation. Prerequisite: Credit or concurrent registration in Aviation 101, or consent of director. 0 credit.
120. **Private Pilot, II.** Second course in preparation for FAA Private Pilot certification; includes instruction in airplane operation, navigation, night flying, and meteorology; and includes 36 hours of inflight training (19 hours dual, 15 hours solo, 2 hours flight exams), and 6 hours in a flight simulator. Students successfully completing final examinations will be issued a Private Pilot Certificate. Prerequisite: Credit or concurrent registration in Aviation 101. 3 hours.
121. **Private Pilot, IIA.** A special course for the student who is entering the University Pilot Training Program with a Private Pilot Certificate and who desires to continue in the commercial-instrument sequence (Aviation 130, 140, etc.); includes instruction in airplane operations, navigation, and meteorology; and includes 17 hours of inflight instruction (minimum of 12 hours dual, maximum of 4 hours solo, and a 1 hour flight exam), and 3 hours in a flight simulator. Prerequisite: Private Pilot Certificate (minimum of 60 hours of flight). 2 hours.
130. **Commercial-Instrument, I.** The first of a series of advanced flight courses in preparation for an FAA Commercial Pilot Certificate; reviews cross-country flight with emphasis on local instrument flying procedures; and includes 40½ hours of lecture-discussion on instrument flying, navigation, advanced maneuvers, and flight physiology, and 32 hours of flight (12½ dual, 16 solo, and 3½ pilot-in-command to include 1 flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 120, consent of director. 3 hours.
140. **Commercial-Instrument, II.** The second in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; IFR/VFR local and cross country. Includes 40½ hours of lecture discussion on advanced maneuvers, aerodynamics, and navigation and 28 hours of flight (5½ dual, 12 solo, and 10½ pilot in command to include one flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 130. 3 hours.
142. **Reciprocating Powerplant Theory.** Examines operating principles of a broad range of reciprocating aircraft powerplants; includes power development and efficiency calculations, design, and manufacturing techniques, and select engine systems. 3 hours.
143. **Materials and Processes, I.** A study of materials and processes used in the maintenance of aircraft; includes theory and practice in precision measurement, identification and use of hardware, safetying techniques, identification of materials used in aircraft plumbing systems, and nondestructive inspection methods. 3 hours.
144. **Turbine Powerplant Theory.** Examines operating principles of broad range of aviation gas-turbine powerplants; includes power development and efficiency calculations, design and manufacturing techniques, operations, and select engine systems. 3 hours.
145. **Aircraft Electrical Systems.** A study of the physical principles that apply to present-day aerospace vehicles; includes AC and DC electrical theory, power sources, transmission, measurement, solid state devices, integrated circuits, and problems in aircraft electrical circuits. 3 hours.
147. **Introduction to Federal Aviation Regulations.** A study of regulations, directives, and specifications governing the manufacture, operation, and maintenance of aircraft, and the control of air traffic as well as the qualifications and certification of personnel and equipment engaged in aircraft operation and maintenance. 3 hours.

152. **Powerplant Systems, I.** Theory and operating principles of the ignition, starting, and electrical power generating components and systems used with aircraft turbine and reciprocating powerplants. Prerequisite: Aviation 142 and 145. 4 hours.
153. **Aircraft Materials and Processes, II.** A survey of materials used in the manufacture of structural components of aerospace vehicles; emphasis on the sources, manufacturing processes, physical properties, and working characteristics of various ferrous and nonferrous metals. 2 hours.
154. **Powerplant Systems, II.** Theory of operation, design, and maintenance procedures for fixed pitch and controllable propellers; includes a study of propeller governing and control systems for reciprocating and turboprop engines. Prerequisite: Aviation 145. 3 hours.
155. **Aerodynamics and Load Planning.** Calculating wing rib layout, load factors, load planning, weight and balance, powerplant performance, and an introduction to high speed aerodynamics. 3 hours.
156. **Powerplant Systems, III.** An introduction to fuels and fuel systems as related to aircraft turbine and reciprocating powerplants; study of fuel system functions including carburetion, fuel injection, fuel management, and supercharging. Prerequisite: Aviation 142 and 145. 3 hours.
157. **Powerplant Conditioning and Testing.** A study of powerplant malfunction, diagnosis and maintenance procedures, materials, and equipment; includes condition monitoring techniques and some of the economic aspects of powerplant maintenance. Prerequisite: Aviation 143, 144, 152, 153, 154, and 156; concurrent registration in Aviation 159 or consent of instructor. 7 hours.
159. **Powerplant Maintenance and Inspection System.** Studies specialized inspection techniques, equipment, and procedures used in the maintenance of aircraft powerplants: includes federal aviation regulations, advisory circulars, airworthiness directives, and manufacturers' publications, and record-keeping systems as they apply to powerplants. Prerequisite: Aviation 142, 143, 144, 145, 147, 152, 154, and 156; concurrent registration in Aviation 157 or consent of instructor. 2 hours.
163. **Aircraft Materials and Processes, III.** A survey of nonstructural materials used in the construction of aircraft components; the sources, manufacturing processes, physical properties, and working characteristics of synthetics, fabrics, composites, woods, and their associated surface treatments studied in detail. Prerequisite: Credit or concurrent registration in Aviation 143. 3 hours.
165. **Aircraft Fabricating Processes, I.** Procedures and techniques of mechanical, nonfusion attachment; sheet metal forming; and use of adhesives, bonded materials, and plastics in aircraft component fabrication. Laboratory experiences include the use of mechanical fasteners, similar and dissimilar metal assembly, and plastic and bonded structure fabrication. Prerequisite: Aviation 143, 153, and 155. 4 hours.
167. **Aircraft Fabricating Processes, II.** Fusion and adhesion procedures and techniques including gas, AC and DC arc, and inert gas processes. Laboratory experiences include fusion and adhesion processes with representative metals used in the aircraft industry. Prerequisite: Aviation 143 and 153; General Engineering 105. 3 hours.
169. **Aircraft Systems, I.** A study of basic principles and design concepts of the environmental and life-support systems used in modern aircraft; study of representative systems for pressurization, oxygen, heating, cooling, and ice and fire protection with detailed emphasis on individual components and their relationship to the complete system. Prerequisite: Aviation 145. 4 hours.
170. **Aircraft Systems, II.** Electrical distribution circuits and associated lighting, power, communication, navigation, and instrumentation systems common to modern aircraft; emphasis on circuit analysis and performance testing. Prerequisite: Aviation 145, 152, and 155. 5 hours.
172. **Aircraft Systems, III.** Includes hydraulic and pneumatic power systems as utilized in modern aircraft; emphasis on theory of operation, design concepts, component relationships, and malfunction diagnosis. Prerequisite: Aviation 145. 3 hours.
174. **Aircraft Assembly and Inspection.** Aircraft assembly, configuration, and alignment consistent with associated aerodynamics; includes structure and systems inspection, and FAA regulations. Prerequisite: Aviation 163, 165, 167, 169, 170, and 172; or concurrent registration in Aviation 169, 170, or 172, and consent of instructor. 5 hours.

179. **Airframe Maintenance and Inspection Systems.** Studies specialized inspection techniques equipment, and procedures used in the maintenance of aircraft/rotorcraft airframes: includes Federal Aviation regulations, advisory circulars, airworthiness directives, manufacturers' publications, record-keeping systems as they apply to airframes. Prerequisite: Aviation 163, 165, 167, 170, 172, and 174; or concurrent registration in Aviation 172 and 174. 2 hours.
181. **Aircraft Communication Systems.** Comprehensive study of the characteristics and operating principles of modern very-high frequency (VHF) and ultra-high frequency (UHF) airborne communications equipment. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 182 and 183. 5 hours.
182. **Aircraft Navigation Systems.** Study of the characteristics and operating principles of airborne navigation equipment; includes VHF omnidirectional range (VOR), instrument landing system (ILS), automatic direction finding (ADF), and area navigation (RNAV). Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 183. 5 hours.
183. **Aircraft Pulse Systems.** Operating principles, applications, diagnosis, and maintenance of airborne pulse equipment, including distance-measuring equipment (DME), transponders, and radar. Prerequisite: Acceptance in Coordinated Avionics Program; concurrent registration in Aviation 181 and 182. 5 hours.
185. **Aircraft Flight Control Systems.** Operating principles, diagnosis, and maintenance of flight directors, autopilots, and area navigation (RNAV) airborne computers (analog and digital). Prerequisite: Aviation 181, 182, and 183. 5 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Commercial-Instrument, III.** The third in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate; reviews cross country flight, emphasizing instrument flying procedures. Includes 40½ hours of lecture discussion on cross country procedures, aircraft powerplants and systems, and aircraft maintenance inspections as well as 28½ hours of flight (7 dual, 11½ solo, and 10 pilot in command to include one flight exam for qualified individuals), plus 8 hours in a flight simulator. Prerequisite: Aviation 140; consent of director. 5 hours.
210. **Commercial-Instrument, IV.** The fourth and final in a series of advanced flight courses in preparation for the FAA Commercial Pilot certificate with an instrument rating: IFR, VFR cross-country, and VFR commercial maneuvers; includes 40½ hours of lecture-discussion on applied meteorology, aircraft operation, and federal aviation regulations and 31½ hours of flight (13½ dual, 10 solo, and 8 pilot-in-command to include 2 flight exams for qualified individuals), plus 4 hours in a flight simulator. Prerequisite: Aviation 200, consent of director. 5 hours. Students may not receive credit for both Aviation 210 and 211.
211. **Commercial-Instrument, V.** The fourth and final in a series of advanced flight courses in preparation for the FAA Commercial Certificate with both instrument and multiengine ratings: IFR local and cross-country; VFR commercial maneuvers in multiengine aircraft. Includes 40½ hours of lecture discussion in applied meteorology, multiengine aircraft operations, and Federal Aviation regulations and 31 hours of flight (23½ dual, 7½ solo) plus 4 hours in a flight simulator and 4 hours of flight tests. Prerequisite: Aviation 200, consent of director. 5 hours. Students may not receive credit for both Aviation 210 and 211.
220. **Flight Instructor.** Prepares the commercial pilot for an FAA Flight Instructor certificate. Forty-eight classroom hours of ground school instruction on techniques of flight instruction and theory of flight, and a minimum of twenty-three hours of flight training in four-place aircraft, two hours in a flight simulator, three hours practice teaching in a flight simulator, and one hour flight check. Prerequisite: Commercial pilot certificate; instrument rating; junior standing; consent of director. 3 hours.
222. **Instrument Flight Instructor.** Leads to an instrument instructor's rating on the student's flight instructor certificate; five hours of simulator, ten hours of flight and one hour of flight check time. Includes refresher on chart symbol interpretation, federal aviation regulations, communications, instrument construction and operation, and electronic aids to navigation; designed to include obtaining a flight instructor instrument rating. Prerequisite: Commercial pilot certificate; instrument rating; flight instructor certificate; airplane rating; consent of director. 1 hour.

224. **All Attitude Orientation.** Safe handling of an aircraft in all attitudes through various aerobatic maneuvers which include loops, snap rolls, slow rolls, Immelmann, Cuban 8's and similar type maneuvers; thorough check of takeoff and landing procedures. Prerequisite: Aviation 101 and 120 or the private pilot certificate; consent of director. 1 hour.
250. **Practice Teaching, Airplane.** Practice teaching using classroom, audiovisual material, simulator, and airplane; prepares the certified flight instructor to teach in all modes of aviation education. A minimum of 2 hours of classroom lecture, 3 hours of simulator instruction, and 1 to 19 hours of airplane instruction is given by the student; an additional 20 hours of classroom lecture clarifies and explains the proper method of successful instruction. Prerequisite: Aviation 220 and flight instructor certificate; junior standing; recommendation from Aviation 220 flight instructor; consent of director. 3 hours.
263. **History of Aviation.** Historical development of aviation from man's first flight to the present, in broad national and international economic, socio-economic, and cultural perspectives; includes the study of initial flight experimentation, early technological advancements with applications to current developments in aviation as it relates to American culture. 3 hours.
280. **Special Rating (Multiengine Land).** Prepares the commercial pilot for an FAA multiengine land airplane rating; 16 hours of discussion and 9 hours of flight (7½ dual, ½ solo, and 1 flight exam for qualified individuals in a multiengine land airplane). Prerequisite: Commercial Pilot Certificate, consent of director. 1 hour.
284. **Jet Aircraft Systems and Operations, I.** An operator-oriented study of modern jet systems and procedures, including related federal aviation regulations, aerodynamics, weight, and balance; preparation for the airline flight engineer. Prerequisite: Commercial Pilot Certificate with Instrument Rating; or Private Pilot Certificate and credit or concurrent registration in Aviation 169, 170, and 172; or consent of instructor. 3 hours.
290. **Advanced Topics in Avionics.** Independent study of advanced topics in the applications of aviation electronics. Prerequisite: Second year standing in aviation or consent of instructor. 1 to 4 hours.
291. **Special Ratings and/or Specialized Flight.** Prepares the commercial pilot for special FAA pilot certificates and/or ratings such as seaplane, airline transport pilot, and helicopter, and specialized flight such as advanced multiengine operation; sixteen hours of preflight (ground school) instruction and variable flight instruction as selected by the student. Options are advanced multiengine, helicopter, and airline transport pilot. Registration is limited to professional students with approval of director through head of pilot training. Prerequisite: Commercial pilot certificate; consent of director. 1 hour.
292. **Professional Multiengine Indoctrination.** Extends the working insight of an advanced Professional Pilot student; internship providing a manufacturer-equivalent school on a Cessna 310R aircraft, a crew coordination school for passenger carrying operations, and proficiency based right-seat second in command qualification. Prerequisite: Aviation 211 or equivalent, and consent of instructor. 3 hours.
293. **Corporate-Jet Pilot Orientation.** Introduction to multi-engine jet airplane operations; 45 hours of lecture-discussion and 20 hours (10 as pilot and 10 as co-pilot) of simulated flight in a T-40 jet aircraft simulator or equivalent; includes turbine engine theory and operation, normal and emergency procedures, performance calculations, and crew coordination. Prerequisite: Aviation 211 and consent of director. 3 hours.
294. **Airport Management.** Management problems in planning, design, operation, maintenance, and administration of airports; legislation and federal regulations affecting air commerce and airports; and current problems in certification, security, safety, land acquisition, zoning, and state and federal participation in airport development. Prerequisite: Aviation 101 and Business Administration 210 or 247, or consent of instructor. 3 hours.
295. **Aviation Management.** Studies management functions, responsibilities, techniques, and problems specific to aviation enterprises. Includes case study analysis of typical problems/ situations found in aviation organizations. Prerequisite: Aviation 120 or Business Administration 210 or 247, or consent of instructor. 3 hours.

355. **Aviation Accident Investigation and Analysis.** Fundamental concepts of aviation safety augmentation with emphasis on accident prevention through accident investigation, casualty reduction through crashworthy design, and safety enhancement resulting from litigation; accident investigation techniques and crash survival design factors. Prerequisite: Aviation 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

BIOCHEMISTRY

Head of Department: Robert L. Switzer

Department Office: 415 Roger Adams Laboratory, 1209 West California, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
292. **Senior Thesis.** Limited in general to seniors in biochemistry and chemistry. Each student who desires to do thesis research must receive written permission from a member of the biochemistry faculty. Accordingly, prospective students are encouraged to contact the biochemistry staff in the semester prior to registration in this course. Students must present a thesis to receive credit in this course. Registration of 10 hours over two semesters is expected. Prerequisite: Biochemistry 350 and 355. 4 to 6 hours. (Counts for advanced hours in LAS.)
320. **Molecular Biophysics.** Same as Biophysics 320. See Biophysics 320.
338. **Plant Molecular Biology.** Same as Plant Biology 338. See Plant Biology 338.
350. **Introductory Biochemistry.** The chemistry and metabolism of carbohydrates, lipids, proteins, nucleic acids, vitamins, and coenzymes and their relation to the regulation and processes of organisms, cells, and subcellular components. Not intended for students in biochemistry curriculum. Prerequisite: Chemistry 131 or 136, or equivalent. 3 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Biochemistry 350 and the Biochemistry 352-353 sequence.
352. **General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Students should not enroll in Biochemistry 352 without intent to take Biochemistry 353. Prerequisite: Chemistry 110 or 123, and Chemistry 336; or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
353. **General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Prerequisite: Biochemistry 352 or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
355. **Biochemistry Laboratory.** Introduction to experimentation with biochemical systems, processes, and compounds; identification and quantitative measurement of constituents and transformations in biological systems. Prerequisite: Chemistry 131 or 136, or equivalent; credit or concurrent registration in Biochemistry 350, 352, or 353, or equivalent. Quantitative analytical chemistry and credit or concurrent registration in a course that includes nucleic acid biochemistry (i.e., Biochemistry 350 or 353) are recommended. 4 hours or 1 unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biophysics and Chemistry 440. See Chemistry 440.
450. **Biomolecular Physics.** Same as Biophysics 450 and Physics 450. See Physics 450.
452. **Experimental Techniques in Biochemistry.** Experiments concerning the detection, isolation, and characterization of macromolecules, including enzymes, antibodies, and nucleic acids; methods of studying the size, shape, and hydrodynamic properties of macromolecules and other compounds. Prerequisite: Biochemistry 355. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of $1\frac{1}{2}$ units credit.
455. **Biochemistry Seminar.** Discussions of current research and literature. Required of all graduate students whose major is biochemistry. Prerequisite: Biochemistry 352, 353, and 355; or equivalent. $\frac{1}{2}$ unit. May be repeated once.
490. **Individual Study.** Designed for students majoring or minoring in biochemistry who wish to undertake individual studies of a non-Ph.D. thesis nature under the direction of a faculty

member of the department. Prerequisite: Consent of head of department. $\frac{1}{4}$ to 4 units (summer session, $\frac{1}{4}$ to 2 units).

494. **Chemical Basis of Biological Specificity.** Same as Chemistry 494. Biological formation and interaction of large molecules; analysis of the structural features concerned with functional specificity in heteropolymers, viruses, and subcellular particles; nucleic acids and their role as genetic molecules; proteins in their role as genetic products with highly specific functions; and metabolic interrelations of these molecules. Prerequisite: Chemistry 344 and 346, Biochemistry 352 and 353, or consent of instructor. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 2 units credit.
499. **Thesis Research.** 0 to 4 units.

BIOENGINEERING

Chair, Executive Committee: R. Magin

Program Office: 164 Mechanical Engineering Building, 1206 West Green, Urbana

120. **Introduction to Bioengineering.** Lecture and discussion of recent trends in bioengineering; topics typically include the biological interaction with ultrasound and microwave radiation, modeling, instrumentation, biomaterials, biomechanics, biological heat and mass transfer, and medical imaging techniques. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
270. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. 0 to 4 hours.
306. **Veterinary Orthopedic Biomechanics.** Same as Veterinary Biosciences 306. See Veterinary Biosciences 306.
308. **Implant Materials for Medical Applications.** Review of the biological and engineering aspects of implant materials; characterization of major classes of promising implant materials; and problems of tissue-implant interaction and surgical problems involved in implant work. Laboratories and independent projects illustrate the use of implant materials. Prerequisite: Chemistry 102; Physics 102 or 108, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Biomedical Instrumentation.** Same as Electrical Engineering 314. See Electrical Engineering 314.
315. **Biomedical Instrumentation Laboratory.** Same as Electrical Engineering 315. See Electrical Engineering 315.
370. **Special Topics in Bioengineering.** Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
375. **Modeling of Bio-Systems.** Same as Electrical Engineering 375. See Electrical Engineering 375.
424. **Ultrasonic Biophysics.** Same as Biophysics 424. See Biophysics 424.
498. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.

BIOLOGY

Director of School of Life Sciences: Jordan Konisky

School Office: 393 Morrill Hall, 505 South Goodwin, Urbana

100. **Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. Low credit option; no laboratory. 3 hours. Credit is not given for both Biology 100 and 101.
101. **Biological Sciences.** Introduction to the biological sciences, their aims, content, and methods, with special reference to their application to human life and civilization. High credit option; weekly laboratory. 4 hours. Credit is not given for both Biology 100 and 101.
102. **Biological Sciences.** Continuation of Biology 100 or 101. Low credit option; lecture and discussion, no laboratory. Prerequisite: Credit in one first-level course in biology. 3 hours.

103. **Biological Sciences.** Continuation of Biology 100 or 101. High credit option; lecture, discussion and laboratory. Prerequisite: Credit in one first-level course in biology. 4 hours.
104. **Animal Biology.** Introductory zoological concepts with emphasis on the diversity and comparative anatomy of animals and the fundamentals of physiology, genetics, evolution, and behavior. Enrollment priority is given to students in curricula which require this course. 4 hours.
105. **Insects and People.** Same as Entomology 105. See Entomology 105.
106. **Heredity and Society.** Provides nonscience students with an understanding of genetics so they can appreciate how recent discoveries and environmental changes may affect their future and the future of society. 3 hours. Credit is not given for more than one of the following: Biology 106, 109, or 210.
107. **Evolution.** Analysis of the theories of evolution, the mechanism of evolutionary changes, and the evolution of man. Prerequisite: Sophomore standing. 3 hours. Students may not receive credit for both Biology 107 and Ecology, Ethology, and Evolution 301.
108. **Biology of Human Aging.** Comprehensive and critical analysis of what happens as humans age; includes information gained from model systems ranging from cells to such diverse organisms as bamboo and chimpanzees; considers the role of evolution in shaping special features of our life cycle. 3 hours.
109. **Biological Sciences.** Introduction to biology for Life Sciences and related scientific majors emphasizing the development and elaboration of biological concepts such as cell theory, gene concept, and the idea of evolution through natural selection. Intended primarily for freshmen. 4 hours. Credit is not given for more than one of the following: Biology 106, 109, or 210.
110. **Principles of Biology, I.** Heredity, evolution, diversity, reproduction, development, structure and function of cells, organisms, and populations. Prerequisite: One year of college chemistry, or concurrent registration in Chemistry 102 with laboratory. 5 hours.
111. **Principles of Biology, II.** Continuation of Biology 110. Prerequisite: Biology 110. 5 hours.
123. **Adventures in Life Sciences.** General introduction to the School of Life Sciences emphasizing selected areas of research in SOLS and career opportunities in life sciences. 1 hour.
144. **Introduction to the Biological Literature.** Using professional literature as examples of introductory-level biological concepts, class discussions analyze biological research papers as they appear in a weekly scientific journal. Prerequisite: Concurrent registration in Biology 111 or consent of instructor. 1 hour.
151. **The Cell.** Study of the biology of cells from the molecular to the microscopic level of organization. Prerequisite: Credit or concurrent registration in organic chemistry; consent of honors biology committee. 5 hours. Students may not receive credit for both Biology 151 and Biology 213.
199. **Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
206. **Working With the Disabled, I.** Same as Rehabilitation 206. See Rehabilitation 206.
207. **Working With the Disabled, II.** Same as Rehabilitation 207. See Rehabilitation 207.
210. **Genetics.** Principles of heredity and the nature of genetic material. Prerequisite: Biology 111 or equivalent, or consent of instructor. 4 hours. Credit is not given for more than one of the following: Biology 106, 109, or 210. (Counts for advanced hours in LAS.)
213. **Cells and Tissues.** Lecture and laboratory introduction to the structure of animal cells and tissues and plant cells, including basic ultrastructure. Prerequisite: Biology 111 or equivalent and consent of instructor. 4 hours. Students may not receive credit for both Biology 151 and 213. (Counts for advanced hours in LAS.)
251. **The Organism.** Study of the way different classes of organisms respond to challenges of their environment; emphasis on the general features of organismic behavior. Prerequisite: Biology 151; good standing in the honors biology program; and consent of the honors biology committee. 5 hours.
303. **Introduction to Neurobiology.** An introduction to the physiology of nerve cells, mechanisms of neural integration, and the organization of sensory and motor systems; also introduces neurochemistry, neuroendocrinology, neural development, neural plasticity, and the physiological basis of behavior. Prerequisite: Biology 111 or 251, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
304. **Biological Clocks.** Study of the nature, mechanisms, functions, development, and evolution of the biological rhythms associated with geophysical cycles; emphasizes circadian rhythms

and their role as biological clocks for the timing of photoperiodism, celestial orientation, and human physiology and behavior. Prerequisite: Biology 111 or equivalent. 2 hours or $\frac{1}{2}$ unit.

305. **Fundamentals of Microscopy.** Lectures on applications of transmission and scanning electron microscopy; review of light microscopy, phase contrast, interference, and Nomarski optics. Prerequisite: Physics 102 or equivalent. 3 hours or $\frac{3}{4}$ unit.
307. **Immunology.** Introduction to fundamentals of immunology with emphasis on biological application; basic background for understanding immunological responses and techniques applicable to biological research. Prerequisite: Four semesters of college biology; a course in organic chemistry, or consent of instructor. 4 hours or $\frac{3}{4}$ unit.
309. **Ecological Genetics.** Study of the genetics of natural populations, stressing empirical observations and experiments. Emphasis on recent theories of genotype/environmental interactions and their relationship to evolutionary processes. Prerequisite: Biology 210. 3 hours or $\frac{3}{4}$ unit.
310. **Immunogenetics and Immunophysiology.** Same as Animal Sciences 310 and Veterinary Pathobiology 310. See Animal Sciences 310.
313. **Experimental Genetics.** Laboratory course to expose students to several types of organisms, experimental approaches, and methods of analysis utilized in genetic research. Prerequisite: Biology 151 or 210; consent of instructor. 4 hours or 1 unit.
316. **Population Genetics.** Same as Animal Sciences 316. See Animal Sciences 316.
317. **Quantitative Genetics.** Same as Animal Sciences 317. See Animal Sciences 317.
324. **Chemical Ecology.** The chemical bases of ecological interactions among organisms; topics include the chemical structures and functions of messenger compounds important in inter- and intraspecific interactions among plants, insects, higher animals, fungi, microbes, and their environments. Offered in alternate years. Prerequisite: Courses in organic chemistry and ecology, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
332. **Genetic Toxicology.** Same as Agronomy 332 and Environmental Studies 332. See Environmental Studies 332.
338. **History of Biology.** Same as History 338. See History 338.
339. **Tropical Ecology.** Interactions of climate, soils, plants, and animals (including humans) in the tropics; examines principles of ecology as they relate to diversity of tropical habitats and to problems of agricultural and technological development in the tropics. Prerequisite: Ecology, Ethology, and Evolution 212 or Plant Biology 381; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
351. **Population Biology.** Study of problems associated with behavior of plant and animal populations based on genetic, evolutionary, and ecological principles. Prerequisite: Biology 251; statistics; good standing in the honors biology program; consent of Honors Biology Committee. 4 hours or 1 unit.
368. **Biological Modeling.** Same as Agronomy 368 and Geography 368. See Geography 368.
371. **Quantitative Biology, I.** Theory and practical application in biology of probability and statistics; lectures and assigned problems. Prerequisite: Mathematics 120 or consent of instructor. 4 hours or 1 unit.
372. **Quantitative Biology, II.** Additional topics in biostatistics, emphasizing nonparametric comparative, correlational, and sequential analyses; multi-dimensional contingency analyses, circular statistics, binomial sequential sampling. Lecture, field trips, and discussion. Prerequisite: Biology 371 or consent of instructor. 4 hours or 1 unit.
373. **Advanced Biometry.** Bivariate and multivariate statistical treatment of biological experiments and surveys; emphasizes analysis of large, unbalanced data matrices; and follows the general linear model approach. Techniques appropriate to electronic digital computation are considered in detail. Prerequisite: A course in calculus, a course in statistics, and a course or experience in electronic digital computation; or consent of instructor. 5 hours or 1 unit.
380. **Social Issues in Biology.** Ethical and sociopolitical implications of the biological sciences; an issue-oriented lecture-discussion format centering on problems such as bioethics, genetics and development, health care and allocation of scarce resources, death and dying, behavior manipulation, biological experimentation, population control, and environmental ethics. Prerequisite: Upper-division standing and 6 hours of life science. 3 hours or $\frac{3}{4}$ unit.

390. **Special Courses.** Experimental and temporary courses. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topic varies.
417. **Advanced Quantitative Genetics.** Same as Animal Sciences 417. See Animal Sciences 417.
418. **Concepts and Topics in Immunology.** Same as Veterinary Pathobiology 418. See Veterinary Pathobiology 418.
420. **Advanced Topics in Neural and Behavioral Biology.** Survey of current research in modern neural and behavioral biology. Each weekly seminar is presented by a faculty member or distinguished visiting neuroscientist. Abstracts and suggested readings are presented prior to each seminar. Prerequisite: Graduate standing or consent of instructor. $\frac{1}{4}$ unit.
425. **Experimental Parasitology.** Same as Veterinary Pathobiology 425. See Veterinary Pathobiology 425.
431. **Plant Cell Metabolism.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 431. One of three courses giving a comprehensive summary of present knowledge in plant physiology; concerns the biochemistry of mature seeds and metabolic processes occurring during seed germination and heterotrophic growth. Meets during the first half of the fall semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
432. **Plant Cell Energetics.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 432. One of three courses giving a comprehensive summary of present knowledge in plant physiology; concerns the energy coupling processes in plant cells (respiration, photosynthesis, photorespiration); and discusses current literature relating to mechanisms of electron transport, phosphorylation, and carbon fixation. Meets during the second half of the fall semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Forestry, Horticulture, and Plant Pathology 433. One of three courses giving a comprehensive summary of present knowledge in plant physiology; concerns mechanisms of plant response to the environment, including ion uptake and transport, water relationships, gas exchange, and photosynthesis of whole plants. Meets during the first half of the spring semester. Prerequisite: Plant Biology 330 or equivalent, and an introductory course in biochemistry. $\frac{1}{2}$ unit.
444. **Morphometry.** Examines the theoretical basis and practical applications of stereological principles to sectioned materials (useful for both light and electron microscopic studies); compares manual and computer-assisted data collection and analysis; three-dimensional reconstructions from serial sections. Prerequisite: Statistics 100 or equivalent; consent of instructor. $\frac{1}{2}$ or $\frac{3}{4}$ unit.
450. **Scanning Electron Microscopy.** Introduction to theoretical aspects of the scanning electron microscope structure and function, beam-specimen interactions, image characteristics, and qualitative energy-dispersive x-ray microanalysis. Prerequisite: Concurrent registration in Biology 451; a course in modern physics or physical chemistry giving an introduction to wave mechanics; consent of instructor. $\frac{1}{2}$ unit.
451. **Scanning Electron Microscopy Laboratory.** Operation of the scanning electron microscope and ancillary equipment; studies of specimen preparation technique development and x-ray microanalysis. Prerequisite: Concurrent registration in Biology 450; consent of instructor. $\frac{1}{2}$ unit.
452. **Transmission Electron Microscopy.** Fundamental principles of transmission electron microscopy; topics include instrumentation, electron optics, image formation and interpretation, photographic techniques, and routine specimen preparation. Prerequisite: Concurrent registration in Biology 453 or equivalent; consent of instructor. $\frac{1}{2}$ unit.
453. **Transmission Electron Microscopy Laboratory.** Examines alignment, operation and performance evaluation of transmission electron microscopes; electron micrography of a variety of biological specimens including electron diffraction, photographic darkroom techniques, ultramicrotomy, perfection of routine and specialized biological specimen preparation. Prerequisite: Concurrent registration in Biology 452; consent of instructor. 1 unit.
454. **Advanced Methods in Electron Microscopy.** Same as Ceramic Engineering 454. Supplementary training in advanced techniques such as electron microprobe analysis, freeze-etch/freezefracture techniques, quantitative energy dispersive x-ray analysis, or instruction on specific

microscopes. Prerequisite: Biology 450-451, 452-453, or Ceramic Engineering 469; consent of instructor. $\frac{1}{4}$ unit. May be repeated.

457. **Ultrastructural Pathology.** Same as Veterinary Pathobiology 457. See Veterinary Pathobiology 457.
490. **Special Topics in Biology.** Individual topics in research and/or reading conducted under the supervision of faculty members in the School of Life Sciences. Designed for students enrolled in the biology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their doctorate degree. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

BIOPHYSICS

(See Physiology and Biophysics)

BRIDGE PROGRAM

Office: College of Liberal Arts and Sciences

Office Address: 270 Lincoln Hall, 702 South Wright, Urbana

100. **Summer Bridge — Reading.** Intensive course designed to improve critical comprehension skills for effective reading of college texts and primary sources; not intended for credit toward a baccalaureate degree. Offered only as part of the Summer Bridge Program. 0 hours.
101. **Summer Bridge — Composition.** Intensive course designed to improve writing skills; not intended for credit toward a baccalaureate degree. Offered only as part of the Summer Bridge Program. 0 hours.
102. **Summer Bridge — Math.** Intensive course designed to improve arithmetical and elementary algebraic skills; topics vary according to the needs of the students, but generally include elementary algebra (absolute value, first degree equations and inequalities, algebraic expressions, rules of exponents, factoring graphing, quadratic equations); not intended for credit toward a baccalaureate degree. Offered only as part of the Summer Bridge Program. 0 hours.

BUSINESS

Dean of College: John D. Hogan

College Office: 260 Commerce Building (West), 1206 South Sixth, Champaign

299. **International Business Study in Absentia.** Upon prior written approval of the adviser, the major department, and the College of Commerce and Business Administration office, a student may earn up to 18 credit hours per semester undertaking a study and/or research project in international business away from the Urbana-Champaign campus. The student's major department verifies the satisfactory progress of the work by means of interim and final written reports, written or oral examinations, or other means established by the department. While absent from the Urbana-Champaign campus, the student must continue to pay all fees required by the University of Illinois to retain continuity of enrollment and to allow the time spent away from this campus to count toward residency. Prerequisite: The student must be a commerce major in good standing who has completed at least 45 semester hours toward a bachelor's degree with at least one semester in residence at the University of Illinois. 0 to 18 hours. This course may be repeated for a maximum of 36 credit hours, all of which must be earned within twelve consecutive months.

BUSINESS ADMINISTRATION

Head of Department: Frederick W. Winter

Department Office: 350 Commerce Building (West), 1206 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **The Legal Environment of Business.** Examination of the nature of law and the formation and application of legal principles; the role of law in society; the legal environment in which business operates, particularly government taxation; the regulation of commerce, competition, and labor-management relations; and the concept of property: its creation, transfer, and importance to our business society. Prerequisite: Junior standing. 3 hours.
202. **Principles of Marketing.** Emphasizes the concepts of planning, organization, control, and decision making as they are applied in the management of the marketing function. Prerequisite: Economics 172 or equivalent. 3 hours.
203. **Principles of Business Law.** Contracts, the uniform commercial code, creditors' rights, agency and employment, business organizations, and property. Prerequisite: Business Administration 200. 4 hours. Credit is not given for both Business Administration 203 and 261.
205. **Business Location Decision-Making: Theory and Practice.** Same as Geography 205. See Geography 205.
210. **Management and Organizational Behavior.** A general analysis of management and organizational behavior from a systems point of view, including classical organizational theory and management, organizational behavior, and management science; environmental forces; planning, organizing, and control processes; motivation, incentives, leadership, communication, and interpersonal relations; and discussion of production and decision-making and mathematical models. Prerequisite: Junior standing. Students are encouraged to take Business Administration 202, 210, and Finance 254 concurrently. 3 hours. Credit is not given for both Business Administration 210 and 247.
212. **Principles of Retailing.** Gives a general analysis of the structure of retailing emphasizing the retailing environment and operating efficiencies; includes patronage behavior, merchandise control, pricing, promotion, location, and vendor relations; and gives special attention to emerging trends in retailing. Prerequisite: Business Administration 202. 3 hours.
247. **Introduction to Management.** Summary of management in a modern industrial enterprise; emphasis on motivation, small group behavior, and the problems of designing and operating a formal organization structure. For noncommerce students only. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Business Administration 247 and 210.
261. **Summary of Business Law.** Basic principles of the private law of business including the law of contracts, agency, and business organizations; a brief introduction to the law of sales, commercial paper, security devices, and property. Prerequisite: Junior standing. 3 hours. Credit is not given for both Business Administration 261 and 203.
274. **Operations Research.** Introduction to methods of operations research from an executive or managerial viewpoint, emphasizing formulation of business problems in quantitative terms; industrial applications of linear programming, dynamic programming, game theory, probability theory, queueing theory, and inventory theory. Prerequisite: Economics 173, or consent of instructor. 3 hours.
294. **Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
295. **Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.
300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Political Science, and Social Science 300. See Political Science 300.
314. **Production.** Introduction to production management, consideration of major problems of the production area, and the use of quantitative methods for solving them. Prerequisite: Business Administration 274 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.

- 315. Management in Manufacturing.** The application of production concepts and quantitative techniques to actual industrial problems; the mathematical structure of the particular production problems; the general structure of the production system and its interaction with marketing and budgeting; and areas including inventory control, production processes, programming, production control, forecasting of production levels, simulation of the production system, and physical planning of industrial plants. Prerequisite: Business Administration 314. 3 hours or $\frac{1}{2}$ unit.
- 320. Marketing Research.** Focuses on the techniques and methods of marketing research; emphasizes primarily survey research and experimental design; and offers students the opportunity to apply techniques to real-world situations. Prerequisite: Business Administration 202 and Economics 172. 3 hours or $\frac{1}{2}$ unit.
- 321. Individual Behavior in Organizations.** Understanding the behavior of employees in work organizations; particular attention to the motivation of individuals to join and perform in organizations and to employee satisfaction with elements of the work environment; and emphasis on various management strategies to modify employee motivation and satisfaction. Prerequisite: Business Administration 210, graduate standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 322. Group Processes in the Organization.** Analyzes several aspects of group techniques within the organization, including norm establishment, communication and comparison processes, collective bargaining, group decision making, problem solving, and coalition formation and conflict. Prerequisite: Business Administration 210 and Psychology 201. 3 hours or $\frac{3}{4}$ unit.
- 323. Organizational Design and Environment.** Understanding of complex organizations; particular attention to ways of dividing work, achieving coordination, and issues connected with change and adaptation. Prerequisite: Business Administration 210. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 337. Promotion Management.** Studies the effects of promotion upon sales and society from managerial and behavioral points of view; examines management of the advertising, sales promotion, and sales force functions within the context of an overall marketing program; includes consumer response to advertising, promotional planning and budgeting, advertising and sales research, media selection, legal environment of promotion, and sales force management and control; takes an analytical focus throughout; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 344. Buyer Behavior.** Studies the factors affecting customer behavior in household and organizational markets and their relevance for marketing management planning and analysis; provides an overview of explanations of consumption differences anchored in socioeconomic, demographic, cultural, and psychological processes; and surveys buyer decision-making processes and their implications for marketing strategy. Prerequisite: Business Administration 320. 3 hours or $\frac{1}{2}$ unit.
- 345. Small Business Consulting.** Through guided experience, students identify and offer advice to local small business firms; exposes students, serving as consultants, to the wide variety of problems facing the smaller firm as well as enables them to apply current business methods to real problems. Students work in teams. Prerequisite: Junior standing in the College of Commerce and Business Administration or admission to the Master of Business Administration program; or consent of instructor. 4 hours or 1 unit.
- 346. Entrepreneurship: Small Business Formation.** Studies entrepreneurship for those with a serious interest in owning their own business within five years of graduation; students prepare a comprehensive business plan for starting or acquiring such a business; also studies the problems of an existing small business. Prerequisite: Consent of instructor. 4 hours or 1 unit.
- 347. Legal Strategies for the Entrepreneurial Firm.** Addresses the legal and managerial strategies important to the emerging firm, with particular focus on defensive legal strategies in the context of entrepreneurship. From the entrepreneur's perspective, examines the law of partnerships, sole proprietorships, corporations, joint ventures, agency, and defensive strategies to thwart takeovers. 4 hours or 1 unit.
- 351. Personnel Administration.** Studies concepts and methods used by the staff personnel unit in building and maintaining an effective work force in an industrial organization; development of ability to design the personnel subsystem within the firm and to deal effectively with problems encountered in such areas as recruitment, selection, training, and wage and salary administration; and considerable emphasis on case analysis, role playing, and research.

- Prerequisite: Business Administration 323; Economics 173 and 240. 3 hours, or $\frac{1}{2}$ to 1 unit. Credit is not given for Business Administration 351 and Psychology 245.
- 352. Pricing Policies.** The role of pricing in contemporary marketing and major pricing decisions facing the firm; theoretical, economic, and practical methods and models for setting prices; pricing new products, initiating price changes, and responding to competitive pricing; the relationship of pricing objectives and strategies to the goals of the firm; and sealed bidding for contracts. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 360. Marketing to Business and Government.** Introduces the general area of industrial marketing; examines the nature of industrial markets especially as they compare to consumer markets and emphasizes such factors as the demand for industrial goods, marketing intelligence systems for industrial firms, marketing strategy in industrial markets, and analyses and control of industrial marketing programs; integrates important concepts from sales management and business logistics throughout the course; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 370. International Marketing.** Examines social, political, cultural, and economic environmental differences among countries in terms of their impact on the strategy of extension versus adjustment of marketing practice by multinational corporations; examines each marketing function in detail with respect to the specific areas the international marketer must examine. A special section concentrates on international market research. Prerequisite: Business Administration 344 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 373. Business Information Systems.** Fundamentals of business data processing; consideration of the use of modern electronic computers in the areas of accountancy, economics, management, marketing, and general business. The facilities of the Digital Computer Laboratory are utilized. Prerequisite: Accountancy 221. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 380. Advanced Marketing Management.** An integrative study of methods and models for marketing decision-making; emphasizes the application of analytical tools and behavioral and quantitative models to marketing decision-making. Uses lectures, case studies and simulation exercises. Prerequisite: Business Administration 274 and 344. 3 hours or $\frac{1}{2}$ unit.
- 382. Introduction to International Business.** Analyzes the major business management functions of international business operations of multinational firms; topics include international business environment, organizational policies and strategies of multinational companies, industrial relations and control policies. Prerequisite: Business Administration 202 or 210, or equivalent; Economics 101 or 102. 3 hours or $\frac{1}{2}$ unit.
- 384. International Management.** Analyzes the impact of socio-cultural variables on organization structure processes, decision-making, leadership role, employee motivation and productivity in the international business area. Prerequisite: Business Administration 202 or 210, or equivalent; senior standing. 3 hours or 1 unit.
- 389. Business Policy.** Analysis of policy formulation and implementation from a company-wide standpoint; emphasis on integration of knowledge and approaches across functional areas; both endogeneous and exogeneous factors which affect company policies; and the role of the firm in society. Prerequisite: Senior standing in the College of Commerce and Business Administration. 3 hours or $\frac{1}{2}$ unit.
- 391. Introduction to Management Information Systems.** Same as Accountancy 332. See Accountancy 332.
- 392. Information Organization for Management Information Systems.** Same as Accountancy 333. Data collection, classification, verification, and transmission; file organization, including sequential and random processing techniques, record locating, overflow procedures, and file security; analysis of alternative methods of data organization; commercial file management systems; design of data processing systems; and instruction in COBOL and use of case studies. Prerequisite: Accountancy 332 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 393. Management Information System Development.** Same as Accountancy 334. Essential steps in developing a management information system, including preliminary planning, design, feasibility analysis, implementation schedule, and postimplementation review of the system; includes a semester-long project which familiarizes students with methodology and techniques. Prerequisite: Accountancy 332 or Business Administration 392, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.

394. **Management Information and Control Systems.** Same as Accountancy 335. See Accountancy 335.
408. **Foundations of Behavioral Science for Administration.** Develops and integrates fundamental behavioral concepts and theory having administrative applications; initially focuses on the individual decision maker and ultimately includes interpersonal, organizational, and social structures and influences; and develops strategies and methods of research on behavioral applications in business. 1 unit.
409. **Organizational Behavior.** Same as Labor and Industrial Relations 409. Examines and analyzes the organization as a social system and the impact of its various components on work attitudes and behavior; topics include the development of organizational structures, organizational effectiveness, decision making and policy formulation, leadership, and change. Prerequisite: Business Administration 408. 1 unit.
410. **Organizational Sciences, I.** Same as Political Science 460, Psychology 453, and Sociology 456. Introduction to the principal theories and important empirical research in various disciplines that study organizations; in addition to examination of the subject matter content of various disciplines, students critically examine the capacities and limitations of the various fields to make contributions to the study of organizations. Prerequisite: Enrollment as a major in organizational sciences in a cooperating program or consent of instructor. 1 unit.
411. **Problems of Personnel Management.** Same as Labor and Industrial Relations 448. Examines the organization and administration of the personnel function in management; the relations of personnel administration to operating departments and the scope of business and industrial personnel services; analytical appraisal of policies and practices in selected areas of personnel administration, such as selection and training, carried out through case studies and direct industrial contracts; and specific consideration given to problems up to and including placing the person on a job. Prerequisite: Consent of instructor. 1 unit.
412. **Organization and Its Environment.** Analysis of business organizations adapting to shifts in internal and external elements; major emphasis on (1) the business firm as a part of a complex socioeconomic system; (2) the effects of government, labor unions, and political, religious, and business organizations on the executive's decision problems; (3) environmental factors conducive to organizational change; and (4) organizational growth. Prerequisite: Business Administration 409. 1 unit.
413. **Behavioral and Organizational Decision Making.** Examines the major types of organization theory; use of organization theory to guide research and to make business decisions; and examination of major research methods used to study business organizations. Prerequisite: Business Administration 412. 1 unit.
415. **Foundations of Buyer Behavior.** Studies alternative models of buyer behavior; focuses attention on psychological, sociological, and economic factors including motivation, learning, attitudes, personality, reference groups, social stratification, demographics, life-styles, and cross-cultural differences and their impact on purchasing, consumption, and choice decisions. Prerequisite: Business Administration 420. 1 unit.
416. **Metatheory in Consumer Behavior.** An advanced doctoral level seminar which critically examines the relevance of behavioral and social constructs for generating consumer behavior theories with the use of philosophy of science and metatheory criteria; specifically discusses the need for, and procedures with which to modify behavioral/social constructs and processes such as motivation, concept formation, information processing, choice axioms, attitude consistency, and group norms. Prerequisite: Business Administration 415. 1 unit.
420. **Marketing Management.** Introduces concepts useful in understanding marketing systems and buyer behavior in addition to developing skills in making marketing decisions; the orientation is primarily managerial and uses examples from both business and non-business contexts. 1 unit.
421. **Marketing Strategy: Theoretical Foundations.** A formal analysis of strategy drawing on concepts from the theory of games, decision theory, value theory, and information theory; topics cover elements of game models, classes of decision problems, games against nature, modern utility theory, information theory, group decision making, statistical decision theory, and linear and nonlinear optimization. 1 unit.
422. **Marketing Strategy: Decision Models.** The role of models in the design, implementation, and adjustment of seller strategy; application of simulation, programming, and other methods

to the specification and solution of product, price, promotion, and other marketing problems; and topics including the nature of models and model building, forecasting models, optimization models, and other decision models. Prerequisite: Business Administration 421. 1 unit.

424. **Market Segmentation.** Deals with unique subsets of potential customers in the market who differ with regard to applications of the marketing tactic to be employed; applies cost benefit criteria to possible aggregations of these subsets. Discusses the topic from a historical perspective, a research perspective, and finally a strategic perspective; involves actual segmentation research by students. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
425. **Product Management.** The decisions on the firm's total market offer, including such topics as use of market analysis in making decisions on assortment, product development, pricing, packaging, branding, and sales forecasting; coordination of these decisions and actions with market communications, physical movement, production, finance, and the overall goals and policies of the firm; and emphasizes the use of analytic and research methods in making assortment and product decisions. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
426. **Marketing Theory and Systems.** A detailed study of macro- and micro-marketing systems and the various approaches to marketing theory; attention given to general systems theory, the nature of marketing systems, system adaptation to the environment, concepts of theory, and major approaches to macro- and micro-theory in marketing. 1 unit.
427. **Sales Force Management.** Examines primary elements and problems in the area of sales force management; studies such topics as the dyadic interaction between the buyer and seller, the sales presentation, important salesperson characteristics, the selection, training, assignment, motivation, and compensation of salespeople, supervision and evaluation of the sales force, and coordination of the sales force with other elements in a firm's marketing program. Uses case studies. Prerequisite: Business Administration 420. 1 unit.
428. **Promotional Strategy.** Management orientation to promotional strategy for the medium and large size organization: includes analyses of the primary elements of the promotional function from both qualitative and quantitative perspectives emphasizing such factors as (1) selection among alternative promotional tools, (2) the promotional budgeting and allocation process, and (3) determination of appropriate messages and media schedules for given product/market situations. Explores widely used models in depth for strategic usefulness; emphasizes case analysis and contemporary situations. Prerequisite: Business Administration 420. 1 unit.
429. **Marketing Research.** Examines the collection and analysis of information applied to marketing decisions; stresses quantitative methods including samplings, scalings, experimental design, forecasting, and multivariate procedures through the use of class projects on actual market research problems. Prerequisite: Business Administration 472, and credit or concurrent registration in Business Administration 420. 1 unit.
430. **Research Methods in Business Administration.** Theory and practice of research methodology for the study of administrative, industrial, and consumer behavior and organizations; alternative methods of data collection and their strengths and weaknesses; observational, questionnaire, field, and laboratory experimentation and statistical analysis of pregathered time-series and cross-sectional data; and examples of good and bad research in business disciplines. A completed individual research project of potentially publishable nature is formally presented in class. Prerequisite: Basic inferential statistics course; credit or concurrent registration in Business Administration 408. 1 unit.
431. **Survey Methods in Marketing Research.** Same as Sociology 474. Analysis of survey methods in marketing with emphasis on sample design, data collection, and data processing; an advanced course in the methods required to design, implement, and evaluate a research project. Prerequisite: Economics 171 or equivalent. 1 unit.
432. **Applied Multivariate Analysis in Business.** An advanced doctoral level seminar on the applications of multivariate statistical techniques to marketing and business problems: critically examines the relevance of optimization rules and inferential properties of various multivariate techniques including regression, AID, MANOVA, discriminant, canonical, factor, cluster-

ing and multidimensional scaling for marketing and business problems; particularly emphasizes pitfalls of data and computational problems. Prerequisite: Psychology 494. 1 unit.

433. **Experimental Design.** Training in the design, execution, and interpretation of field and laboratory experimental research; emphasis on the evaluation of alternative designs, execution of problems, and interpretation of data; and a review of illustrative research studies made, an actual study designed, and data collected and interpreted. Prerequisite: Business Administration 472 or consent of instructor. 1 unit.
435. **The Sampling of Human Populations and Social Organizations.** Same as Sociology 485 and Psychology 485. Procedures for selecting samples from and estimating population parameters for human populations and social organizations; types of sample designs treated include simple random samples, stratified, and cluster samples together with random number and systematic selection techniques; and emphasis given to the study of various kinds of advanced sample designs for both area and institutional settings together with the problems involved in the application of analytical statistics to complicated sampling procedures. Each student is required to participate in a field project which involves the actual selection of a cluster sample from the local area. Prerequisite: Sociology 387 or consent of instructor. 1 unit.
443. **Legal Aspects of Management Decisions.** The legal environment in which business decisions are made, including the legal system and the role of courts, government taxation and regulation of business, administrative law, antitrust law, labor law, and trends in the law affecting business policy. 1 unit.
444. **Policy and Planning.** Policy construction and planning of policy implementation at the executive level; case studies of company-wide situations from the management point of view; and integration and application of material from previous courses. Credit is not given for both Business Administration 444 and 389. Prerequisite: Business Administration 408, 420, and 467, Finance 451, or equivalent. 1 unit.
452. **Long-Term Financial Decision Making.** Same as Finance 452. See Finance 452.
453. **Working Capital Management.** Same as Finance 453. See Finance 453.
455. **Risk Management and Control.** Same as Finance 470. See Finance 470.
456. **Investment.** Same as Finance 456. See Finance 456.
457. **Security Analysis.** Same as Finance 457. See Finance 457.
458. **Portfolio Management.** Same as Finance 458. See Finance 458.
460. **Managerial Accounting and Control.** Analysis of managerial controls, the information needed for their operation, and the manner in which accounting provides that information; emphasis on accounting as a tool of management; and problems and cases stressing the type of figure information relevant to managerial decisions and the methods of using such data. 1 unit.
467. **Production Management.** An introductory course in decision-making problems in production; includes the theoretical foundations for production management as well as the applications of decision-making techniques to production problems in the firm; and considers production processes, plant layout, maintenance, scheduling, quality control, and production control in particular. Prerequisite: Business Administration 472 and 473. 1 unit.
468. **Production Planning and Control.** In-depth treatment of decision-making topics in production at the factory manager level and above; topics include the development of generalized decision rules and systems analysis in production; and particular emphasis on the design of production control, quality control, and inventory control systems, and how each of these systems is integrated into the firm as a whole. Prerequisite: First year of the M.B.A. program. 1 unit.
469. **Quantitative Techniques in Production.** An advanced course in the application of quantitative techniques to decision-making problems dealing with production in the firm; topics include structural estimation of production systems, application of operations research techniques to production problems, and computer simulation of decision systems. Prerequisite: Business Administration 468 or equivalent. 1 unit.
470. **Mathematical Analysis for Management Decisions.** An elementary course in calculus with applications to business and economics; topics include differentiations, integration, Lagrange multipliers, multivariate functions, and matrices. 1 unit.
472. **Modern and Classical Statistics for Management Decisions.** The application of classical and modern statistics for business decision making. The level of the course assumes some prior

- knowledge of basic statistics as well as facility with elementary calculus. Prerequisite: Business Administration 470. 1 unit.
473. **The Quantitative Analysis of Decisions.** Introduction to operations research techniques; topics include the construction and solution of linear models under certainty, and the construction of probabilistic models, specifically queueing theory, Markov chains, and sequential decisions. Prerequisite: Business Administration 470. 1 unit.
474. **Applications of Operations Research Techniques.** The application of the operations research techniques developed in Business Administration 473 to practical business problems. Most of the semester is devoted to a series of field research studies. A review of previous work in the field is made prior to the field studies, and the role of the computer in solving operations research problems and its application to the field research is also a major consideration. Prerequisite: Business Administration 473. 1 unit.
475. **Systems Modeling and Simulation.** Same as Computer Science 445. Theory and techniques of simulation and gaming; simulation languages such as GPSS, DYNAMO, and SIMSCRIPT. Applications: investigation, control, and design of various systems (inventory, production scheduling, computer, marketing, and others). Prerequisite: Computer Science 105 or Statistics 310 or Business Administration 274, or equivalent, or consent of instructor. 1 unit.
476. **Business Forecasting and Econometrics.** Introduction to maximum likelihood estimating techniques; topics including the use and limitations of least squares, two-stage least squares, limited-information and full-information estimates; and consideration of problems with observational errors, multicollinearity, and autocorrelation in time-series and cross-section structural estimation. A major portion of the course is devoted to the application of the econometric techniques in business forecasting and analysis. Prerequisite: Business Administration 472. 1 unit.
477. **Economics of Decision Making.** The operational analysis of the problems of individual decisions under uncertainty that arise in the practice of management. Prerequisite: Business Administration 472. 1 unit.
478. **Stochastic Models in Management Science.** Application of Markov processes to describe, analyze, and design systems of interest in management science, including queues, inventory, production, brand loyalty, stock market, and other applications. Prerequisite: Mathematics 361 or Statistics 310, or equivalent. 1 unit.
479. **Mathematical Programming for Management Science.** Mathematical programming models (linear, integer, quadratic, nonlinear, dynamic, and combinatorial) used to describe, analyze, and design systems such as production, transportation, scheduling, and planning. Prerequisite: Mathematics 315 or equivalent. 1 unit.
482. **International Business Operations, I.** An integration of economics and the functional areas of business focused on the problems of managing international business operations; studies economic, legal, functional, and administrative problems through cases and literature emphasizing financial and marketing problems. Students select one area from the following for special study and reporting: Europe, Latin America, Africa, Middle and Near East, or South Asia and Far East. Prerequisite: Completion of first year of the M.B.A. program. 1 unit.
483. **International Business Operations, II.** Continuation of Business Administration 482. Prerequisite: Business Administration 482. 1 unit.
486. **Japanese Business and Management Systems.** Analyzes the business and management systems of Japan and compares them with the American business and management systems; topics include quality circles and quality of work life; the human side of Japanese productivity; business-government relations in Japan; organizational strategies and policies of Japanese business organizations; economic, political, legal, and ecological factors affecting Japanese management systems. Prerequisite: Graduate standing; Business Administration 409 or equivalent. 1 unit.
490. **Seminar in Business Administration.** Special topics in the general area of business. Topics are selected by the instructor at the beginning of each semester. 0 to 1 unit.
491. **Seminar in Special Topics.** Lectures in topics of current interest not covered by regular course offerings. Subjects are announced in the *Timetable*. Prerequisite: Consent of instructor or head of department. $\frac{1}{4}$ to 1 unit.
493. **Research in Special Fields.** $\frac{1}{4}$ to 2 units.

494. **Independent Study and Research.** Directed reading and research. $\frac{1}{2}$ or 1 unit.
499. **Dissertation Research.** Required of all students writing doctoral dissertations in business administration; guidance in writing theses and seminar discussions of interim progress reports. 0 to 4 units.

BUSINESS AND TECHNICAL WRITING

(See English)

CELL AND STRUCTURAL BIOLOGY

Head of Department: Alan Horwitz

Department Office: 506 Morrill Hall, 505 South Goodwin, Urbana

211. **Developmental Biology.** Introduction to embryonic development with emphasis on understanding the basic processes of cell determination and differentiation, and morphogenesis, at the tissue, cell, and molecular levels. Prerequisite: Biology 111 or equivalent. (Counts for advanced hours in LAS.)
234. **Functional Human Anatomy.** Studies the essentials of functional human anatomy with special reference to skeletal, muscular, splanchnic, circulatory, and nervous systems. Prerequisite: Biology 110 and 111, or Physiology 103; or consent of instructor. 5 hours. (Counts for advanced hours in LAS.)
290. **Individual Topics.** Laboratory work and/or reading in fields selected in consultation with an appropriate faculty member. Prerequisite: 15 hours in Life Sciences courses including one course in Cell and Structural Biology, and consent of instructor. 2 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
307. **Functional Neuroanatomy.** Examines the structural organization and function of the major systems of the nervous system. Prerequisite: Physiology 302, Biology 303, graduate standing, or consent of instructor. 4 hours or 1 unit.
312. **Developmental Genetics.** Mechanisms underlying the genetic control of early eukaryote development at the molecular and cellular levels. Prerequisite: Biology 151 or 210; Cell and Structural Biology 211 or Biology 251; a course in biochemistry or cell biology recommended. 3 hours or $\frac{3}{4}$ unit.
315. **Human Genetics.** Studies the techniques employed for genetic analysis of human traits; discussion of genetic mechanisms operative in human development, metabolism, and behavior; and genetics and human disease. Prerequisite: Biology 210; biochemistry and statistics recommended. 3 hours or $\frac{3}{4}$ unit.
319. **Vertebrate Histology.** Microscopic anatomy of vertebrates with special reference to man; emphasis on developing an understanding of the structural organization of cells, tissues, and organs, together with functional relationships; provides morphological approaches for comprehending and investigating biological problems at cellular and subcellular levels. Prerequisite: Biology 111 or 151, or equivalent; and consent of instructor. 4 hours or 1 unit.
322. **Anatomy of the Human Extremities.** Comprehensive study of the human extremities with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
323. **Anatomy of the Human Thorax and Back.** Comprehensive study of the human thorax and back with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 1 hour or $\frac{1}{4}$ unit.

324. **Anatomy of the Human Abdomen and Pelvis.** Comprehensive study of the human abdomen and pelvis with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
325. **Anatomy of the Human Neck and Head.** Comprehensive study of the human neck and head with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
360. **Cell Biology, I.** Principles of eukaryotic cell biology; consideration of molecular and fine structural components of the cell with an emphasis on experimental analysis of the relationship of structure to function of gene, membrane, cytoskeleton, and extracellular matrix. Prerequisite: Biology 111, and concurrent registration in Biochemistry 350 or 352 or consent of instructor. 4 hours or 1 unit.
361. **Cell Biology, II.** Continuation of Cell Biology I. Emphasizes molecular and cellular topics in development, neurobiology, and immunology and molecular mechanisms of motility and tumorigenesis. Prerequisite: Cell and Structural Biology 360 or Biology 213, and Biochemistry 350 or 352 or consent of instructor. 4 hours or 1 unit.
412. **Cell and Structural Biology Seminar.** Invited speakers, faculty, and student presentations and discussions on current research topics. Prerequisite: Graduate standing. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
490. **Individual Topics.** Individual topics in research and/or reading for graduate students, to be conducted under the supervision of faculty members in cell and structural biology; designed to allow students to become more familiar with specialized fields of study prior to committing themselves to a specific area for their graduate degree. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{4}$ to 4 units.

CERAMIC ENGINEERING

(See Materials Science and Engineering)

CHEMICAL ENGINEERING

Head of Department: R. C. Alkire

Department Office: 114 Roger Adams Laboratory, 1209 West California, Urbana

161. **The Chemical Engineering Profession.** Lectures and problems on the history and scope of chemical engineering endeavors; decisions and criteria for process development and plant design. Prerequisite: Chemistry 101 or 107. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Cooperative Education: Planning.** Same as Chemistry 201. See Chemistry 201.
202. **Cooperative Education: Industrial Practice.** Same as Chemistry 202. See Chemistry 202.
261. **Introduction to Chemical Engineering.** Lectures and problems on material and energy balances. Prerequisite: Chemistry 102 or 108. 3 hours.
292. **Senior Thesis.** Limited in general to seniors in the curriculum in chemical engineering. Any others must have the consent of the head of the department. Each student taking the course must register in a minimum of 5 hours either in one semester or divided over two semesters. A maximum registration of 10 hours in two semesters is permitted. However, Chemical Engineering 390 (2 hours) may be substituted for 2 of the 5 hours required in Chemical Engineering 292. In order to receive credit, a thesis must be presented by each student registered in Chemical Engineering 292. 1 to 6 hours.
370. **Chemical Engineering Thermodynamics.** Fundamental concepts and laws of thermodynamics with emphasis on application to chemical engineering problems; introduction to phase equilibria. Prerequisite: Chemical Engineering 261. 3 hours or $\frac{1}{2}$ unit.

- 371. Fluid Mechanics and Heat Transfer.** Introduction to fluid statics and dynamics; dimensional analysis; design of flow systems; and introduction to heat transfer conduction, convection, and radiation. Prerequisite: Chemical Engineering 261 or consent of instructor. 4 hours or 1 unit.
- 373. Mass Transfer Operations.** Introduction to mass transfer processes and design methods for separation equipment. Prerequisite: Chemical Engineering 371 or consent of instructor. 4 hours or 1 unit.
- 374. Chemical Engineering Laboratory.** Experiments and computation in fluid mechanics, heat transfer, reaction kinetics, and separation processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; senior standing in chemical engineering. 3 hours or $\frac{1}{2}$ unit.
- 377. Synthesis and Design of Chemical Systems.** Techniques used in the synthesis and analysis of designs for chemical processing systems; emphasizes the strategy of process engineering, including economic analysis, process simulation, and optimization. This is a capstone course designed to bring together principles from previous courses for the design of complete processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; Mathematics 345; Computer Science 101. 3 hours or $\frac{3}{4}$ unit.
- 380. Heat, Mass, and Momentum Transport.** A unifying treatment of physical rate processes with particular emphasis on the formulation and solution of typical boundary value problems associated with heat, mass, and momentum transport. Prerequisite: Chemical Engineering 371; Mathematics 345. 3 hours or $\frac{3}{4}$ unit.
- 381. Chemical Rate Processes and Reactor Design.** Chemical kinetics, chemical reactor design, and the interrelationship of transport and chemical reaction in open and closed systems. Prerequisite: Credit or registration in Chemical Engineering 373. 2 hours or $\frac{1}{2}$ unit.
- 382. The Prediction of Physical Properties.** Prediction of equilibrium and transport properties in gases, liquids, and solids. Prerequisite: One year of physical chemistry. 2 hours or $\frac{1}{2}$ unit.
- 387. Applied Chemical Kinetics and Catalysis.** Problems in chemical kinetics; techniques for the prediction and measurement of rates of reactions; and homogeneous and heterogeneous catalysis chain reactions. Prerequisite: Chemistry 342 or Chemical Engineering 370. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
- 388. Electrochemical Engineering.** Fundamentals of analysis, design, and optimization of electrochemical systems. Prerequisite: Senior standing in physical science or engineering. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
- 389. Chemical Process Control and Dynamics.** Techniques used in the analysis of process dynamics and in the design of process control systems; includes Laplace transforms, stability analysis, and frequency response methods. Laboratory emphasizes on-line data acquisition and control. Prerequisite: Chemical Engineering 371 and senior standing in Chemical Engineering; Mathematics 345; Computer Science 101. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
- 390. Individual Chemical Engineering Projects.** Laboratory; development of an individual project. Prerequisite: Senior standing in chemical engineering. 2 hours or $\frac{1}{2}$ unit.
- 392. Polymer Science and Engineering.** Fundamentals of polymer science and engineering: polymerization mechanisms, kinetics, and processes; physical chemistry and characterization of polymers; polymer rheology, mechanical properties, and processing. Prerequisite: Chemical Engineering 370; credit or concurrent registration in Chemical Engineering 371; Chemistry 344. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Chemical Engineering 392 and either Metallurgical Engineering 375 or Chemistry 346.
- 396. Special Topics in Chemical Engineering.** Study of topics in chemical engineering; content varies from semester to semester. Typical topics include optimization, chemical kinetics, phase equilibrium, biochemical engineering, kinetic theory, and transport properties. Prerequisite: Senior standing in chemical engineering, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated.
- 465. Chemical Engineering Seminar.** Required of all graduate students whose major is chemical engineering. Prerequisite: Chemical Engineering 373. $\frac{1}{4}$ unit.
- 466. Applied Mathematics in Chemical Engineering.** The development of mathematical models and a survey of modern mathematical methods currently used in the solution of chemical engineering problems; topics include the application of vectors and matrices, partial differential

- equations, numerical analysis, and methods of optimization in chemical engineering. Prerequisite: Consent of instructor. $\frac{3}{4}$ or 1 unit.
468. **Properties of Fluids.** The kinetic theory of gases and the prediction of transport coefficients; statistical mechanics applied to dense gases and liquids; and theories of solutions. Prerequisite: A background in modern physical chemistry and physics; consent of instructor. $\frac{3}{4}$ or 1 unit.
469. **Special Topics in Chemical Engineering.** Various advanced topics; generally taken during the second year of graduate study. Typical topics include turbulence, hydrodynamic instability, process dynamics, interfacial phenomena, reactor design, properties of matter at high pressure, and phase transitions. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated.
487. **Fluid Dynamics.** Basic concepts in fluid dynamics with special emphasis on topics of interest to chemical engineers; derivation of the Navier-Stokes equations; solutions for creeping flow, for perfect fluids, and for boundary layers; non-Newtonian fluids; and turbulence. Prerequisite: Consent of instructor. 1 unit.
488. **Advanced Topics in Heat and Mass Transfer.** Principles of transfer operations developed in terms of physical rate processes; boundary layer heat and mass transfer, eddy diffusion, phase changes, and separation processes. Prerequisite: Consent of instructor. $\frac{3}{4}$ or 1 unit.
496. **Individual Study.** Study under the supervision of a staff member in areas not covered in course offerings. Prerequisite: Consent of the staff member under whom the study is to be made. 0 to 1 unit.
497. **Special Problems.** Individual work on problem-oriented projects not included in theses. This could be research, engineering design, or professional work in chemical engineering which has educational values. The work must be done under the supervision of a staff member with the approval of the department head. $\frac{1}{2}$ to 4 units.
498. **Research Seminar.** Discussion of recent developments of importance to different areas of chemical engineering research. The course is divided into a number of sections, and subject matter differs from section to section and from time to time. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
499. **Thesis Research.** Candidates for the master's degree who elect research are required to write a thesis. A thesis is always required for the Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in another department must receive permission from the head of the Department of Chemical Engineering to register in this course. 0 to 4 units.

CHEMICAL SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Biochemistry, Chemical Engineering, and Chemistry.)

Director of School: Jiri Jonas

School Office: 106 Noyes Laboratory, 505 South Mathews, Urbana

CHEMISTRY

Acting Head of Department: J. P. Hummel

Department Office: 106 Noyes Laboratory, 505 South Mathews, Urbana

100. **Introductory Chemistry.** Introduction to the basic concepts and language of chemistry; lectures, recitations, and laboratory. Prerequisite: Two and one-half units in high school mathematics, or credit or concurrent registration in Mathematics 112. 3 hours. Only students without high school chemistry or with chemistry placement scores inadequate for enrollment in Chemistry 101 receive graduation credit.

NOTE: Chemistry 101 - 102 constitutes the standard college chemistry sequence. Chemistry 107, 108, 109, and 110 is the intensive, more rigorous sequence for chemistry majors and well-prepared students of science. The regular and intensive sequences are not designed to be mixed. A student who registers for parts of both sequences without special permission from the director of general chemistry risks loss of credit. Chemistry 101 and 103 constitutes a terminal sequence for agriculture students which does not satisfy prerequisites for advanced chemistry courses.

101. **General Chemistry.** Lecture and laboratory. For students who have some prior knowledge of chemistry. Principles governing atomic structure, bonding, states of matter, stoichiometry, and chemical equilibrium; descriptive chemistry of the elements and coordination compounds. Prerequisite: Credit in or exemption from Mathematics 112; one year of high school chemistry or equivalent. Placement into 101 by the Chemistry Placement Test recommended. 4 hours. Students may not receive credit for both Chemistry 101 and Chemistry 107 and 109. Three semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
102. **General Chemistry (Biological or Physical Version).** Lectures, recitations, and laboratory. Section B (Biological Version): Chemistry of organic and biochemical systems, chemical energetics and equilibrium, chemical kinetics, and reaction mechanisms. Section P (Physical Version): Chemistry of materials, including organic and biological substances, chemical energetics and equilibrium, chemical kinetics, and solids and crystals. Prerequisite: Chemistry 101, or Chemistry 107 and 109, or advanced placement credit for one semester of college-level chemistry. 4 hours. Students may not receive credit for both Chemistry 102 and Chemistry 108 and 110. Three semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
103. **General Chemistry: Organic Chemical Studies.** Lectures, recitations, and laboratory-discussion. Descriptive facts and theory of organic chemistry and applications to living processes. For students in the College of Agriculture. A terminal course in chemistry; it does not meet the Chemistry 102 prerequisite for more advanced courses in chemistry. Prerequisite: Chemistry 101. 4 hours. No two of the courses Chemistry 102, 103, and 108 may be taken for credit.
107. **Accelerated Chemistry, I.** Lectures and recitations. The beginning chemistry course for students in the chemical sciences and others with strong high school chemistry and mathematics preparation. Chemical calculations, structure, bonding and equilibrium. Credit toward graduation is received for Chemistry 107 only if Chemistry 109 is also completed. Prerequisite: Admission by U. of I. placement test or consent of adviser; credit or concurrent registration in Mathematics 120 or 135; concurrent registration in Chemistry 109. 3 hours.
108. **Accelerated Chemistry, II.** Continuation of Chemistry 107. Lectures and recitations. Emphasizes chemical thermodynamics, equilibrium, chemical kinetics, and coordination chemistry. Prerequisite: Chemistry 107 and/or 109 and concurrent registration in Chemistry 110, or consent of instructor. 3 hours.
109. **Accelerated Chemistry Laboratory, I.** Laboratory and discussion. Includes quantitative analysis. Prerequisite: Concurrent registration in Chemistry 107, or receipt of credit by examination for Chemistry 107, or consent of department. 2 hours. Credit is not given for both Chemistry 109 and either 122 or 123.
110. **Accelerated Chemistry Laboratory, II.** Laboratory and discussion. Includes experiments in qualitative analysis, inorganic synthesis, and kinetics as well as an individual project. Prerequisite: Concurrent registration in Chemistry 108 or consent of department. 2 hours.
122. **Elementary Quantitative Analysis.** Theory and practice of equilibria pertinent to chemical analyses; practical applications of classical and instrumental methods of analysis. Intended primarily for students outside the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 122 and either 109 or 123.
123. **Quantitative Analysis.** Theory and application of chemical equilibria and instrumentation in analysis. Intended primarily for students majoring in departments within the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 123 and either 109 or 122.

131. **Elementary Organic Chemistry.** Presents elementary structural and synthetic chemistry with emphasis on applications of this material to closely related areas. For students in agricultural, nutritional, and biological sciences, as well as premedical, pre dental, and preveterinary programs. One-semester survey course; may be followed by Chemistry 331. Prerequisite: Chemistry 102 or 108. 3 hours. Students may not receive credit for both Chemistry 131 and Chemistry 136.
134. **Elementary Organic Chemistry Laboratory.** Basic laboratory technique in organic chemistry is presented with emphasis on experiments of interest to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Credit or concurrent registration in Chemistry 131. 2 hours. Students may not receive credit for both Chemistry 134 and 181.
136. **Basic Organic Chemistry.** Fundamental structural, synthetic, and mechanistic organic chemistry is presented. For students whose major is chemistry or for those registering in the curriculum in chemistry or chemical engineering. Prerequisite: Chemistry 108, 122, or 123; concurrent registration in Chemistry 181; Mathematics 132 or 135. 3 hours. Students may not receive credit for both Chemistry 136 and 131.
181. **Structures and Synthesis.** A laboratory course emphasizing molecular structure and synthetic chemistry. Prerequisite: Chemistry 108, 122, or 123; Mathematics 132 or 135; credit or concurrent registration in Chemistry 136. 2 hours. Students may not receive credit for both Chemistry 181 and 134.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Cooperative Education: Planning.** Same as Chemical Engineering 201. On-campus planning and discussion of cooperative work-study education programs in industry and government. Each chemistry or chemical engineering student participating in the cooperative education program must register for Chemistry Chemical Engineering 201 or 202 each term (201 if on-campus, 202 if off-campus). Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
202. **Cooperative Education: Industrial Practice.** Same as Chemical Engineering 202. Off-campus cooperative practice of chemistry or chemical engineering in industrial or governmental facilities. Each chemistry or chemical engineering student participating in cooperative education must register for Chemistry 202 for each off-campus term. Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
245. **Thermodynamics of Materials.** Same as Materials Science and Engineering 301. See Materials Science and Engineering 301.
292. **Senior Thesis.** Research, with thesis, under the direction of a senior staff member in chemistry. Normally the student takes two semesters of Chemistry 292 in the senior year. Chemistry 292 is recommended for all those who plan to do research and graduate study, and it or Biochemistry 292 is a prerequisite for graduation with distinction in chemistry. In the semester preceding their initial enrollment, those interested in taking the course should consult with their advisers and with the graduate adviser for the area of interest in which they plan to work. A maximum of 10 hours may be counted toward graduation and a thesis must be presented for credit to be received. 2 to 6 hours. (Counts for advanced hours in LAS.)
315. **Inorganic Chemistry.** Electronic structure of atoms and molecules and their relation to the properties of the elements and compounds; types of bonding; and a survey of symmetry, group theory, ligand field theory, organo-metallic chemistry, acids and bases, nonaqueous solvents, homogeneous catalysts, and bioinorganic chemistry. Prerequisite: Credit or concurrent registration in Chemistry 342. 3 hours or $\frac{3}{4}$ unit.
316. **Inorganic Chemistry Laboratory.** Preparation of typical inorganic compounds illustrating special and advanced techniques, including characterization by modern physical methods. Prerequisite: Chemistry 383, or credit or concurrent registration in Chemistry 315, or equivalent. 3 hours or $\frac{3}{4}$ unit.
322. **Separation Methods.** Examines theory, practice, and instrumentation in gas and liquid chromatography, extraction techniques, mass spectrometry as coupled to chromatography, electrophoresis, and separations based on phase equilibria. Prerequisite: Credit or concurrent registration in Chemistry 340 or 342. 4 hours or 1 unit.

- 323. Applied Electronics for Scientists.** A lecture and laboratory course designed expressly for chemists and other scientists or engineers who have little or no background in electronics, but who need a working knowledge of electronic devices, circuits, and instruments; begins with electronic principles and leads systematically into digital, analog, and servo systems used in scientific instrumentation. Prerequisite: Senior or graduate standing in any of the physical sciences or engineering, or consent of instructor. 4 hours or 1 unit.
- 329. Instrumental Methods of Analysis.** Studies instrumental methods for characterization of chemical systems: potentiometry, voltammetry, atomic spectroscopy, molecular absorption and fluorescence, mass spectrometry, activation analysis, electron and x-ray spectroscopies, gas and liquid chromatography, and current topics such as laser spectroscopy. Prerequisite: Chemistry 340; or credit or concurrent registration in Chemistry 342; or consent of instructor. 4 hours or 1 unit.
- 336. Fundamental Organic Chemistry II.** Second course; lectures. Prerequisite: Chemistry 131 and 134, or Chemistry 136 and 181. 3 hours or $\frac{3}{4}$ unit.
- 337. Organic Chemistry.** Laboratory experiments in organic chemistry with emphasis on synthesis. Prerequisite: Credit or concurrent registration in Chemistry 336. 3 hours or $\frac{3}{4}$ unit.
- 338. Separation, Purification, and Identification of Organic Compounds.** Separation, purification, and identification of organic compounds using modern research methods; the identification of organic compounds by the use of spectroscopic methods and chemical conversion; the separation of mixtures and the purification of the components by crystallizations, sublimation, distillation, extraction, and chromatography; and the qualitative and quantitative identification of the components of a mixture. Prerequisite: Chemistry 336 and 337. 4 hours or 1 unit.
- 339. Advanced Organic Chemistry.** Interpretation of reactivity, reaction mechanisms, and intermediates; applications in organic synthesis, photochemistry, biosynthesis of natural products, and other areas. Prerequisite: Chemistry 338. 3 hours or $\frac{3}{4}$ unit.
- 340. Principles of Physical Chemistry.** A one-semester course in physical chemistry emphasizing topics most important to students in the biological and agricultural sciences. Not open to students in the specialized curricula in chemistry and chemical engineering. Laboratory experience in this area provided by Chemistry 383 to be taken preferably after Chemistry 340. Prerequisite: Chemistry 122 or 123 and Chemistry 131, or equivalent; Physics 102; Mathematics 242 or equivalent (calculus including partial derivatives). 4 hours or 1 unit.
- 342. Physical Chemistry, I.** Lectures and problems focusing on microscopic properties. Chemistry 342 and 344 constitute a year-long study of chemical principles covering topics such as quantum chemistry, atomic and molecular structure and spectra, statistical thermodynamics, properties and thermodynamics of materials in gases, solids, and liquids, and chemical kinetics and equilibria. Prerequisite: Chemistry 108, 122, or 123; Mathematics 225 or 315, and a minimal knowledge of differential equations, or equivalent; Physics 106, 107, and 108 or equivalent. 4 hours or 1 unit.
- 344. Physical Chemistry, II.** Continuation of Chemistry 342, focusing on bulk properties. Prerequisite: Chemistry 342. 4 hours or 1 unit.
- 346. Physical Chemistry of Macromolecules.** The physical properties of systems containing large molecules, with special emphasis on proteins, nucleic acids, and high polymers; the use of physical methods for the characterization of such substances. Prerequisite: Chemistry 340 or 344. 3 hours or $\frac{3}{4}$ unit. Credit may not be received for both Chemistry 346 and Physics 350.
- 348. Advanced Physical Chemistry.** The sequence, Chemistry 348 and 349, is designed to give seniors and graduate students a unified treatment of physical chemistry on an advanced level; topics include the electronic structure and spectra of atoms, principles of wave mechanics, experimental and theoretical aspects of the chemical bond in diatomic and polyatomic molecules, statistical thermodynamics, and chemical kinetics. Prerequisite: Chemistry 344 or equivalent. 4 hours or 1 unit.
- 349. Advanced Physical Chemistry.** Continuation of Chemistry 348. Prerequisite: Chemistry 348. 4 hours or 1 unit.
- 383. Dynamics, Structure, and Physical Methods.** Laboratory presenting the relationship of dynamics and structure with emphasis on the use of physical methods to follow the course of reactions. Prerequisite: Chemistry 181 or 134; credit or concurrent registration in Chemistry 342, or credit in Chemistry 340. 2 hours or $\frac{1}{2}$ unit.

385. **Chemical Fundamentals.** Laboratory with experiments on the fundamental physical nature of chemical phenomena. Prerequisite: Chemistry 342 and 383; credit or concurrent registration in Chemistry 344. 4 hours or 1 unit.
390. **History of Chemistry.** Selected topics in the intellectual and social history of chemistry from antiquity to the present, viewed within the context of broader scientific and cultural developments. Prerequisite: Technical background commensurate with that of juniors in chemistry or allied sciences; or, with consent of instructor, junior standing in history and philosophy of science or other disciplines. 2 hours or $\frac{1}{2}$ unit.
391. **Special Topics in Chemical Science and Technology.** Open to advanced undergraduates and graduate students. Deals with subjects not ordinarily covered by regularly scheduled courses. Prerequisite: Credit or concurrent registration in any 300-level course in chemistry. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. May be repeated as topics vary.
392. **Solid State Structural Analysis.** Lectures and laboratory on various aspects of x-ray diffraction studies of solids; topics include the properties of crystals, symmetry, diffraction techniques, data collection methods, and the determination and refinement of crystal structures. Prerequisite: Chemistry 342 or consent of instructor. 4 hours or 1 unit.
397. **Radiochemistry.** Same as Nuclear Engineering 397. Properties of radioactive nuclei, nature of radioactivity, nuclear structure, nuclear reactions, interactions of radiations with matter, chemical aspects of radioactivity work, and applications of nucleonics to chemistry. Prerequisite: One semester of physical chemistry or one semester of atomic physics, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
404. **Advanced Inorganic Chemistry Laboratory.** Specialized laboratory techniques; more difficult inorganic syntheses. Prerequisite: Credit or concurrent registration in one of the lecture courses in inorganic chemistry in the 400 series. $\frac{1}{4}$ to $\frac{3}{4}$ unit.
405. **Inorganic Chemistry Seminar.** Required of all graduate students whose major is inorganic chemistry. $\frac{1}{4}$ unit.
406. **Physical Inorganic Chemistry.** Includes group theory and use of physical methods to provide information about the geometry, electronic structures, and reactivity of inorganic compounds in solution; emphasizes NMR and ESR. Prerequisite: Chemistry 344. 1 unit.
407. **Special Topics in Inorganic Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as organometallic chemistry, advanced ligand field theory and molecular orbital theory of inorganic compounds, kinetics and mechanisms of inorganic reactions, etc. Prerequisite: Chemistry 406 or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for credit.
421. **Spectrochemical Methods of Analysis.** Principles and applications of spectroscopic measurements and instrumentation; atomic emission, absorption, and fluorescence; ultraviolet, visible, and infrared absorption spectroscopy; molecular fluorescence and phosphorescence; Raman spectroscopy; and other spectrometric methods. Prerequisite: General physics and chemistry equivalent to a major in physical sciences for a bachelor's degree. $\frac{1}{2}$ or 1 unit. (Lecture, $\frac{1}{2}$ unit; lecture and laboratory, 1 unit.)
422. **Electrochemistry and Electroanalysis.** Fundamentals of electrochemical systems with an emphasis on structure and dynamics at electrode/electrolyte interfaces and applications of electrochemistry in chemical analysis. Prerequisite: Chemistry 342 and Chemistry 344. Chemistry 340 may be substituted for the Chemistry 342, Chemistry 344 sequence. $\frac{3}{4}$ or 1 unit. $\frac{3}{4}$ unit for lecture only; 1 unit for lecture and laboratory.
424. **Special Topics in Analytical Chemistry.** Recent advances in measurement science and the application of analytical chemistry to other sciences; designed to acquaint students with techniques and applications not covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May be repeated.
425. **Analytical Chemistry Seminar.** Required of all graduate students whose major is analytical chemistry. $\frac{1}{4}$ unit.
430. **Advanced Organic Chemistry: Structure and Spectroscopy.** Advanced survey of organic chemistry with emphasis on structure and spectroscopy. Prerequisite: Chemistry 336. 1 unit.
431. **Advanced Organic Chemistry: Reaction Mechanisms.** Advanced survey of organic chemistry with emphasis on reaction mechanisms and concepts of physical organic chemistry. Prerequisite: Chemistry 336 and one year of physical chemistry. 1 unit.

432. **Advanced Organic Chemistry: Synthesis.** Advanced survey of organic chemistry with emphasis on synthesis. Prerequisite: Chemistry 336. 1 unit.
433. **Organic Chemistry.** Special topics in organic chemistry. An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as natural product synthesis and biosynthesis, organic photochemistry, chemistry of special families of organic compounds, etc. Prerequisite: Chemistry 431 and 432, one of which may be taken concurrently. $\frac{1}{2}$ or $\frac{3}{4}$ unit. Two lectures per week are required for $\frac{3}{4}$ unit credit. May be repeated for credit.
435. **Organic Chemistry Seminar.** Current literature in organic chemistry. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
436. **Experimental Organic Chemistry.** A lecture course on research techniques in organic chemistry. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biochemistry and Biophysics 440. Topics of importance in research in biophysical chemistry are discussed with emphasis on physical background and current applications; topics may be chosen from among the following: NMR and ESR spectra of biological macromolecules; x-ray diffraction studies of macromolecules; kinetics and statistical mechanics of helix coil transitions; physical approaches to the refolding and assembly of multi-subunit proteins; fluorescence spectroscopic studies on macromolecules; and light scattering from macromolecules in solution. Prerequisite: Chemistry 344 or equivalent, or Chemistry 346. 1 unit.
441. **Thermodynamics and Statistical Thermodynamics.** Fundamentals of classical thermodynamics with emphasis on equilibrium and stability criteria; an introduction to equilibrium statistical mechanics with discussion of several ensembles and applications to ideal systems of interest to chemists; and introduction to nonequilibrium thermodynamics. Prerequisite: Chemistry 342 and 344, or equivalent. 1 unit.
442. **Statistical Mechanics.** Fundamentals of equilibrium statistical mechanics with selected applications to interacting classical fluids: dense gases, solutions, liquids, plasmas, and ionic solutions; introduction to nonequilibrium statistical mechanics and linear response theory. Prerequisite: Chemistry 348 and 441, or equivalent, or consent of instructor. 1 unit.
443. **Quantum Dynamics.** The quantum mechanical description of time-dependent processes, including discussions of the time-dependent Schrodinger equation, approximations, interaction of matter with radiation, wave packets, elastic and inelastic scattering, and relaxation phenomena. Prerequisite: Concurrent registration in Chemistry 348 or consent of instructor. 1 unit.
445. **Physical Chemistry Seminar.** Required of all graduate students whose major is physical chemistry. Prerequisite: Consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
446. **Molecular Electronic Structure.** The theoretical basis of the electronic structure of atoms and molecules; molecular orbital concepts and self-consistent field theory; angular momentum and the full rotation group; electron correlation effects; and applications to electronic spectroscopy of organic molecules, detailed descriptions of chemical reactions, and molecular properties. Prerequisite: Chemistry 348. 1 unit.
448. **Chemical Kinetics.** Theoretical and experimental topics in chemical kinetics and chemical dynamics; topics include relation between rates and mechanisms of chemical reactions, collision theory of reaction rates, activated complex theory, theory of unimolecular processes, classical dynamics of reactive scattering, elastic scattering, quantum theory of inelastic scattering or equivalent curve crossing processes, and experimental methods. Prerequisite: Chemistry 344. 1 unit.
449. **Special Topics in Physical Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as molecular spectroscopy, statistical mechanics, radiation and hot-atom chemistry, molecular quantum mechanics, radio-frequency spectroscopy, advanced experimental methods, kinetics of irreversible processes and cooperative phenomena, etc. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated.
490. **Special Topics in Chemistry.** Designed for students majoring or minoring in chemistry who wish to undertake individual studies of a non-research nature under the direction of a faculty member of the department. Prerequisite: Consent of instructor and written approval of department head. Staff for the course is the same as for Chemistry 499. $\frac{1}{4}$ to 1 unit.
494. **Chemical Basis of Biological Specificity.** Same as Biochemistry 494. See Biochemistry 494.

496. **Carbon and Hydrogen Tracer Methodology.** Comprehensive study of the tracer methodology concerned with the use of carbon-13, carbon-14, hydrogen-2, and hydrogen-3 in chemical research. Prerequisite: Chemistry 337 or consent of instructor. $\frac{3}{4}$ unit.
499. **Thesis Research.** A candidate for the master's degree who elects research is required to present a thesis. A thesis is always required of students working toward the degree of Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in a department other than chemistry or chemical engineering must receive permission from the head of the Department of Chemistry to register in this course. 0 to 4 units.

CINEMATOGRAPHY

(See Art and Design)

CIVIL ENGINEERING

Head of Department: W. J. Hall

Department Office: 1114 Civil Engineering Building, 205 North Mathews, Urbana

195. **Introduction to Civil Engineering.** A civil engineering orientation course including historical developments, educational requirements, relation to science, professional practice, and specialties within the profession. Prerequisite: Sophomore standing in civil engineering. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Engineering Surveying.** Introduction to surveying and photogrammetry. Prerequisite: Civil Engineering 293; credit or concurrent registration in Computer Science 101. 4 hours.
205. **Route Surveying and Design.** Principles for the design and layout of routes; coverage includes horizontal and vertical alignment, route location, earthwork, computation, ground and photogrammetric survey methods, and special survey methods for highways, railroads, pipelines, tunnels and urban construction. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours.
210. **Behavior of Materials.** Same as Theoretical and Applied Mechanics 224. See Theoretical and Applied Mechanics 224.
216. **Construction Engineering.** Introduction to the construction processes: contracting and bonding, planning and scheduling, estimating and project control, productivity models, and construction econometrics. Prerequisite: Civil Engineering 292; credit or concurrent registration in Computer Science 101 and Civil Engineering 293. 3 hours.
220. **Materials for Transportation Facilities.** Materials for the construction of transportation roadways including soils, aggregates, soil-aggregates, bituminous materials, asphaltic mixtures, and stabilized soils; emphasizes properties, behavior, mixture analysis, and quality control. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours.
241. **Air and Water Quality.** Sources and types of air and water pollution; measurement of air and water quality; effects of pollutants on the environment; transport and ultimate fate of pollutants; environmental quality standards; and methods of pollution control and abatement. Prerequisite: Chemistry 102. 3 hours.
255. **Introduction to Hydrosystems Engineering.** Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water; presents a quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: Civil Engineering 293 or a course in probability or statistics; credit or concurrent registration in Theoretical and Applied Mechanics 235 and Civil Engineering 292, or equivalent. 3 hours.
261. **Introduction to Structural Engineering.** Basic topics in the analysis, behavior and design of trusses and framed structures under static loads; analysis topics include member forces in trusses, shear and moment diagrams, deflections, simple applications of the force method

- and slope-deflection; and an introduction to computer applications by means of a general purpose structural analysis program. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
- 262. Intermediate Structural Analysis.** Energy principles as applied to structural analysis; a comprehensive study of the flexibility and stiffness methods of analysis of structures; influence functions; curves of maxima; and use and interpretation of computer structural analysis programs. Prerequisite: Civil Engineering 261. 3 hours.
- 263. Behavior and Design of Metal Structures, I.** Introduction to the design of metal structures; behavior of members and their connections; and theoretical, experimental, and practical bases for proportioning members and their connections. Prerequisite: Civil Engineering 261. 3 hours.
- 264. Reinforced Concrete Design, I.** Study of the strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces; extensive discussion of the influence of the material properties on behavior. Prerequisite: Civil Engineering 261. 3 hours.
- 280. Introduction to Soil Mechanics and Foundation Engineering.** Classification of soils, compaction in the laboratory and in the field, soil exploration, boring and sampling, one-dimensional settlement analyses, strength, bearing capacity of foundations, and stability of retaining walls and slopes. Prerequisites: Theoretical and Applied Mechanics 221. 3 hours.
- 284. Geotechnical Engineering.** Applied problems in geotechnical engineering; introductions analysis and design of foundations, excavation walls, slopes, and underground structures in soil and rock; includes bearing capacity and settlement of foundations, stability of excavations and slopes, and ground movements due to construction. Prerequisite: Civil Engineering 280. 3 hours.
- 290. Legal Aspects of Engineering Contracts and Specifications.** Same as General Engineering 290. See General Engineering 290.
- 292. Planning, Design, and Management of Civil Engineering Systems.** Introduction to the formulation and solution of civil engineering problems. Major topics are: engineering economy, mathematical modeling, and optimization. Techniques, including classical optimization, linear and nonlinear programming, network theory, critical path methods, simulation, decision theory, and dynamic programming are applied with the aid of personal computers to a variety of civil engineering problems. Prerequisite: Mathematics 132, and credit or concurrent registration in Mathematics 225. 3 hours.
- 293. Engineering Modeling Under Uncertainty.** Identification and modeling of non-deterministic problems in civil engineering, and the treatment thereof relative to engineering design and decision making. Development of stochastic concepts and simulation models, and their relevance to real design and decision problems in various areas of civil engineering. Prerequisite: Mathematics 132; credit or concurrent registration in Mathematics 242 recommended. 3 hours.
- 295. Professional Practice.** A series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. Lectures are given approximately once a week. Prerequisite: Junior standing. 0 hours.
- 314. Properties and Behavior of Concrete.** Examines the influence of constituent materials (cements, aggregates and admixtures) on the properties of fresh and hardened concrete; mix design handling and placement of concrete; and behavior of concrete under various types of loading and environment; test methods. Laboratory practice is an integral part of the course. Prerequisite: Civil Engineering 210. 3 hours or $\frac{3}{4}$ unit.
- 315. Construction Productivity.** Introduction of the application of scientific principles to the measurement and forecasting of productivity in construction engineering. Conceptual and mathematical formulation of the labor, equipment, and material factors affecting productivity. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 316. Construction Planning and Control.** Project definition; scheduling and control models; material, labor and equipment allocation; optimal schedules; project organization; documentation and reporting systems; and management and control. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 318. Construction Cost Analyses and Estimates.** Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups

- and profits; and the fundamentals of cost recording for construction cost accounts and cost controls. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
320. **Pavement Analysis and Design, I.** Analysis, behavior, performance, and structural design of pavements for highways and airfields; topics include climate factors, rehabilitation, life cycle design economics, and traffic loadings. Prerequisite: Civil Engineering 220 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
321. **Bituminous Materials and Mix Design.** Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; and recycling of mixtures. Prerequisite: Civil Engineering 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
322. **Development of Highway Facilities.** Analysis of factors in developing a highway transportation facility; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming improvements; drainage design; structural design of surface; concepts of highway management and finance; and highway maintenance planning. Prerequisite: Civil Engineering 220 or consent of instructor. 4 hours or 1 unit.
325. **Highway Traffic Analysis and Design.** Study of fundamentals of traffic engineering; analysis of traffic stream characteristics; capacity of urban and rural highways; design and analysis of traffic signals and intersections; traffic control; traffic impact studies; and traffic accidents. Prerequisite: Civil Engineering 322 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
330. **Urban Transportation Planning.** Same as Urban Planning 330. See Urban Planning 330.
331. **Regional Transportation Planning.** Same as Urban Planning 331. Examination of the transportation systems for regions larger than urban areas through theoretical models linking the economic and political realities of present freight and passenger services at state, interstate, and national levels; considers competition among agencies and travel modes in light of federal regulations and technological developments. Prerequisite: Civil Engineering 230 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
334. **Airport Design.** Basic principles of site selection for airports and fundamental considerations of design, construction, and maintenance of airport pavements and structures. Prerequisite: Civil Engineering 220 and senior standing in civil engineering, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
337. **Managing Wastewaters in Aquatic Ecosystems.** Examines the characteristics of rivers and lakes which affect the management of domestic and industrial wastewaters; includes assessment of chemical hazards, and introduction to surveillance and biomonitoring, and a review of regulations governing effluents. Prerequisite: Civil Engineering 241 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
338. **Biomonitoring: Design, Analysis, and Interpretation.** Discusses the theory and application of biomonitoring as a component of environmental management; reviews a range of techniques to analyze effluents and assess condition and trend in the environment, using biological and ecological systems; and emphasizes biomonitoring program design, selection and analysis of data, and interpretation of biomonitoring results. Prerequisite: Civil Engineering 337 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
339. **Environmental Systems Analysis, I.** Examination of principles of environmental engineering design: applications to mathematical methods, including single and multi-objective programming, to environmental systems; economic analysis, including benefit-cost; and management strategies. Prerequisite: Civil Engineering 292; and Civil Engineering 342 or 349. 3 hours or $\frac{3}{4}$ unit.
340. **Physical Principles of Environmental Engineering Processes.** Analysis of the physical principles which form the basis of many water and air quality-control operations; sedimentation, filtration, inertial separations, flocculation, mixing and principles of reactor design. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
341. **Regional Environment Management Simulation.** Same as Agricultural Economics 319, Environmental Studies 341, Geography 341, and Urban and Regional Planning 375. Simulation of environmental, political, and economic problems facing a midwestern community. Students assume the responsibilities of planners, environmental quality managers, lawyers, business managers, land developers, and other roles and interact to resolve these problems. Course

- introduces practical procedures and decisions that public servants, lawyers, engineers, business persons, and citizens in general confront with regard to the environment. Prerequisite: Senior or graduate standing, or consent of instructor and credit in an introductory course in pollution control. 2 hours or $\frac{1}{2}$ unit.
342. **Water Quality Control Processes.** Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
343. **Chemical Principles of Environmental Engineering Processes.** Application of principles of chemical equilibrium, surface chemistry, chemical kinetics, and photochemistry to air and water quality considerations; carbonate and phosphate systems in natural waters; dissolved gases; hardness; hydrolysis of coagulants; corrosion; chemistry of disinfectants; removal of impurities by adsorption; and reactions of various pollutants in the atmosphere. Prerequisite: Civil Engineering 342 or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
344. **Solid Waste Management.** Analysis of the sources, quantities, and characteristics of solid waste; effect of refuse on the environment; establishment and operation of collection and transportation systems; material recovery systems; energy recovery systems; ultimate disposal systems. A term project is required of all graduate students. Prerequisite: Civil Engineering 241 or consent of instructor. 3 hours or 1 unit.
345. **Atmospheric Dispersion Modeling.** Application of the fundamentals of meteorology to air pollution problems including the transport and diffusion of particulate matter, aerosols and gases; precipitation processes and rain-out; behavior of stack effluents; effects of pollutants in the atmosphere. Prerequisite: Theoretical and Applied Mechanics 235 and Mechanical Engineering 205, or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
346. **Biological Principles of Environmental Engineering Processes.** Application of principles of biochemistry and microbiology to air and water quality, wastes, and their engineering management; biological mediated changes in water and in domestic and industrial wastewater. Prerequisite: Civil Engineering 343 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
347. **Stream Ecology.** Same as Ecology, Ethology, and Evolution 359. A description of physical, chemical, and biological characteristics in streams and rivers including an integrated study of the environmental factors affecting the composition and distribution of biota; emphasizes the application of ecological principles in aquatic ecosystem protection and management. Prerequisite: Civil Engineering 337 or Ecology, Ethology, and Evolution 212, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
348. **Atmospheric Chemistry.** Same as Environmental Studies 348. Examines of the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; atmospheric chemistry of carbon, nitrogen, and sulfur; atmospheric aerosol and heterogeneous reactions; material transport; stratospheric ozone and its depletion; airborne radioactivity and atmospheric ion chemistry. Prerequisite: Mechanical Engineering 207, Chemistry 340, or Atmospheric Sciences 301, or equivalent; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
349. **Air Resources Engineering.** Introduction to air pollution; includes the basis for air quality criteria, classification of sources, and the design of systems to control air pollution from stationary sources. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
350. **Surface Water Hydrology.** A study of descriptive and quantitative hydrology dealing with the distribution, circulation, and storage of water on the earth's surface; discusses principles of hydrologic processes and presents methods of analysis and their applications to engineering and environmental problems. Prerequisite: Civil Engineering 255 or equivalent with consent of instructor. 3 hours, or $\frac{3}{4}$ unit.
351. **Hydromechanics.** Incompressible fluid mechanics with particular emphasis on topics in analysis and applications in civil engineering areas; primary topics include principles of continuity, momentum and energy, kinematics of flow and stream functions, potential flow, laminar motion, turbulence, and boundary-layer theory. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

353. **Analysis and Design of Hydraulic Systems.** Hydraulic analysis and design of engineering systems: closed conduits and pipe networks; hydraulic structures, including spillways, stilling basins, and embankment seepage; selection and installation of hydraulic machinery. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor 3 hours or $\frac{3}{4}$ unit.
356. **Hydraulics of Surface Drainage.** Hydraulic analysis and design of urban, highway, airport, and small rural watershed drainage problems; discussion of overload and drainage channel flows; hydraulics of storm-drain systems and culverts; determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
357. **Groundwater.** Physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass transport, well hydraulics and pumping test analysis, role of groundwater in the hydrologic cycle, groundwater quality and contamination. Prerequisite: Civil Engineering 255 and Theoretical and Applied Mechanics 235, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
361. **Matrix Analysis of Framed Structures.** A unified formulation of displacement and force methods of analysis including the topological view of the structure as an assemblage of members; matrix techniques of formulation; considerations for automatic computation; and evaluation of truss, grid, and frame models for the response of real structures. Prerequisite: Civil Engineering 262. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
363. **Behavior and Design of Metal Structures, II.** Metal members under combined loads; connections, welded and bolted; moment-resistant connections; plate girders, conventional behavior, and tension field action. Prerequisite: Civil Engineering 263. 3 hours, or $\frac{3}{4}$ or 1 unit.
364. **Reinforced Concrete Design, II.** Study of the strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Design of Structural Systems.** The whole structural design process including definition of functional requirements, selection of structural scheme, formulation of design criteria, preliminary and computer-aided proportioning, and analysis of response, cost, and value. Prerequisite: Civil Engineering 262, and credit in either Civil Engineering 263 or 264 with concurrent registration in the other. 3 hours or 1 unit.
368. **Prestressed Concrete.** Study of strength, behavior, and design of prestressed reinforced concrete members and structures, with primary emphasis on pretensioned, precast construction; emphasis on the necessary coordination between design and construction techniques in prestressing. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $\frac{3}{4}$ or 1 unit.
369. **Behavior and Design of Wood Structures.** Mechanical properties of wood, stress grades and working stresses; effects of strength-reducing characteristics, moisture content, and duration of loading and causes of wood deterioration; glued-laminated timber and plywood; behavior and design of connections, beams, and beam-columns; design of buildings and bridges; other structural applications: trusses, rigid frames, arches, and pole-type buildings; and prismatic plates and hyperbolic paraboloids. Prerequisite: Civil Engineering 261 and one of: Civil Engineering 262, 263, or 264. 3 hours, or $\frac{3}{4}$ or 1 unit.
370. **Structural Reliability and Probabilistic Bases of Design.** Modern probabilistic bases for the design and evaluation of structures and systems, including analysis of structural safety and reliability, and development of probability-based design criteria; quantitative risk evaluation, systematic assessment and analysis of uncertainties, safety and load factor determinations, and risk analysis and design for wind storms and earthquakes. Prerequisite: Civil Engineering 261 and 293, or equivalent, or graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.
371. **Fire Protection for Structures.** An introduction to the design and analysis of fire protection for structures of buildings; includes study of the effects of fire on structural materials and elements and of basic defenses against spread of fires; assessment of fire damage and methods

of repair. Prerequisite: Civil Engineering 262, 263, and 264, or equivalent, or consent of instructor. 4 hours or 1 unit.

- 374. Introduction to Structural Dynamics.** Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; and introduction to systems with distributed mass and flexibility. Prerequisite: Theoretical and Applied Mechanics 212; Mathematics 285; Civil Engineering 261, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. Credit is not given for both Civil Engineering 374 and Theoretical and Applied Mechanics 311.
- 375. Welding and Joining Processes.** Same as Metallurgical Engineering 301. See Metallurgical Engineering 301.
- 378. Introduction to the Design of Ocean Structures.** Introduction to design and construction of civil engineering structures in the ocean and to associated engineering operations; principal topics include water wave mechanics, engineering oceanography, wave and current forces, and design considerations for fixed and floating structures. Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 261; Civil Engineering 293. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 379. Applied Structural Mechanics.** Study of beams under lateral load; beams with combined lateral load and thrust; beams on elastic foundations; applications of Fourier series and virtual work principles to beam-type structures; stress and strain in three dimensions; applications to flexure of beams and plates; elements of the engineering theory of plates; and torsion of thin-walled open sections. Prerequisite: Mathematics 285 and Civil Engineering 262. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Soil Mechanics and Soil Properties.** Index properties and engineering classification; water flow and hydraulic properties; stress in soil; stress-strain properties of soils; consolidation; shear strength; properties of natural soil deposits; unsaturated soils; and experimental measurements. Prerequisite: Civil Engineering 280 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 384. Applied Soil Mechanics.** Application of soil mechanics to foundations of buildings; stability of earth slopes; earth pressures and retaining walls; braced cuts; and damage due to construction operations. Prerequisite: Civil Engineering 383 or equivalent. 4 hours or 1 unit.
- 391. Computer Methods in Civil Engineering.** Review of programming concepts; formulation and programming of numerical, data processing, and logical problems with applications from various branches of civil engineering; organization of programs and data; and development and use of problem-oriented programming languages in civil engineering. Prerequisite: Computer Science 101 or equivalent; senior or graduate standing in civil engineering; or consent of instructor. 3 hours or 1 unit.
- 393. Engineering Decision and Risk Analysis.** Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multi-objective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk-based design criteria, risk benefit trade-offs, and optimal decisions. Prerequisite: Civil Engineering 293 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 397. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. Prerequisite: Senior or graduate standing. 1 to 4 hours, or 0 to 4 units.
- 398. Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering offered by the faculty to augment the formal courses available. Prerequisite: Individually identified for each offering under this course number; see *Timetable*. 1 to 4 hours, or $\frac{3}{4}$ to 1 unit.
- 414. Advanced Concrete Technology.** Discusses the physical and engineering properties of concrete at an advanced level, with emphasis on the materials aspects of repair and rehabilitation of concrete structures. Prerequisite: Civil Engineering 314. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Industrial Engineering 416. See Industrial Engineering 416.
- 417. Systems Analysis, II: Digital Simulation.** Same as Industrial Engineering 417. See Industrial Engineering 417.

420. **Pavement Analysis and Design, II.** Development of models for and analysis of pavement systems; use of transfer functions relating pavement response to pavement performance; evaluation and application of current pavement design practices and procedures; analysis of the effects of maintenance activities on pavement performance; and economic evaluation of highway and airport pavements. Prerequisite: Civil Engineering 320. 1 unit.
421. **Pavement Evaluation, Maintenance, and Rehabilitation.** Concepts and procedures for condition survey rating; evaluation by nondestructive testing (roughness, skid resistance, structural capacity); and destructive testing, maintenance strategies, and rehabilitation of pavement systems for highways and airfields. Prerequisite: Civil Engineering 320. 1 unit.
423. **Highway Materials Stabilization.** Stabilization of aggregates and soils with cement, lime, bituminous materials, and other stabilizing agents; emphasis on basic stabilization reactions, properties of stabilized materials, and composition design. Prerequisite: Civil Engineering 220 or consent of instructor. 1 unit.
424. **Transportation Soils Engineering.** Occurrence and properties of surficial soils, soil classification systems, soil variability; subgrade evaluation procedures, repeated loading behavior of soils; soil compaction and field control; soil moisture, soil temperature, and frost action; soil trafficability and subgrade stability for transportation facility engineering. Prerequisite: Civil Engineering 383 or equivalent. 1 unit.
439. **Environmental Systems Analysis, II.** Examination of advanced topics in environmental systems analysis with emphasis on the mathematical modeling of water quality systems and multi-objective programming methods of analysis. Large scale optimization models and interrelationships between water quality and water quantity analyses, e.g., reservoir operation. Prerequisite: Civil Engineering 339. 1 unit.
440. **Processes for Water Quality Control, I.** Theory and basic design of processes used in water and wastewater treatment, including adsorption, ion exchange, chemical oxidation and reduction, disinfection, sedimentation, filtration, coagulation, flocculation, and chemical precipitation. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
441. **Modeling of Water Quality in Natural Systems.** Studies mathematical modeling of the movement and fate of pollutants and other substances in streams, lakes, and other natural water bodies; the emphasis is on the development of practical models of aquatic systems. Prerequisite: Civil Engineering 340 or 351. 1 unit.
442. **Processes for Water Quality Control, II.** Theory and its application for design and operation of processes used in water and wastewater treatment; emphasis is on biological treatment processes and related processes for gas transfer, sludge dewatering, sludge disposal, and solids separations. Prerequisites: Civil Engineering 340 and 343, and credit or concurrent registration in Civil Engineering 346, or consent of instructor. 1 unit.
443. **Unit Operations in Environmental Engineering.** Experimental and pilot plant studies of unit operations and unit processes in environmental engineering, emphasizing water treatment and wastewater treatment; evaluation of parameters for the design of biological waste treatment units; determination of chemical requirements for water treatment processes; and studies of anaerobic digestion. Prerequisite: Civil Engineering 440 or credit or concurrent registration in Civil Engineering 442, or consent of instructor. 1 unit.
448. **Control of Air Pollution from Stationary Sources.** Same as Mechanical Engineering 411. Study of the basic theory of pollution control devices and their application to air pollution control problems. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
449. **Techniques and Instrumentation in Air Sampling.** Same as Environmental Studies 449. Studies principles of sampling for particles and gases in the field of air pollution; examines instrumental techniques relevant to the design of sampling systems used in process control, ambient air monitoring and laboratory experiments; methods of sample analysis and their limitations. Prerequisite: Mathematics 285 and Civil Engineering 349; or consent of instructor. 1 unit.
450. **Advanced Hydrologic Modeling.** Application of deterministic and probabilistic concepts to simulate and analyze hydrologic systems; discussion of the theory and application of linear and nonlinear, lumped, and distributed systems techniques in modeling the various phases of the hydrologic cycle. Prerequisite: Civil Engineering 350 or consent of instructor. 1 unit.

451. **Open-Channel Hydraulics.** Advanced hydraulics of free surface flow in rivers and open channels; discussion of theory, analytical and numerical solution techniques, and their applications to gradually and rapidly varied nonuniform flows, unsteady flow, and flow in open-channel networks. Prerequisite: Civil Engineering 351 or equivalent. 1 unit.
455. **Transport Processes in Water.** Physical processes involved in transport of pollutants by water; turbulent diffusion and longitudinal dispersion in rivers, pipes, lakes, and the ocean; diffusion in turbulent jets, buoyant jets, and plumes. Prerequisite: Mathematics 280 and 285, and Theoretical and Applied Mechanics 235, or consent of instructor. 1 unit.
457. **Modeling of Groundwater Flow and Solute Transport.** Examines theory and application of numerical methods, finite differences and finite element, for solving the equations of groundwater flow and solute transport; transport of chemically reacting solutes; model calibration and verification. Prerequisite: Civil Engineering 357 or consent of instructor; Mathematics 285 or equivalent. 1 unit.
459. **Sediment Transport.** Physical processes of transportation and deposition of sediment particles in liquid bodies with particular emphasis on fluvial sediment problems; sediment in desilting basins; reservoirs and delta formation; erosion; stable channel design; and river morphology. Prerequisite: Civil Engineering 451 or consent of instructor. 1 unit.
462. **Design of Tall Building Structures.** Examination of the methods of analysis and design criteria for tall buildings: dead, live, wind, and earthquake loads; reinforced concrete and steel moment-resisting frames, shear walls, braced frames; plastic design of multistory steel braced frames; P-Delta effects and instability; unreinforced and reinforced masonry buildings; very tall buildings including framed tube, tube in tube, trussed tube and hat trusses. Prerequisite: Graduate standing in structural engineering with courses equivalent to Civil Engineering 363 and 466, or consent of instructor. 1 unit.
463. **Optimization of Structures.** Structural design processes; formulation of problems in the optimization of structures; optimization of structural elements; minimum volume principles; and use of mathematical programming in optimization of structural systems. Prerequisite: Bachelor of Science degree in engineering with courses in structural analysis and design, or consent of instructor. 1 unit.
465. **Behavior of Structural Metal Frameworks.** Theories of ultimate behavior of metal structural members with emphasis on buckling and stability of members and frames; theory of torsion applied to beam torsion, lateral-torsional buckling, curved beams with emphasis on design criteria; post-buckling strength of plates and post-buckling versus column behavior. Prerequisite: Civil Engineering 363. 1 unit.
466. **Behavior of Reinforced Concrete Members.** In-depth study of the behavior of reinforced concrete members, including the relationships between behavior and building code requirements. Prerequisite: Civil Engineering 262 and 264. 1 unit.
467. **Behavior of Reinforced Concrete Structures.** Study of the strength and behavior of assemblages of reinforced concrete members, including a study of the applicability of traditional elastic design procedures to structures which exhibit inelastic behavior under the influence of both short and long term loadings. Prerequisite: Civil Engineering 466. 1 unit.
469. **Thin Shell Structures.** Fundamental membrane and bending theories of shells; application of theories to analysis and design of folded plates and cylindrical, rotational, and translational shells; membrane stresses and deflections; and approximate bending solutions by variational, finite-difference, and finite-element methods. Prerequisite: Civil Engineering 473 or consent of instructor. 1 unit.
473. **Theory of Plates.** Classical plate bending theory; emphasis on methods of solution including series expansions, variational procedures, and finite element techniques applicable to plate-type structures commonly encountered in practice; consideration of inplane loads, large deflections, buckling, and anisotropy. Prerequisite: Civil Engineering 262 and Mathematics 285. 1 unit.
474. **Dynamics of Framed Structures.** Advanced treatment of the dynamics of multi-degree-of-freedom framed structural systems; fundamental concepts of eigenvalue theory of real matrices and energy principles of dynamics as bases for a unified approach to dynamical problems of structural assemblages; structural idealizations, principles of dynamics, Lagrange's equations, response calculations, normal mode method and its limitations; transfer matrix approach, and computer utilization. Prerequisite: Civil Engineering 361 and 374, or equivalent. 1 unit.

475. **Steel Structures: Fatigue and Fracture.** Examines fatigue and fracture behavior of steel structures and connections; discusses relevant fatigue and fracture mechanics theory and experimental data and applies them to an assessment of behavior and current design specification practice. Prerequisite: Civil Engineering 363. 1 unit.
478. **Finite Element Methods in Solid and Structural Mechanics.** Theory and application of the finite element method; stiffness matrices for triangular, quadrilateral, and isoparametric elements; two- and three-dimensional elements; algorithms necessary for the assembly and solution; direct stress and plate bending problems for static, nonlinear buckling and dynamic load conditions; displacement, hybrid, and mixed models together with their origin in variational methods. Prerequisite: Theoretical and Applied Mechanics 451, or Civil Engineering 379, or consent of instructor. 1 unit.
479. **Earthquake Engineering.** Study of the effects of earthquakes on constructed works and of the design of structures to resist earthquake motions; earthquake ground motions and mechanisms; response of structures to earthquake motion; behavior of materials, elements, assemblages and structures subjected to earthquake motion; principles of earthquake resistant design; and special topics. Prerequisite: Civil Engineering 374. 1 unit.
480. **Earth Pressures and Retaining Structures.** Classical and modern earth pressure theories and their experimental justification; pressures and bases for design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
481. **Earth Dams and Related Problems.** Fundamentals of problems of slope stability; seepage in composite sections and anisotropic materials; methods of stability analysis; mechanism of failure of natural and artificial slopes; compaction; and field observations. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
482. **Advanced Analysis of Consolidation of Clays.** Elastic solutions relevant to soil mechanics; permeability; general application of Terzaghi's theory of one-dimensional consolidation; advances in consolidation theories; mechanism of volume change; delayed and secondary compressibility and creep; theory of three-dimensional consolidation and solutions; radial flow and design of sand drains; and analysis and control of settlement. Prerequisite: Civil Engineering 383. 1 unit.
483. **Advanced Analysis of Shear Strength of Soils.** Physico-chemical properties of soils; fabric and structure of soil; mechanism of shearing resistance; residual shear strength of overconsolidated clays and clay shales; long-term shear strength of overconsolidated clays; Hvorslev shear strength parameters; and undrained shear strength of clays. Prerequisite: Civil Engineering 383. 1 unit.
484. **Foundation Engineering.** Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments, and waterfront structures. Prerequisite: Civil Engineering 384. 1 unit.
485. **Behavior and Design of Deep Foundations.** Ultimate capacities and load-deflection of piles and drilled shafts subjected to compressive loads, tensile loads, and lateral loads; effects of duration of load, soil-structure interaction; two and three dimensional analysis of pile groups with closely spaced piles; effects of installation; inspection of deep foundations and full-scale field tests. Prerequisite: Civil Engineering 383, 384, or consent of instructor. 1 unit.
486. **Rock Mechanics, I.** Physical properties and classification of intact rock, theories of rock failure, state of stress in the earth's crust, stresses and deformations around underground openings assuming elastic, plastic, and time-dependent behavior; effect of geologic discontinuities on rock strength; and introduction to stability analyses in rock. Prerequisite: Civil Engineering 383; Geology 450 or equivalent; Theoretical and Applied Mechanics 321 or equivalent; or consent of instructor. 1 unit.
487. **Rock Mechanics, II.** Application of rock mechanics to engineering problems; shear strength of rock masses; dynamic and static stability of rock slopes; deformability of rock masses; design of pressure tunnel linings and dam foundations; controlled blasting and blasting vibrations; tunnel support; machine tunneling; design and construction of large underground openings; and field instrumentation. Prerequisite: Civil Engineering 486 or consent of instructor. 1 unit.

495. **Civil and Environmental Engineering Seminar.** Discussion of current topics in civil and environmental engineering and related fields by staff, students, and visiting lecturers. 0 to ¼ unit. May be repeated.
497. **Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the adviser and the staff member who will supervise the investigation. Prerequisite: Consent of instructor. 0 to 4 units.
498. **Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering at an advanced graduate level. Prerequisite: Individually identified for each offering under this course number; see *Timetable*. ¼ to 1 unit.
499. **Thesis Research.** 0 to 4 units.

CLASSICAL CIVILIZATION

(See Classics)

CLASSICS

(Including Classical Civilization, Coptic, Greek, and Latin)

Chair of Department: John J. Bateman

Department Office: 4072 Foreign Languages Building, 707 South Mathews, Urbana

Classical Civilization

The following courses presuppose no knowledge of the Greek and Latin languages and are open to all students. For other courses in the area of classical civilization, see Architecture 210; History of Art 215, 216, and 323; History 181, 182, 381, 382, 383, and 384; Philosophy 203 and 310; Political Science 393; and Religious Studies 201, 202, 210, and 340.

100. **Vocabulary Building from Greek and Latin Roots.** Vocabulary building assistance for students through an analysis of Greek and Latin roots, prefixes, and suffixes found in English. 2 hours.
101. **PLATO Laboratory in English Vocabulary Building.** Intensive drill and practice in English words derived from key Latin and Greek roots. Prerequisite: Concurrent registration in Classical Civilization 100. 1 hour.
110. **Introduction to Greek Culture.** Study of social and cultural life in Greece during the classical period. 2 hours. Credit is not given for both Classical Civilization 110 and 114.
111. **Mythology of Greece and Rome.** A study of the major myths of Greece and Rome and their impact upon later art, music, and literature. 2 hours. Credit is not given for both Classical Civilization 111 and 115.
112. **The Roman Achievement.** Introduction to Roman civilization through the study of the social and cultural life of ancient Rome. 2 hours. Credit is not given for both Classical Civilization 112 and 116.
114. **Introduction to Greek Culture.** Studies the social and cultural life in Greece during the classical period. Shares two hours of lecture with Classical Civilization 110; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 110 and 114.
115. **Mythology of Greece and Rome.** Studies the major myths of Greece and Rome and their impact upon later art, music, and literature. Shares two hours of lecture with Classical Civilization 111; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 111 and 115.

116. **The Roman Achievement.** Introduces Roman civilization through the study of the social and cultural life of ancient Rome. Shares two hours of lecture with Classical Civilization 112; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 112 and 116.
120. **Origins of Western Literature.** Same as Comparative Literature 120. The origins and development of selected major genres in Western literature, emphasizing the relationship between classical representatives and their modern successors. 3 hours.
131. **Introduction to Classical Archaeology: Greece.** Introduction to the archaeology of ancient Greece and the Aegean world. 3 hours.
132. **Introduction to Classical Archaeology: Rome and Italy.** Introduction to the archaeology of Italy and Rome to the fall of the Roman Empire. 3 hours.
150. **Sports in Greece and Rome.** Same as Kinesiology 141. Athletics and sports in ancient Greece and Rome from 776 B.C. to 393 A.D. 2 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
217. **Greek Art.** Same as History of Art 215. See History of Art 215.
218. **Roman Art.** Same as History of Art 216. See History of Art 216.
221. **The Heroic Tradition.** Same as Comparative Literature 263. Study of ancient epics and their relation to the social consciousness of their period; introductory and background lectures; and readings in the epic tradition of antiquity and its successors. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
222. **The Tragic Spirit.** Same as Comparative Literature 264. Readings in the tragic drama of Greece and Rome: a systematic study of the contents and development of this classical literary/dramatic genre. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
231. **The Development of the Ancient City.** Same as History of Art 217. Monuments and archaeological remains illustrating the development of the Greek and Roman city (polis). Prerequisite: Sophomore standing or consent of instructor. 3 hours.
232. **Ancient Greek Sanctuaries.** Same as History of Art 218 and Religious Studies 232. A survey of the archaeological remains of ancient Greek sanctuaries and their importance to ancient society and religion. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
292. **Senior Thesis.** Thesis and honors; for candidates for departmental distinction in classical civilization and for other seniors. Prerequisite: Senior standing and consent of chairperson of classics honors program. 2 to 4 hours. (Counts for advanced hours in LAS.)
298. **Senior Survey.** For candidates for departmental distinction in the classics field of concentration. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
315. **Greek, Roman, and Medieval Rhetorical Theory.** Same as Speech Communication 315. See Speech Communication 315.
332. **The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Comparative Literature 306. Study of the aesthetic standards and theories of the Graeco-Roman world and the ways in which these ideals are expressed in the literature, art, and architecture of antiquity. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
343. **The Archaeology of Greece.** Same as History of Art 315. Monuments, material remains, and sculpture and other arts illustrating the development of Greek civilization to 323 B.C. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
344. **The Archaeology of Italy.** Same as History of Art 316. Monuments, material remains, and sculpture and other arts illustrating the development of Graeco-Roman and other ancient Italian civilizations to 330 A.D. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
382. **Computer-Based Foreign Language Teaching.** Same as English as an International Language, French, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
390. **Topics in Classical Literature.** Same as Comparative Literature 307. Study of selected topics in Greek and Latin literature in translation; content is variable. Prerequisite: 200 level classical civilization course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.

391. **Topics in Classical Archaeology and Civilization: Seminar and Tutorial.** Study of selected topics; variable content. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.

Coptic

301. **Introductory Coptic, I.** Same as Linguistics 314 and Religious Studies 301. Introduction to the principles of Coptic grammar and to the reading of biblical and gnostic texts. A knowledge of classical or koine Greek, though useful, is not required. 3 hours or $\frac{3}{4}$ unit.
302. **Introductory Coptic, II.** Same as Linguistics 315 and Religious Studies 302. Continuation of Coptic/Religious Studies 301 and Linguistics 314; reading of gnostic and postbiblical texts. Prerequisite: Coptic 301 or Linguistics 314. 3 hours or $\frac{3}{4}$ unit.

Greek

101. **Elementary Greek, I.** Same as Religious Studies 111. Introduces ancient Greek (both classical and koine), including the reading of simple prose. 4 hours.
102. **Elementary Greek, II.** Same as Religious Studies 112. Continuation of Greek 101. Grammar and reading in classical and koine Greek. Prerequisite: Greek 101. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Classical and Koine Greek Prose.** Same as Religious Studies 200. Readings in classical Greek prose, and narrative and epistolary New Testament texts. Prerequisite: Greek 102. 4 hours.
202. **Second-Year Greek.** Continuation of Greek 201. Introduction to epic Greek; reading of Homer. Prerequisite: Greek 201 or equivalent. 4 hours.
204. **The Gospels.** Same as Religious Studies 204. Reading and analysis of the Greek Gospels following literary-critical, form-critical, and redaction-critical approaches. Prerequisite: Greek 201 or equivalent. 4 hours.
292. **Senior Thesis.** Open to candidates for distinction in Greek. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
298. **Senior Survey.** Thesis and honors. For candidates for honors in Greek and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
301. **Third-Year Greek.** Readings in Attic prose. Prerequisite: Greek 202. 3 hours or $\frac{1}{2}$ unit.
310. **Introduction to Indo-European Linguistics.** Same as Latin 310 and Linguistics 309. See Linguistics 309.
311. **Greek Prose Composition.** Practice in the writing of Greek prose. Prerequisite: Greek 201 or equivalent. 3 hours or $\frac{1}{2}$ unit.
391. **Readings in Greek Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Greek. Prerequisite: Greek 301 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
393. **Independent Reading.** Prerequisite: Greek 301 and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated (to a maximum of 8 hours or 3 units).
411. **Advanced Composition.** Practice in writing continuous Greek prose, with special attention to stylistic problems. Prerequisite: Greek 311 or equivalent. $\frac{1}{2}$ unit.
419. **Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric, dramatic, or Hellenistic poetry. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
420. **Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or Hellenistic prose. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
431. **Special Disciplines.** Same as Latin 431. Variable content course concentrating on an area such as comparative grammar, epigraphy, metrics, palaeography, or papyrology. Prerequisite: Greek 391 and Latin 391, or equivalent. 1 unit. May be repeated as topic varies.

- 480. **Greek Seminar.** Research on special problems of Greek literature; required of all majors in classical philology. Prerequisite: A Greek proseminar. 1 unit.
- 495. **Introduction to Classical Studies.** Same as Latin 495. An introductory survey for graduate students in classics; prepares students for work at the graduate level and surveys basic bibliography and methodology. Prerequisite: Graduate standing in classics. 1 unit.
- 499. **Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

Latin

- 101. **Elementary Latin.** Grammar and reading for students who have had no work in Latin. 4 hours.
- 102. **Elementary Latin.** Grammar and reading of easy prose. Prerequisite: Latin 101 or one year of high school Latin. 4 hours.
- 103. **Intermediate Latin.** Review of grammar; reading of easy narrative prose. Prerequisite: Latin 102 or two years of high school Latin. 4 hours.
- 104. **Introduction to Latin Literature.** Continuation of Latin 103, with readings chiefly in Latin poetic literature. 4 hours.
- 105. **Intensive Elementary Latin.** Equivalent to Latin 101 and 102. Introduction to basic grammar and syntax for students who have had no previous Latin and want to learn at a rapid rate; use of computer-assisted individual mastery lessons. 8 hours.
- 106. **Intensive Intermediate Latin.** Equivalent to Latin 103 and 104. Review of grammar and syntax and reading of easy prose and poetry for students who have attained 102 proficiency and wish to advance more rapidly; use of computer-assisted program materials. Prerequisite: Latin 102 or 105, or a placement score showing high school achievement equivalent to Latin 102. 8 hours.
- 113. **Latin Composition.** Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Credit or concurrent registration in Latin 103 or three years of high school Latin. 2 hours.
- 114. **Latin Composition.** Continuation of Latin 113. Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Latin 113. 2 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. **Survey of Latin Literature.** The republican period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
- 202. **Survey of Latin Literature.** The imperial period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
- 270. **Parateaching.** Same as French, German, Russian, and Spanish 270. See French 270.
- 279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Russian, and Spanish 279. See Humanities 279.
- 280. **Teachers' Course.** Introduction to the problems of the teaching of Latin and a study of textbooks. Required of teacher-training majors in Latin. This course will not meet during the six-week student teaching period. Prerequisite: Latin 202; senior standing. 4 hours.
- 292. **Senior Thesis.** Thesis and honors. For candidates for honors in Latin and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 298. **Senior Survey.** Thesis and honors. For candidates for honors in Latin and for other seniors. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 310. **Introduction to Indo-European Linguistics.** Same as Greek 310 and Linguistics 309. See Linguistics 309.
- 311. **Intermediate Prose Composition.** Practice in the writing of Latin prose. Prerequisite: Latin 114 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 391. **Readings in Latin Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Latin. Prerequisite: Three years of college Latin or equivalent; consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit.
- 393. **Independent Reading.** Prerequisite: Latin 202 and consent of the instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 8 hours or 3 units.

400. **Beginning Latin for Graduate Students.** Basic grammar, syntax, and vocabulary; reading practice. Designed for graduate students who need to use Latin in their research. 4 hours. No graduate credit.
401. **Readings in Latin for Graduate Students.** Directed readings, largely in medieval and modern Latin. Designed for graduate students who need to use Latin in their research. Prerequisite: Latin 400 or two years of high school Latin, or equivalent. 4 hours. No graduate credit.
411. **Advanced Composition.** Practice in writing Latin prose, with special attention to stylistic questions. Prerequisite: Latin 311 or equivalent. ½ unit.
419. **Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric and elegiac, dramatic, or satirical poetry. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
420. **Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or epistolography. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
431. **Special Disciplines.** Same as Greek 431. See Greek 431.
480. **Latin Seminar.** Research on special problems of Latin literature; required of all concentrators in classical philology. Prerequisite: A Latin proseminar. 1 unit.
495. **Introduction to Classical Studies.** Same as Greek 495. See Greek 495.
499. **Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

COMMUNICATIONS

Chair of Committee on Graduate Study: C. Christians
Office: 222b Armory Building, 505 East Armory, Champaign

101. **The Social and Cultural Foundations of the Mass Media.** Analysis of the evolution and structure of the mass media in the United States with special emphasis on the effects of the mass media on public life. Prerequisite: Freshman or Sophomore standing. 3 hours. Does not count toward major requirements in the College of Communications.
217. **History of Communications.** Same as Journalism 217. See Journalism 217.
218. **Communications and Public Opinion.** Same as Journalism 218. See Journalism 218.
220. **Communications and Popular Culture.** Same as Journalism 220. Examines the critical literature on mass media entertainment; reviews significant contemporary issues and develops perspectives for understanding popular culture. Prerequisite: Registration in the College of Communications or consent of the College. 3 hours.
231. **Mass Communications in a Democratic Society.** Same as Journalism 231. See Journalism 231.
241. **Law and Communications.** Same as Journalism 241. See Journalism 241.
251. **Social Aspects of Mass Communications.** Same as Journalism 251 and Sociology 251. See Journalism 251.
261. **American Broadcasting and Telecommunications.** Examines the history and principal issues of American broadcasting and the electronic media; the context of prior forms of mass communication and ideas about purposes and terms of control; the important social, economic, political, and cultural questions bearing on AM and FM radio, commercial television, public broadcasting, cable and new forms of electronic communication; issues in programming and service content; and basic legal and regulatory matters. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours.
264. **Economic Structure of Communication.** Describes and analyzes the economic structures, policies, and current problems of fields such as telecommunications, publishing, broadcasting and cable, film, recorded music, and postal service; examines how copyrights, patents, antitrust laws, and government regulation bear on the communications industry. Prerequisite: Consent of College. 3 hours.
291. **Special Problems.** Special projects, research, and independent reading in communications for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of the College. 1 to 3 hours.

307. **The Art of the Screen: Narration.** Same as Speech Communication 307. See Speech Communication 307.
308. **The Art of the Screen: Exposition and Persuasion.** Same as Speech Communication 308. See Speech Communication 308.
310. **Media Ethics.** Surveys the major ethical problems in news, advertising, and entertainment media; includes case studies and moral reasoning on confidentiality, privacy, conflict of interests, deception, violence, and pornography. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
319. **Studies in Russian and East European Cinema.** Same as Slavic and Speech Communication 319. See Slavic 319.
322. **Politics and the Media.** Same as Political Science 322. Examines the interaction between the media and politics in the United States and elsewhere, with special emphasis on the constitutional protection of the media, politics of media control, impact of the media on such political processes as elections and policymaking, international news agencies and communications satellites, and quest for a new international information order. Prerequisite: Political Science 150 or 6 hours of social science; or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
323. **Language Acquisition.** Same as Linguistics 323 and Psychology 323. See Psychology 323.
325. **Introduction to Psycholinguistics.** Same as Linguistics 325. See Linguistics 325.
335. **Interpersonal Communication Processes.** Same as Speech Communication 335. See Speech Communication 335.
352. **Attitude Theory and Change.** Same as Psychology 352 and Sociology 352. See Psychology 352.
361. **Telecommunications Programming.** History and interpretation of American radio and television programs; types, formats, and contents in relationship to trends in American social and cultural history, themes, and myths; and relevant aspects of telecommunications technology, economics, and cultural production. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
362. **Telecommunications Management.** Examines problems and issues in telecommunications management; the role of management in operation of broadcasting, cable, and telecommunications industries; forces shaping products and services in commercial and non-profit media, i.e., technology, markets, revenues, programming, and regulation; planning, accountability, and social responsibility. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
366. **Film as Business.** Studies the filmed entertainment industry; the economic structures and policies of the production, distribution, and exhibition sectors; the nature of ownership patterns, investment, competition, and trade practices; filmed entertainment as a commodity in an international market system. Prerequisite: Consent of college or consent of instructor. 3 hours or 1 unit.
368. **Legal and Policy Issues in Telecommunications.** Same as Radio and Television 368. Studies the histories, assumptions, and consequences of major legislative, regulatory, and judicial decisions in American broadcasting and telecommunications; social, cultural and economic background of federal communications law and regulation; administrative agency (FCC) practice and constraints; various regulatory and policy issues including fiduciary licensing, fairness doctrine, cable, public broadcasting, telematics, deregulation, and statutory revision process. Prerequisite: Enrollment in the College of Communications or consent of the college. 3 hours or 1 unit.
370. **Language, Culture, and Society.** Same as Anthropology 370 and Linguistics 370. See Anthropology 370.
377. **International Communications.** Same as Political Science 377. See Political Science 377.
414. **Seminar on Social Interaction.** Same as Sociology 414. See Sociology 414.
417. **Contemporary Viewpoints in Speech Communication Theory.** Same as Speech Communication 417. See Speech Communication 417.
420. **Seminar in Semantics.** Same as Philosophy 420. See Philosophy 420.
424. **Developmental Psycholinguistics.** Same as Linguistics 424 and Psychology 424. See Psychology 424.
425. **Psycholinguistics.** Same as Linguistics 425 and Psychology 425. See Psychology 425.
432. **History of Libraries.** Same as Library and Information Science 432. See Library and Information Science 432.

437. **The Analysis of Interpersonal Interaction.** Same as Speech Communication 437. See Speech Communication 437.
444. **Seminar in Public Opinion.** Same as Sociology 444. See Sociology 444.
448. **Seminar: Mass Communicators.** Production of mass media messages examined from individual, organizational and institutional perspectives. Study of forces and influences shaping the creation and production of news and information, entertainment and culture. 1 unit.
456. **Attitude Measurement and Behavioral Prediction.** Same as Psychology 456. See Psychology 456.
462. **Seminar in Radio and Television.** Same as Radio and Television 462. See Radio and Television 462.
463. **World Broadcasting.** Same as Radio and Television 463. See Radio and Television 463.
468. **The Political Economy of Communications.** Same as Journalism 468. See Journalism 468.
470. **Communications and Popular Culture.** Same as Journalism 470. See Journalism 470.
471. **Proseminar in Communications, I.** Same as Journalism 471. See Journalism 471.
472. **Proseminar in Communications, II.** Same as Journalism 472. See Journalism 472.
473. **History and Theory of Freedom of the Press.** Same as Journalism 473. See Journalism 473.
474. **Communications Systems.** Same as Journalism 474. See Journalism 474.
481. **Economic and Social Aspects of Advertising.** Same as Advertising 481. See Advertising 481.
482. **Research Methods in Advertising and Communications.** Same as Advertising 482. See Advertising 482.
485. **Advertising Planning and Decision Making.** Same as Advertising 485. See Advertising 485.
486. **Analytical Methods in Advertising and Communications.** Same as Advertising 486. See Advertising 486.
490. **Special Topics in Communications.** Prerequisite: Consent of chairperson of committee on graduate study in communications. ½ to 2 units.
492. **Research Methods in Communications.** Same as Journalism 492. Introduction to the methods of empirical research in the behavioral sciences applicable to research problems in human communication, with emphasis on studies of mass communication. Lectures, readings, and laboratory practice. Prerequisite: Consent of College of Communications. 1 unit.
493. **Qualitative Research Methods in Communications.** Introduces qualitative concepts and strategies in the social sciences and humanities which apply to research problems in mass communications. Prerequisite: Consent of College of Communications. 1 unit.
499. **Thesis Research.** Prerequisite: Consent of chairperson of committee on graduate study in communications, and of thesis supervisor. 0 to 4 units. Students may reregister for a total of 8 units.

COMPARATIVE LITERATURE

Director of Program: Michael Palencia-Roth

Office: 2070 Foreign Languages Building, 707 South Mathews, Urbana

119. **The Literature of Fantasy.** Same as English 119. See English 119.
120. **Origins of Western Literature.** Same as Classical Civilization 120. See Classical Civilization 120.
141. **Masterpieces of Western Culture, I.** Comparative study of selected works reflecting main currents of western literature and thought, such as biblical stories, Homer, Greek drama, Vergil, medieval romance and love lyrics, Dante, Boccaccio, Chaucer, Petrarch, Rabelais, Cervantes, and Shakespeare. 3 hours.
142. **Masterpieces of Western Culture, II.** Comparative study of selected works reflecting main currents of western literature and thought, such as Moliere, Voltaire, Swift, Goethe, romantic lyrics, Melville, Flaubert, Dostoevsky, Ibsen, Joyce, Kafka, and Camus. 3 hours.
175. **Masterpieces of East Asian Literature.** Same as Asian Studies 175, Chinese 175, and Japanese 175. See Asian Studies 175.
189. **Classic Masterpieces of Non-Western Cultures.** Analysis of representative works from the Middle East and Asia through the seventeenth century, portraying literary, philosophical

and religious achievements of the Islamic, Hindu, Buddhist and Confucian traditions, and emphasizing comparative perspectives both within the range of non-western traditions and in juxtaposition to western thinking. All readings in English. 3 hours.

190. **Modern Masterpieces of Non-Western Cultures.** Analysis of representative works from the Middle East and Asia of the eighteenth to twentieth centuries, portraying literary, philosophical and religious achievements of the Islamic, Hindu, Buddhist and Confucian traditions and emphasizing comparative perspectives both within the range of non-western traditions and in juxtaposition to western thinking. All readings in English. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Comparative Literary Studies, I.** An introduction to various methods in comparative literary study, including genres, thematics, literary relations, literary movements, and interdisciplinary approaches. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
202. **Comparative Literary Studies, II.** An analysis of several important world-views in western civilization (such as classical, Romantic, modern, and so forth), studied comparatively and in relation to selected figures in western literature. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
203. **Introduction to Persian Culture and Literature, I.** Same as Persian 205. See Persian 205.
204. **Introduction to Persian Culture and Literature, II.** Same as Persian 206. See Persian 206.
210. **Introduction to Modern African Literature.** Same as African Studies 210 and English 211. See African Studies 210.
211. **Japanese Literature in Translation, I.** Same as Asian Studies and Japanese 205. See Japanese 205.
212. **Japanese Literature in Translation, II.** Same as Asian Studies and Japanese 206. See Japanese 206.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Scandinavian 215. See Scandinavian 215.
218. **Japanese Hero Types.** Same as Asian Studies and Japanese 218. See Japanese 218.
219. **Women in Japanese Literature.** Same as Asian Studies, Japanese, and Women's Studies 219. See Japanese 219.
224. **German Literature in Translation.** Same as German 200. See German 200.
225. **Gods and Man in Modern Japanese Drama.** Same as Asian Studies and Religious Studies 225. See Asian Studies 225.
228. **Special Topics in German Literature.** Same as German 296. See German 296.
238. **Hiroshima Nagasaki and the Literature of Survival.** Same as Asian Studies and Japanese 238. See Japanese 238.
240. **Italian Civilization of the Middle Ages and Renaissance.** Same as Italian 240. See Italian 240.
244. **Hispanic Literature and Culture.** Same as Spanish 244. See Spanish 244.
248. **Dostoevsky and Tolstoy.** Same as Russian 222. See Russian 222.
249. **Soviet Russian Literature.** Same as Russian 225. See Russian 225.
252. **Icelandic Sagas in Translation.** Same as Scandinavian 252. See Scandinavian 252.
253. **Medieval Literature and Culture.** Same as English 202. See English 202.
255. **Renaissance Literature and Culture.** Same as English 204. See English 204.
257. **Literature and Culture of the Enlightenment.** Same as English 206. See English 206.
260. **Science and Technology in Contemporary Literature.** Same as Science, Technology, and Society 260. See Science, Technology, and Society 260.
263. **The Heroic Tradition.** Same as Classical Civilization 221. See Classical Civilization 221.
264. **The Tragic Spirit.** Same as Classical Civilization 222. See Classical Civilization 222.
265. **Development of the Modern Drama.** Same as English 243. See English 243.
266. **Development of the Modern Drama.** Same as English 244. See English 244.
267. **The Short Story.** Same as English 245. See English 245.
268. **The Short Story.** Same as English 246. See English 246.
269. **Modern British and American Fiction in Relation to Continental Fiction.** Same as English 248. See English 248.
283. **Jewish Sacred Literature.** Same as English and Religious Studies 283. See Religious Studies 283.

284. **Jewish Experience in Literature.** Same as English and Religious Studies 284. See English 284.
288. **French and Comparative Cinema, I.** Same as French 288. See French 288.
289. **French and Comparative Cinema, II.** Same as French 289. See French 289.
293. **Senior Thesis and Honors.** Independent research guided by tutor(s), leading to the writing of a comparative thesis. Intended primarily for candidates for honors in comparative literature, but open to other seniors. 3 to 6 hours. May be repeated to a maximum of 12 hours. (Counts for advanced hours in LAS.)
295. **Special Topics: Colloquium on Interdisciplinary Subjects.** Presentation and discussion of subjects relating literature to other disciplines; topics vary. 3 hours. May be repeated to a maximum of 6 hours.
305. **Literary Criticism from 1800 to the Present.** Same as English 383. See English 383.
306. **The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Classical Civilization 332. See Classical Civilization 332.
307. **Topics in Classical Literature.** Same as Classical Civilization 390. See Classical Civilization 390.
310. **Modern African Fiction.** Same as African Studies and French 310 and English 370. See African Studies 310.
311. **The Chinese Novel.** Same as Asian Studies and Chinese 311. See Chinese 311.
312. **Modern Chinese Literature in Translation.** Same as Asian Studies and Chinese 312. See Chinese 312.
313. **Dante.** Same as Italian 313. See Italian 313.
314. **Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Italian 314. See Italian 314.
315. **Modern Japanese Fiction in Translation.** Same as Asian Studies and Japanese 315. See Japanese 315.
320. **Masterpieces of Italian Renaissance Literature.** Same as Italian 320. See Italian 320.
323. **Modern German Poetry.** Same as German 330. See German 330.
326. **Ibsen in Translation.** Same as Scandinavian 361. See Scandinavian 361.
327. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Scandinavian 362. See Scandinavian 362.
334. **Studies in Francophonie.** Same as French 379. See French 379.
335. **Polish Literature in Translation, I.** Same as Polish 345. See Polish 345.
336. **Polish Literature in Translation, II.** Same as Polish 346. See Polish 346.
337. **Nineteenth-Century Literature in Translation.** Same as Russian 315. See Russian 315.
338. **Twentieth-Century Literature in Translation.** Same as Russian 317. See Russian 317.
340. **Studies in Russian Literature and Society.** Same as Russian 360. See Russian 360.
341. **Themes and Types in Western and non-Western Narratives.** Analysis of literary themes and types in narratives of Western and non-Western literatures (e.g., the hero, east and west; dream visions), emphasizing comparative perspectives. Prerequisite: One year of college literature, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **International Literary Movements.** Study of the development and mutation of literary movements and stylistic trends; emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **Russian Modernism.** Same as Russian 324. See Russian 324.
359. **The International Folk Tale.** Same as English 367. See English 367.
361. **International Literary Genres and Forms.** Structure and development of literary genres and forms in historical perspective (for instance, drama, parody and the grotesque, poetry, fables and fabulists, and modern fiction); essential international components and significant national variations of such genres and forms. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Comedy.** Same as English 365. See English 365.
368. **Russian Drama.** Same as Russian 335. See Russian 335.
370. **Nabokov and Emigre Literature.** Same as Russian 370. See Russian 370.
371. **International Literary Relations.** Study of specific relations between authors of different countries; influences of certain works, concepts, or tastes on another work, author, or country; and literary interaction between Eastern and Western cultures. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

387. **Introduction to Myth and Folklore.** Same as English, German, Slavic and Speech Communication 387. See English 387.
396. **Special Topics in Comparative Literature.** Selected literary topics of international significance in relation to other cultural expressions. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
401. **Theory of Literature.** Major issues of literary theory, critical approaches, and comparative research. Prerequisite: Reading knowledge of two foreign languages; consent of instructor. 1 unit.
402. **Cross-cultural Comparison.** Problems and methods of cross-cultural literary studies, concentrating on the effects of historical encounters between different civilizations and on theoretical issues in comparing literatures across cultures. Prerequisite: Advanced knowledge of two languages. 1 unit.
404. **Seminar in Renaissance and Baroque Literature.** Same as Spanish 410. See Spanish 410.
405. **Seminar in Stylistics.** Same as Linguistics 405. See Linguistics 405.
415. **Dostoevsky.** Same as Russian 415. See Russian 415.
419. **Tolstoy.** Same as Russian 419. See Russian 419.
420. **Chekhov.** Same as Russian 420. See Russian 420.
425. **Studies in Contemporary Critical Problems.** Same as French 425. See French 425.
441. **Naturalism, Symbolism, and Expressionism.** Same as German 451. See German 451.
451. **Seminar in Literary Movements and Periods.** Investigation of the development and mutation of literary movements (classicism, romanticism, symbolism, etc.) through a study of critical texts and their reception in various countries. The subject of the seminar varies each semester. 1 unit. May be repeated to a total of 3 units.
452. **Seminar in Romantic Literature.** Same as English 433. See English 433.
461. **Seminar in Literary Genres and Forms.** Study of a form (the lyric, the novel, the drama, etc.) to discover its essential components in all the literatures studied and the significance of national variations. 1 unit. May be repeated to a maximum of 3 units as topic varies.
462. **Seminar in Spanish-American Novel.** Same as Spanish 430. See Spanish 430.
471. **Seminar in Literary Relations.** Investigation of the impact of one literature upon another, or of some specific works upon others (the role of English literature in continental Europe, the influence of Russian novelists on French and German writers, etc.). The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
472. **Studies in French and Comparative Cinema.** Same as French 452. See French 452.
478. **Seminar in Twentieth-Century French Literature.** Same as French 478. See French 478.
481. **Seminar in Literary Themes and Types.** Study of a theme or type (the Faust myth, the romantic hero, etc.) to discover its essential components in all the literatures studied and the significance of national variations. The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
482. **Seminar in Modern German Literature.** Same as German 461. See German 461.
490. **Seminar in Contemporary Criticism, Methods and Theory.** Same as French 490. See French 490.
493. **Special Studies.** $\frac{1}{4}$ to 1 unit.
499. **Thesis Research.** Intended for students engaged in writing a thesis as a partial requirement for the M.A. or Ph.D. degree in comparative literature. Maximum credit for master's candidates is 2 units. 0 to 4 units.

COMPUTER SCIENCE

Head of Department: C. W. Gear

Department Office: 114 Digital Computer Laboratory, 1304 West Springfield, Urbana

NOTE: Credit is not allowed for more than one of Computer Science 101, 102, 103, 105, and 121. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences.

101. **Introduction to Computers for Application to Engineering and Physical Science.** A beginning course in problem solving by digital computers which covers problem formulation, algorithm development, and coding in a high-level language; use of the computer in solving a series of problems. Prerequisite: Mathematics 120 or consent of instructor. 3 hours.
102. **Introduction to Computers and Their Application to Architecture.** Introduction to computer programming for students of architecture; higher-level programming languages and application programs of special use in architecture. Prerequisite: Mathematics 112 or high school equivalent. 3 hours.
103. **Introduction to Computers and Their Application to Social and Behavioral Science.** Introduction to computer programming for students with an interest in behavioral and social science computation; instruction in programming languages with an emphasis on applications from statistical and data manipulative procedures. Prerequisite: Sophomore standing; one year of college mathematics or statistics. 3 hours.
105. **Introduction to Computers and Their Application to Business and Commerce.** Introduction to computer fundamentals, higher language programming, and the use of the computer for the solution of business problems. Prerequisite: Mathematics 112 or high school equivalent. 3 hours.
106. **Introduction to Computers for the Nontechnical Major.** A concise treatment of the computer's important and still-growing role in virtually every significant aspect of society, including commerce, quantitative and qualitative planning, science, the criminal justice system, education, and medicine. The student is first taught to program computers interactively using an elementary programming language. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 121, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences. 3 hours.
121. **Introduction to Computer Science.** The first course for computer science majors and other students with a deep interest in the subject; introduces students to a high-level block-structured programming language and presents the fundamental techniques of using such a language for the solution of non-numerical problems. Students write several programs during the course. Prerequisite: Three years of high school mathematics or Mathematics 112. 4 hours. Credit is not given for both Computer Science 121 and 122.
122. **Introduction to Computer Science.** For students with previous programming experience as an alternative to Computer Science 121; presents the fundamental techniques of using a block-structured programming language for the solution of non-numerical problems. Students write several programs. Prerequisite: Computer Science 101, 102, 103, or 105, or equivalent programming experience. 2 hours. Credit is not given for both Computer Science 121 and 122.
196. **Honors Course in Computer Science.** This course is offered for honors credit in conjunction with other 100-level computer science courses, in which concurrent registration is required. Enrollment is strictly limited to beginning students with superior talents in computer science. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 100-level computer science course (see *Timetable*); consent of instructor. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
225. **Data Structures.** A continuation of Computer Science 121; basic data types, including bits, integers, characters, and reals; data structures, including arrays, strings, lists, stacks, queues,

- and trees; storage management, including allocation and pointers; and searching and sorting techniques. Prerequisite: Computer Science 121 or 122. 3 hours.
231. **Computer Architecture, I.** Introduction to computer architecture, working up from the logic gate level: combinational and sequential networks; computer arithmetic; arithmetic/logic units; memory organization; control unit design. Prerequisite: Computer Science 121 or 122. 3 hours. Students may not receive credit for both Computer Science 231 and Electrical and Computer Engineering 290.
232. **Computer Architecture, II.** Second-level course in computer architecture: machine-level programming, instruction sets, data representations; subroutines; input/output hardware and software; linking and loading; relation to high-level languages. Prerequisite: Computer Science 231. 3 hours. Students may not receive credit for both Computer Science 232 and Electrical and Computer Engineering 291.
257. **Numerical Methods.** Same as Mathematics 257. An introduction to numerical methods for students in science and engineering; topics include floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations; discusses various applications in science and engineering; includes some programming as well as the use of high quality mathematical library routines. Prerequisite: 100-level computer science course or Computer Science 400; Mathematics 225 or 315; Mathematics 242. 3 hours.
273. **Introduction to Theory of Computation.** Introduction to the various aspects of the theory of computation, including the necessary background in graph theory, combinatorics, and probability theory; also includes algorithmic procedures, theoretical limitations of computing machines, analysis of algorithms, and correctness and efficiency of algorithms. Prerequisite: Computer Science 121 or 122, or consent of instructor. 3 hours.
281. **Introduction to Computer Hardware.** Theory and operation of circuits used in digital computers including basic electrical circuit principles, diodes, bipolar and MOS transistors, digital logic circuits, memory circuits, and the fundamentals of analog circuits. Prerequisite: Physics 102 or 107, and credit or concurrent registration in Computer Science 231. 3 hours.
290. **Individual Study.** Prerequisite: 100-level computer science course. 1 to 3 hours.
296. **Honors Course in Computer Science.** Group projects for honors work in computer science. Sections of this course are offered in conjunction with other 200-level computer science courses, in which concurrent registration is required. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 200-level computer science course (see *Timetable*); consent of instructor. 1 hour.
297. **Special Topics in Computer Science.** A lecture course in topics of current interest. See *Timetable* for current topics. Prerequisite: Consent of instructor. 2 to 4 hours.
300. **Advanced Computer Programming.** Advanced features of programming languages; input/output disks and tapes; plotted output; and use of operating systems and job control languages. This course is intended primarily for students who are not majoring in computer science. Prerequisite: Computer Science 100-level programming course or Computer Science 400, or consent of instructor. 3 hours or 1 unit. Students majoring in computer science may not receive graduate credit for Computer Science 300.
310. **Information Systems.** Systems design and analysis: includes structured programming and programming in COBOL; file organizations and processing; sorting, validating, updating, and retrieval of information; storage devices; and data base concepts. Prerequisite: Accountancy 331 or 332, or 6 hours of computer science courses; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Database Systems.** Examines the logical organization of databases: the entity-relationship model; the hierarchical, network, and relational data models and their languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control, and distributed database systems. Prerequisite: Computer Science 225 or 310; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
313. **Combinatorial Mathematics.** Same as Mathematics 313. See Mathematics 313.
317. **Computer-Assisted Instruction.** Same as Curriculum and Instruction 335. See Curriculum and Instruction 335.
318. **Computer Graphics.** Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applica-

- tions of these tools to specific problems. Prerequisite: Computer Science 225 or 300, and analytic geometry. 3 hours, or $\frac{3}{4}$ or 1 unit.
323. **Operating Systems Design.** Discussion of the organization and structure of operating systems for various modes of computer use from simple batch systems to time-sharing/multiprocessing systems. Prerequisite: Computer Science 225, and Computer Science 232 or Electrical and Computer Engineering 291. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Programming Language Principles.** An introduction to the structure of programming languages. Formal specification of syntax and semantics; structure of algorithmic, list processing, string manipulation, data description, and simulation languages; basic data types, operations, statement types, and program structure; macro languages and their implementation; and run-time representation of programs and data. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
326. **Compiler Construction.** Compiler structure; lexical analysis, syntax analysis, grammars, description of programming languages, automatically constructed recognizers, and error recovery; and semantic analysis, semantic languages, semantic processes, intermediate language, optimization techniques, and extendible compilers. Prerequisite: Computer Science 232 and 325. 3 hours, or $\frac{3}{4}$ or 1 unit.
327. **Software Engineering.** Follows the software life cycle from the requirement, specification, and design phases through the construction of actual software. Topics include management of programming teams, programming methodologies, debugging aids, documentation, evaluation and measurement of software, verification and testing techniques, and the problems of maintenance, modification, and portability. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
328. **Computer Networks and Distributed Systems.** Same as Electrical and Computer Engineering 328. Introduction to concepts of transport connections and sessions; design issues in transport layer and session layer protocols, terminal and file transfer protocols, message handling protocols, etc.; methods to ensure network security and privacy; algorithms for deadlock detection, concurrency control and synchronization in distributed systems; models of distributed computation; networking facilities and resource control and management methods in network and distributed operating systems. Prerequisite: Computer Science 232 or Electrical and Computer Engineering 291; Computer Science 225. 3 hours or $\frac{3}{4}$ unit.
331. **Microprocessor Systems.** Study of microprocessor architectures, hardware modules, and interfaces; programming, software tools, development systems, and applications; and microprocessor system design methodology. Prerequisite: Computer Science 232; Computer Science 231 or Electrical and Computer Engineering 290. 3 hours, or $\frac{3}{4}$ or 1 unit.
333. **Computer System Organization.** Computer system analysis and design; organizational dependence on computations to be performed; and speed and cost of parts and overall machines. Prerequisite: Computer Science 232 or Electrical and Computer Engineering 291; Computer Science 231 or Electrical and Computer Engineering 290. 3 hours or 1 unit.
335. **Introduction to the VLSI System Design.** Same as Electrical and Computer Engineering 325. See Electrical and Computer Engineering 325.
337. **Control Structure of Computers.** Asynchronous, synchronous, and microprogrammed control structures in the framework of computer architecture; interlocking of autonomous subcontrols; and case studies in typical control features: instruction look-ahead, multiprocessing interrupt, and input/output. Prerequisite: Computer Science 231, Electrical and Computer Engineering 290, or Mathematics 391. 3 hours or 1 unit.
338. **Communication Networks for Computers.** Same as Electrical Engineering 338. Introduction to International Standards Organization Open System Interconnection (ISO-OSI) reference model, design issues and protocols in the physical layer, data link layer and network layer; architectures and control algorithms of local-area networks, point-to-point networks and satellite networks; standards in network access protocols; models of network interconnection; and overview of networking and communication software. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290. 3 hours or $\frac{3}{4}$ unit.
339. **Computer Aided Design for Digital Systems.** Same as Electrical and Computer Engineering 339. Examines fundamental concepts, techniques, and tools for the computer-aided design of digital systems; topics include hardware description languages, hardware compilers, evaluation and simulation of computer architectures, logic and circuit simulation, testing, partitioning, placement and routing algorithms and the integration of CAD tools into complete

design automation systems. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290; Computer Science 232 or Electrical and Computer Engineering 291; and Computer Science 281 or Electrical and Computer Engineering 340 and 342. 3 hours, or $\frac{3}{4}$ or 1 unit.

341. **Mechanized Mathematical Inference.** Introduces methods of mathematical inference which can be programmed on a computer; topics include propositional calculus decision procedures, forward and backward chaining, semantics, resolution, equational systems, specialized decision procedures, applications to program verification, abstraction, and problem representation. Prerequisite: Computer Science 273 or Mathematics 314, and Computer Science 325 or 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
342. **Computer Inference and Knowledge Acquisition.** Systematically describes principles and algorithms underlying development of artificial intelligence systems, with special emphasis on methods of computer inference and knowledge acquisition; topics include deductive and inductive inference systems, plausible reasoning techniques, problem solving strategies, knowledge representation schemes, machine learning, conceptual data analysis, prediction and discovery programs, automatic programming, and planning strategies. Prerequisite: Computer Science 273 and 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
346. **Pattern Recognition and Machine Learning.** Organized review of basic theoretical concepts and methods of machine learning and recognition; decision space and linguistic and relational representation of objects; statistical and deterministic recognition algorithms; various types of learning, including adaptive, procedural, and inductive; selected applications; and medical consulting, determination of cost-optimal classification rules, inferential information systems, and computer vision. Prerequisite: Computer Science 273 and 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
347. **Knowledge-Based Programming.** Examines use of the computer to process human-made knowledge-bases. Topics include: trade-off of search versus knowledge; complexity of finite problem-domains; machine-aided acquisition of knowledge from experts; acquisition of knowledge by computer induction; validation and measurement methods, production-rule programming; and logic programming. Prerequisite: Computer Science 273 and 348. 3 hours, or $\frac{3}{4}$ or 1 unit.
348. **Introduction to Artificial Intelligence.** Same as Electrical Engineering 348. An introductory description of the major subjects and directions of research in artificial intelligence; topics include AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Prerequisite: Electrical and Computer Engineering 291 or Computer Science 225; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
355. **Numerical Methods for Partial Differential Equations.** Same as Mathematics 355. An introduction to numerical techniques for initial and boundary value problems in partial differential equations; includes finite difference and finite element discretization techniques, direct and iterative solution methods for discrete problems, and programming techniques and usage of FORTRAN packages. Prerequisite: Computer Science 257; Mathematics 341, 343, or 345. 3 hours, or $\frac{3}{4}$ or 1 unit.
358. **Numerical Linear Algebra.** Same as Mathematics 358. Direct and iterative methods for systems of linear equations; overdetermined systems of equations; eigenvalue problems; non-linear systems of equations. Prerequisite: Computer Science 257 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
359. **Numerical Approximation and Ordinary Differential Equations.** Same as Mathematics 359. Polynomial and spline interpolation; least squares and uniform approximation; numerical differentiation and integration; initial-value and boundary-value problems in ordinary differential equations. Prerequisite: Computer Science 257 and Mathematics 340, 341, or 345, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
362. **Logic Design.** Same as Electrical and Computer Engineering 362 and Mathematics 391. See Electrical and Computer Engineering 362.
363. **Integrated Circuit Logic Design.** IC fabrication techniques; survey of different IC logic families; logic design procedures for each IC logic family; design of masks; logic design of digital networks with IC packages; use of ROMs as substitutes for gates; computer-aided design; and comparison of different implementation approaches based on different IC logic fami-

- lies, from the viewpoints of economy, performance, and design time. Prerequisite: Computer Science 281 or equivalent and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
364. **Introduction to Computer Arithmetic.** Review of binary number representations, logical design of adders and arithmetic units, and simple multiplication and division methods; multiplier recoding; redundant division methods; design of carry-save adders and signed-digit arithmetic units; and case studies of high-speed arithmetic units. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290. 3 hours or 1 unit.
373. **Combinatorial Algorithms.** Same as Mathematics 373. Representation and generation of combinatorial objects; searching; exhaustive search and its approximations and fast search techniques; sorting and related problems; graph algorithms; NP-hard and NP-complete combinatorial problems. Prerequisite: Computer Science 225 and 273. 3 hours, or $\frac{3}{4}$ or 1 unit.
375. **Automata, Formal Languages, and Computational Complexity.** Same as Mathematics 375. Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linear-bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems; recursive functions; and computational complexity. Prerequisite: Mathematics 319 or Computer Science 273. 3 hours or 1 unit.
376. **Program Verification.** Examines formal methods for demonstrating correctness and other properties of programs; includes an overview of predicate calculus. Topics include: invariant assertions, Hoare axiomatics, well-founded orderings for proving termination, structural induction, computational induction, data structures, and parallel programs. Prerequisite: Computer Science 225, and either Computer Science 273 or Mathematics 314. 3 hours, or $\frac{3}{4}$ or 1 unit.
381. **Introduction to Computer Memories and I/O.** Introduction to memories, input/output devices, and optical processors; lecture and demonstration. Prerequisite: Computer Science 281, Electrical and Computer Engineering 340, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
383. **Linear Programming.** Same as Mathematics 383. See Mathematics 383.
384. **Computer Data Acquisition Systems.** Theory, operation, and design of computer data acquisition systems; analog and digital aspects, conversions between representations, interfacing and systems considerations. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290; Computer Science 281 or Electrical and Computer Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit.
389. **Advanced Computer Circuits.** Theory, operation and use of digital integrated circuit technologies that are commonly used in modern digital computers; provides an understanding of the operation of various computer technologies, design knowledge at the integrated circuit package level, and an introduction to computer circuit design aids. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290; Computer Science 281 or Electrical and Computer Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit. Students may not receive credit for both Computer Science 389 and Electrical and Computer Engineering 380.
397. **Special Topics in Computer Science.** Lectures in topics of current interest. See *Timetable* for current topics. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
400. **Introduction to Automatic Digital Computing for Graduate Students.** Beginning course covering the programming of digital computers using a procedure-oriented language. Prerequisite: Mathematics 112 or high school equivalent. 1 hour. No graduate credit.
405. **Numerical Methods in Fluid Dynamics.** Same as Atmospheric Science 405. See Atmospheric Science 405.
425. **Programming Language Semantics.** Topics in the theory and formal description of programming languages, including: functional programming; meta-circular interpreters; typed, untyped, and polymorphic lambda-calculi; and denotational semantics. Prerequisite: Computer Science 325. $\frac{3}{4}$ or 1 unit.
426. **Topics in Compiler Construction.** Advanced topics in compiler construction, including incremental and interactive compiling, error correction, code optimization, models of code generators, etc. Prerequisite: Computer Science 326. 1 unit.
433. **Theory of High-Speed Parallel Computation.** Same as Electrical and Computer Engineering 433. Theoretical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; and overall computer system ideas. Prerequisite: Consent of instructor. 1 unit.

436. **Design of Fault-Tolerant Digital Systems.** Same as Electrical and Computer Engineering 442. See Electrical and Computer Engineering 442.
441. **Computer Systems Analysis.** Same as Electrical and Computer Engineering 441. Development of analytical models of computer systems and application of such models to performance evaluation; topics include scheduling policies, paging algorithms, multiprogrammed resource management, and queueing theory. Prerequisite: Mathematics 361 or 363, and Electrical and Computer Engineering 313, or equivalent. 1 unit.
444. **Design of Computer Problem Solvers.** Same as Electrical and Computer Engineering 444. Principles and engineering techniques for artificial intelligence problem-solving and inference systems; pattern-directed inference systems, including context mechanisms and efficiency issues; truth-maintenance systems, including basics of justification-based, logic-based, and assumption-based systems, dependency-directed search and closed-world reasoning, and integration with other reasoning modules; constraint languages, including applications to engineering systems; symbolic relaxation systems, including applications to vision and temporal reasoning; production rule languages; MYCIN-like rule languages. Prerequisite: Computer Science 348. 1 unit.
445. **Systems Modeling and Simulation.** Same as Business Administration 475. See Business Administration 475.
446. **Advanced Artificial Intelligence Programming Methods.** Same as Electrical and Computer Engineering 446. Concepts and implementation techniques for advanced artificial intelligence programming algorithms and practices using Common LISP; data-driven programming, coroutines, continuations, agenda control, discrimination nets, deductive retrieval, production systems, inheritance, object-oriented programming, backtracking, and knowledge representation. Prerequisite: Computer Science 348 or consent of instructor. 1 unit.
448. **Computer Models of Cognitive Processes.** Same as Electrical and Computer Engineering 448. Formal models and concepts in vision and language; detailed analysis of computer vision, language, and learning problems; relevant psychological results and linguistic systems; and survey of the state of the art in artificial intelligence. Prerequisite: Computer Science 348. 1 unit.
454. **Parallel Numerical Algorithms.** Same as Mathematics 486. Introduction of numerical algorithms for vector and parallel computers: parallel algorithms in numerical linear algebra (dense and sparse solvers for linear systems and the algebraic eigenvalue problem), numerical handling for ordinary and partial differential equations, and numerical optimization techniques. Prerequisite: At least one of Computer Science 355, 358, or 359. 1 unit.
456. **Coding Theory.** Same as Electrical and Computer Engineering 456 and Mathematics 476. See Electrical and Computer Engineering 456.
457. **Numerical Solution of Ordinary Differential Equations.** Same as Mathematics 457. Derivation and rigorous analysis of one-step, multistep, and extrapolation methods, variable step-size, error estimation, stiff equations, and boundary value problems. Prerequisite: Computer Science 359 or consent of instructor. 1 unit.
458. **Topics in Numerical Analysis.** Same as Mathematics 458. Prerequisite: Consent of instructor. 1 unit. May be repeated.
463. **Information Theory.** Same as Electrical and Computer Engineering, Mathematics, and Statistics 463. See Mathematics 463.
464. **Topics in Digital Computer Arithmetic.** Topics selected from the advanced theory of digital computer arithmetic, including division methods, use of redundancy, and implications of the use of number representations, such as continued products and continued fractions. Prerequisite: Computer Science 364. 1 unit.
465. **Topics in Automata Theory.** Same as Electrical and Computer Engineering 465 and Mathematics 465. See Mathematics 465.
469. **Introduction to Coherent Optics and Holography.** Same as Electrical and Computer Engineering 469. See Electrical and Computer Engineering 469.
472. **Graph Theory.** Same as Mathematics 418. See Mathematics 418.
473. **Topics in Analysis of Algorithms.** Theoretical analysis of various algorithms; topics include sorting, searching, selection, polynomial evaluation, matrix multiplication, and multiplication of real numbers. Prerequisite: Computer Science or Mathematics 373 or equivalent, or consent of instructor. 3 hours or 1 unit.

- 474. **Topics in Graph and Geometric Algorithms.** Same as Electrical and Computer Engineering 474. See Electrical and Computer Engineering 474.
- 475. **Topics in Combinatorics.** Same as Mathematics 475. Selected topics from graph theory, algebraic coding theory, enumerative analysis, combinatorial design, and discrete optimization; includes other topics of current research interest, such as Ramsey's Theorem, Sperner's Theorem, Dilworth's Theorem, and the theory of matroids. Prerequisite: Computer Science 273, Mathematics 313, or consent of instructor. 1 unit.
- 479. **Computational Complexity.** Same as Electrical and Computer Engineering 479 and Mathematics 479. See Electrical and Computer Engineering 479.
- 485. **Topics in Computer Hardware.** Advanced features of computer hardware; topics vary, but typically are chosen from: memories, optical data processing and storage, device modeling and computer-aided circuit design, and stochastic representation and processing of information. Prerequisite: Consent of instructor. 1 unit.
- 487. **Theory of Approximation.** Same as Mathematics 487. See Mathematics 487.
- 490. **Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.
- 491. **Seminar in Computer Science.** Seminar on topics of current interest. See *Timetable* for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 492. **Individual Project Study.** Individual study of a computer-related project required of all candidates for the Master of Computer Science degree. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units (summer session $\frac{1}{2}$ to 2 units).
- 497. **Special Topics in Computer Science.** Lecture course in topics of current interest. See *Timetable* for current topics. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.
- 499. **Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

CONSUMER SCIENCES

(Including Family and Consumer Economics, Interior Design, and Textiles and Apparel)

Chair of Division: H. M. Buckley

Division Office: 237 Bevier Hall, 905 South Goodwin, Urbana

Family and Consumer Economics

- 170. **Consumer Economics.** Introduction to the study of the consumer in the American economy; sources of consumer information and consumer protection; and examination of current consumer issues within an economic framework. 3 hours.
- 175. **Energy in the Home.** Examines household energy use emphasizing energy sources and patterns of energy use in the home; studies the effect of energy supply on life styles, national policies, and the management of energy use by families and society. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. **Consumer Economics Internship.** A supervised off-campus experience through a cooperative program with an agency, business, industry, financial or educational institution, or legislative body having a consumer component. Prerequisite: Junior standing and consent of division chair; not available to students on academic probation. 4 hours.
- 270. **Family Financial Management.** Examines principles of family financial management with attention given to research findings on the interdependence of financial decisions and energy, time, and other resources used to attain family goals and maintain family values. Prerequisite: Junior standing and 6 hours of sociology, psychology, and/or economics. 3 hours.
- 276. **Engineering Applications in Residential Housing.** Same as Agricultural Mechanization 271 and Interior Design 271. See Agricultural Mechanization 271.
- 291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of chair of division. 3 to 5 hours.

292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of chair of division. 3 to 5 hours.
313. **Economics of Consumption.** Same as Economics 313. Introduces the concepts, theories, and methods for analysis of the micro and macro aspects of consumption; includes standards and content of consumption and description of consumption patterns and trends in the U.S.A. and selected other countries. Prerequisite: Economics 101 or equivalent; a course in statistics; junior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
314. **Consumption in Developing Countries.** Standards and actual levels of household consumption in developing countries, including food, housing, health care, and energy, with special emphasis on the role of women in household production and consumption. Prerequisite: Family and Consumer Economics 313, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
370. **Family Economics.** Same as Agricultural Economics 370, and Economics 346. Examines the economic welfare of American families: application of economic theory to the behavior of families and individuals with respect to time allocation between the home and the market; family forms; human capital accumulation; sex differences in income; income inequality; and poverty. Considers the role of public policy. Prerequisite: Economics 101 or equivalent; a course in applied statistics; senior standing. 3 hours, or $\frac{1}{2}$ to 1 unit. Students in family and consumer economics may receive 1 unit credit; students in agricultural economics may receive $\frac{3}{4}$ unit credit; and students in economics may receive $\frac{1}{2}$ unit credit.
371. **The Family as a Consuming Unit.** Analyzes choice-making, buying, using, and disposing of consumer goods by families from a social policy perspective. Prerequisite: 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
373. **Family Resource Management.** Focuses on the family as a problem-solving group with attention to the impact of decisions about resource use on various family environments and human resource development; applies management processes to personal and family life and its interdependence with work and public issues. Prerequisite: Junior standing and 9 hours in the social sciences; Family and Consumer Economics 270. 4 hours or 1 unit.
375. **Home Equipment.** Principles related to the selection, use, and care of household equipment; individual problems include library research of sources of information on equipment and laboratory evaluation of equipment. Prerequisite: Foods and Nutrition 231, Family and Consumer Economics 373, or Textiles and Apparel 380. 3 hours, or $\frac{3}{4}$ or 1 unit.
378. **Problems in Management, Equipment, and Housing.** Individual investigations on problems in the fields of family resource management, household equipment or housing. Prerequisite: Senior standing; Family and Consumer Economics 270 or 373 or 375. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
379. **Problems in Family, Consumer, and Consumption Economics.** Individual investigations and reports of specific problems in the field of family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313, 370, 371, or consent of instructor; senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
405. **Research Methods in Home Economics.** Same as Textiles and Apparel 405. See Textiles and Apparel 405.
413. **Consumption Economics.** Same as Economics 413. Examines theoretical and empirical analysis of consumer demand; topics include theory of consumer behavior, as well as extensions and applications in a static context (characteristics analysis and product quality, price indices, measurement of consumer welfare) and in a dynamic context (intertemporal choice, habit and stock adjustment modes, choice under uncertainty). Prerequisite: A course in microeconomic theory and a course in statistics. 1 unit.
470. **Seminar in Family and Consumption Economics.** Same as Agricultural Economics 470. Discussion of current topics and review of the literature in family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313 or 370, or consent of instructor. $\frac{1}{2}$ or 1 unit.
472. **Economics of the Family.** Discusses and analyzes advanced literature on the economics of the family, developed within the models of human capital and allocation of time; emphasizes the theory and empirical applications. Prerequisite: Economics 400 or 402; Economics 470 or Sociology 385, or equivalent. 1 unit.

493. **Advanced Studies in Family and Consumer Economics.** Research or practical experience with specific problems of limited scope. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{2}$ to 1 unit.
499. **Thesis Research.** 0 to 4 units.

Interior Design

160. **Residential Environments.** Design fundamentals utilized in the development and selection of housing to meet human needs; aesthetic, social, economic, structural, and functional aspects of residential environments. 3 hours.
161. **Interior Design Studio, I.** Theory and practice in the elements of interior design: design parameter development, graphic exercises to familiarize the student with tools used to communicate design. Primarily for students in the interior design curriculum. Prerequisite: Credit or concurrent registration in Interior Design 160. 3 hours.
162. **Interior Design Studio, II: Residential Alternatives.** Application of basic design theory to a variety of residential environments determined by special populations; open only to students in the Interior Design curriculum. Prerequisite: Interior Design 160 and 161. 3 hours.
164. **Computer Graphics Interior Design Studio.** Introduction to the computer with emphasis on computer-aided design as related to interior design. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Interior Design Internship.** A supervised, off-campus experience in interior design through a cooperative program with selected employers. Prerequisite: Interior Design 160, 161, 262, and 263. 4 hours.
260. **Interiors and Furniture, I.** Development of interior environments from prehistoric times to the nineteenth century in Europe with emphasis on the social, economic, political, and cultural aspects which influenced the development of architecture and furniture; consideration of the adaptation and use of period styles in contemporary interiors. Prerequisite: History of Art 112 or consent of instructor. 3 hours.
261. **Interiors and Furniture, II.** Continuation of Interior Design 260. Development of interior environments through the Federal Period in America and during the nineteenth and twentieth centuries in Europe and the United States; emphasizes the social, economic, political, and cultural influences on the evolution of the styles. Prerequisite: Interior Design 260. 3 hours.
262. **Interior Design Studio, III.** Designing of interiors and their components: emphasis on design theory, presentation techniques, and evaluation of design concepts. Prerequisite: Interior Design 161; General Professional Courses in Art and Design 118, 120 and 122; Textiles and Apparel 280. 3 hours.
263. **Interior Design Studio, V.** Examines characteristics, manufacturing processes, and application of materials as related to interior design, design process, and presentation. Prerequisite: Interior Design 262 or consent of instructor. 3 hours.
264. **Professional Practices for Interior Designers.** Indepth study of professional responsibilities of the interior designer, including: analysis of scope of services, workroom practices, and relations with trade and industry sources. Prerequisite: Interior Design 162. 3 hours.
271. **Engineering Applications in Residential Housing.** Same as Agricultural Mechanization 271 and Family and Consumer Economics 276. See Agricultural Mechanization 271.
272. **Structural Materials and Systems for Interiors.** Materials and construction methods utilized in interior environments with an emphasis on detailing. Prerequisite: Interior Design 162. 3 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
360. **Interior Design Studio, V.** Development of complete set of working drawings for an interior renovation delineating new materials in floor plans, elevations, sections, details, schedules, electrical and furniture layouts. Prerequisite: Interior Design 263 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

378. **Problems in Interior Design, Studio VI.** Individual investigations and reports of specific problems in the field of interior design. Prerequisite: Interior Design 360 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
380. **Colonial American Interior Design.** An analysis of regional variations of American furnishings, interior finishes, and architecture from colonization to 1783; considers historical, economic, social, political, and religious influences on design. Prerequisite: Interior Design 261. 3 hours or $\frac{3}{4}$ unit.
381. **Contemporary Interior Design.** Analyzes the contemporary design movement in Europe and America during the late nineteenth and twentieth centuries; considers the influences of technology, materials, economics, and artistic and social movements on the development of the decorative arts and architecture. Prerequisite: Interior Design 261. 3 hours or $\frac{3}{4}$ unit.
485. **Interior Design Seminar.** An advanced, multidisciplinary approach to current research in interior design. Prerequisite: 6 hours of interior design or a related field at the 300- or 400-level, or equivalent; consent of instructor. 1 unit.
493. **Advanced Studies in Interior Design.** Advanced research on a specific topic related to interior design; provides experience in one of the following types of research: laboratory, theoretical, historical, or a problem in design. Prerequisite: Interior Design 485. 1 unit.
499. **Thesis Research.** Interior design thesis research using design, laboratory, or theoretical methodologies to investigate specific topics. Prerequisite: Interior Design 485. 0 to 2 units.

Textiles and Apparel

182. **Apparel Production Analysis.** Introduces the nature and scope of apparel production methods in the U.S.; investigates new technology and apparel production methods; includes apparel design analysis, cutting production analysis, principles of apparel construction techniques, production control, quality control and cost control. 3 hours.
183. **Introduction to Textiles.** Introductory analysis and study of textile fibers, yarns, fabrications, finishes, and regulatory legislation; designed to improve consumer competence in selection, use, and care of textile products. Lecture and laboratory. Prerequisite: Chemistry 100 or exemption. 3 hours.
184. **Apparel Design and Selection.** A comprehensive overview of apparel design and selection of clothing for individual needs as they relate to the designing and marketing of apparel goods. Prerequisite: Introduction to Art and Design 185 or General Professional Courses in Art and Design 119; or consent of instructor. 3 hours.
190. **Cross-Cultural Analysis of Dress.** Cross-cultural variations in form, functions, and meaning of dress analyzed in relation to biological, psychological, and social needs of human beings. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Textile and Apparel Business Internship.** A supervised learning experience through a cooperative program with a textile and/or apparel related agency, business, or industry. Prerequisite: Sophomore standing; Textiles and Apparel 182, 183, or 184; consent of supervisor of internships. Not available to students on probation. 4 hours.
280. **Textiles for Interiors.** Analysis of criteria for selection of textiles, emphasizing aesthetics, comfort, durability, energy conservation, cost and safety considerations for private and public interiors, including transportation interiors; introduction to standards and specifications for textiles used in residential and commercial interiors. Prerequisite: Textiles and Apparel 183. 3 hours.
281. **Retailing of Home and Apparel Accessories.** Consumer analysis of accessory items of leather, fur, plastic, metal, glass, and china; includes technological, ecological, economic, and legislative aspects of each; develops analytical skills in evaluating quality of these materials. Prerequisite: Textiles and Apparel 183 or consent of instructor. 3 hours.
284. **Apparel Design for the Market.** Design of apparel for high fashion and mass fashion markets for various price levels and age groups through the development of color sketches; includes a survey of design sources that influence contemporary dress. Prerequisite: General Profes-

- sional Courses in Art and Design 120 or Introduction to Art and Design 186; Textiles and Apparel 184. 2 hours.
285. **History of Costume.** Costumes and their settings from the early Egyptian period through the middle of the twentieth century. 3 hours.
286. **Apparel Design: Flat Pattern.** Use of the flat pattern technique in designing and drafting clothing patterns; construction of two garments from patterns developed. Prerequisite: General Professional Courses in Art and Design 120, or Introduction to Art and Design 186; Textiles and Apparel 182; Textiles and Apparel 183 and 184. 3 hours.
287. **Dress and Human Behavior.** Applies selected principles from the behavioral and social sciences to the analysis of dress as it relates to human behavior; includes relevant historical and contemporary theory and research. Prerequisite: Sociology 201 or Psychology 201; or consent of instructor. 3 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of division. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of division. 3 to 5 hours.
295. **Textiles and Apparel in International Economy.** History of the development of fiber, fabric, apparel, and related industries; present structure, organization, domestic and international operation, and interrelationships of these industries; trends of the major sectors of the primary and secondary markets; and application of the principles of marketing to textiles and apparel. Prerequisite: Business Administration 202. 3 hours.
296. **Administrative Retailing.** Analysis of functions in a retail store with emphasis on textiles and apparel; relationship of the retailer to related primary and secondary markets and the consumer; and analysis of current trends and social influences in fashion retailing. Prerequisite: Business Administration 212. 3 hours.
350. **Textile and Apparel Business Practicum.** A cooperatively supervised field experience in management and administration in a textile or apparel business and/or industry. Only one unit may be applied to the total required for a graduate degree in Human Resources and Family Studies, TAID option. At the undergraduate level, only four hours may be applied to the total TAID courses required. Prerequisite: Major in Textiles, Apparel, and Interior Design; Textiles and Apparel 295 or 296; and consent of instructor. Not available to students on probation. 4 or 6 hours, or 1 or ½ units. May be taken during the same semester for up to 12 hours or 3 units.
380. **Advanced Textiles.** Examines chemical composition, polymer structure, and engineering potential of textile fibers; effect of chemical finishes and recycling procedures on performance characteristics of consumer textile products; and introduces physical and chemical metrology techniques useful for quality control and research purposes. Prerequisite: Textiles and Apparel 280, and Chemistry 102 or 103. 4 hours or 1 unit.
385. **History of Textiles.** Examines the aesthetic, technological, and cultural aspects of significant textiles produced by selected societies throughout history. 4 hours or 1 unit.
388. **Problems in Textiles and Clothing.** Individual problems in the fields of textiles, apparel, marketing, or textile design. Prerequisite: Senior standing; 3.5 grade-point average; consent of instructor; credit in one of the following: Textiles and Apparel 285, 286, 287, 294, or 380, or Business Administration 212. 2 to 4 hours, or ½ to 1 unit.
395. **Macroenvironment of Textile and Apparel Businesses.** An overview of consumer behavior as related to textiles and apparel; interrelationships of foreign and domestic textile and apparel markets; current research in retailing; and analysis of fashion marketing and retailing issues through the case study method. Prerequisite: Business Administration 212. 3 hours or ½ unit.
405. **Research Methods in Home Economics.** Same as Family and Consumer Economics 405. Theory and practice of empirical research methods that have application to such areas of home economics as textiles, apparel, interior design, and family and consumer economics. Prerequisite: An introductory course in statistics. 1 unit.
480. **Seminar in Textiles.** Reviews selected research literature in the field of textiles. Prerequisite: Textiles and Apparel 380 or equivalent; consent of instructor. ½ to 1 unit.
481. **Principles of Textile Metrology.** Examines textile metrology as a component of the production and use of textiles; includes case studies and investigative metrology. Prerequisite: Textiles and Apparel 380 and Agronomy 340. 1 unit.

482. **Textile Finishing: Theory and Development.** Examines developments in textile finishing technology to enhance the aesthetic and functional qualities of fibers and fabrics. Prerequisite: Textiles and Apparel 380 and Chemistry 131; graduate standing in textiles and apparel or a related area; consent of instructor. 1 unit.
483. **Social Psychology of Dress: Research and Theory.** Analyzes and evaluates recent developments in theory and research in the social psychology of dress; emphasizes the interpersonal process and social influences affecting apparel selection; focuses on future research directions and rationale of the directions in light of latest research. Prerequisite: A course in social psychology of dress, and another course in social psychology or a related area; consent of instructor. 1 unit.
484. **Analysis of Research in Apparel Marketing.** Analysis of apparel marketing emphasizing trends and future research directions. Prerequisite: A course in marketing and consent of instructor. 1 unit.
487. **Seminar in Apparel.** Reviews and analyzes selected theory and research in the apparel fields. Prerequisite: Graduate standing in textiles and apparel, or consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated as topics vary.
488. **International Economic and Marketing Structures of Textiles and Apparel.** Examines the history, policies, organization, performance, and trends of the international textile and apparel industries. Prerequisite: Textiles and Apparel 295 or equivalent; or consent of instructor. 1 unit.
493. **Advanced Studies in Textiles and Apparel.** Researches specific problems of limited scope. Students who do not write a thesis may substitute this course for Textiles and Apparel 499 when combined with 8 additional units for a master's degree. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.
499. **Thesis Research.** 0 to 4 units.

CRAFTS

(See Art and Design)

DEPARTMENT OF CURRICULUM AND INSTRUCTION

Head of Department: Theodore Manolakes

Department Office: 311 Education Building, 1310 South Sixth, Champaign

101. **Introduction to the Teaching of Secondary School Subjects.** A survey of recent developments in the teaching of secondary school subjects; assesses standard and new programs; and explores research and empirical evidence as they relate to effective teaching of secondary school subjects. Special sections are provided in English, mathematics, science, social studies, speech, and computer science. Experiences in school settings are provided in Curriculum and Instruction 219. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
209. **Preliminary Field Experience in Secondary Teaching.** To be taken during the sophomore year by continuing students at the University of Illinois in secondary education curricula of English, mathematics, science, social studies, and speech. For students transferring into these programs at the 60 or near 60-hour level from other colleges, universities, or junior colleges, the course may be taken during the first semester of their work on this campus. Includes at least 8 hours of visitation in public school classrooms, at least one microteaching lesson in the Teaching Techniques Laboratory, and one or more conferences with an advisor in teacher education. Students amass up to 10 hours of early field experiences toward the required total of 100 hours. 0 hours.
219. **Field Experience in Secondary Teaching.** Offered in conjunction with Curriculum and Instruction 101 in the secondary teacher education program in English, mathematics, science, social studies, speech, and computer science. Meets in subject area discussion sections one hour

per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in a school for at least two hours per week for the entire semester. Students amass at least 32 hours of early field experiences toward the required total of 100 hours. Prerequisite: Concurrent registration in Curriculum and Instruction 101. 0 to 2 hours.

229. **Field Experience in Secondary Education.** Offered in conjunction with Curriculum and Instruction 240 for students in secondary teacher education programs adopting this means of fulfilling early field experience requirements. Meets in discussion sections paralleling Curriculum and Instruction 240 sections for one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in school and community settings for at least two hours per week for the entire semester, thereby amassing at least 32 hours of early field experiences toward the required total of 100 hours. Registration is required in secondary teacher education programs adopting this means of fulfilling early field experiences requirements. Prerequisite: Concurrent registration in Curriculum and Instruction 240. 0 to 2 hours.
237. **Theory and Process in Elementary School Teaching.** Directed toward affecting prospective teacher insight with regard to classroom behavior in teaching; includes materials dealing with child learning, teaching theory, and elementary school curriculum. A six-week morning assignment to a public school classroom is part of the course structure. Prerequisite: Educational Policy Studies 201, Educational Psychology 236, and admission to the Elementary Education Teacher Education curriculum. 5 hours.
239. **Microteaching: Practice in Teaching Techniques.** Instruction and practice in basic teaching techniques; consideration of both teacher-centered and learner-centered techniques; systematic examination of each technique in terms of basic descriptive and evaluative procedures; and application of techniques to specific instructional situations. Students amass 32 hours of early field experiences (laboratory component) toward the required total of 100 hours. Prerequisite: Junior standing. 2 hours.
240. **Secondary Education in the United States.** Provides each specialized educational worker with a common orientation to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Experiences in school settings, required in some curricula, and provided in Curriculum and Instruction 229. Prerequisite: Curriculum and Instruction 101; Psychology 100; concurrent registration in Educational Policy Studies 201. 2 hours.
241. **Techniques of Teaching in the Secondary Schools.** Methods of teaching specific subject matter fields in the secondary school; special sections provided in the usual high school subjects. Prerequisite: Educational Policy Studies 201; Curriculum and Instruction 240; concurrent registration in Educational Practice 242; consent of instructor. 3 to 5 hours.
247. **Teaching of Speech.** Same as Speech Communication 247. A study of methods and materials used in teaching speech in the high school. Prerequisite: Senior standing. 3 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 or 3 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
300. **Workshop and Laboratory in Curriculum Development.** Curriculum development projects in specialized fields of education. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units toward any one degree.
310. **Alternative Approaches to Classroom Instruction.** Improvement of classroom instruction through a study of alternative approaches to teaching with emphasis on demonstration teaching and the development of skill in observing and analyzing teaching. Prerequisite: Curriculum and Instruction 241 and Educational Psychology 211, or equivalents; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
320. **Foundations of Early Childhood Education.** The study of the role of the early childhood teacher in designing, organizing, and implementing educational programs for children in preschools, kindergartens, and the first three grades of the elementary school; includes the

- history, philosophy, and theory of early childhood education; includes morning school practicum providing at least 90 hours of early field experience. Prerequisite: Admission to the Early Childhood Teacher Education Curriculum; Educational Psychology 236; Educational Policy Studies 201. 5 hours or 1 unit.
321. **Principles and Practices in Early Childhood Education.** Studies the principles and practices of using play as an educational tool in early childhood education; reviews historical, philosophical, and psychological foundations of nursery-kindergarten methods; assesses techniques relating play to various aspects of instruction; surveys materials and equipment; and presents methods of classroom evaluation. Prerequisite: Curriculum and Instruction 320. 3 hours, or $\frac{1}{2}$ or 1 unit.
322. **Parent Involvement Techniques for Teachers.** Principles and practices in working with parents in programs of involvement, education, and participation for elementary and early childhood teachers; includes techniques of reporting to parents, counseling with parents, guiding parent participation in schools, and developing relations with community agencies. Prerequisite: Curriculum and Instruction 320 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
324. **Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Human Development and Family Studies 305. See Foods and Nutrition 305.
330. **Principles and Practices in Mathematics Education.** Organization, scope, and sequence of the mathematics program and the functional nature of mathematics; methods, techniques, experiences, and materials of value in teaching mathematics, and the role of classroom teacher. Prerequisite: Curriculum and Instruction 237 or 320; Mathematics 201 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
335. **Computer-Assisted Instruction.** Same as Computer Science 317. Computer-assisted instruction (CAI) and its relation to classroom teaching; the teacher's role in development, management, and criticism of CAI lessons; treatment of topics including instructional capabilities of CAI systems, instructional programming, and the design of CAI lessons. Prerequisite: 100 level Computer Science course, or Computer Science 400, or consent of instructor. 4 hours or 1 unit.
336. **The Computer and Mathematics Education.** Examines the role of the computer as an instructional tool in the secondary school mathematics classroom; reviews curricular materials and develops sample classroom projects in computer mathematics; analyzes computational problems and develops algorithms for their solution; and includes iteration, Monte Carlo methods, and simulation. Prerequisite: Computer Science 101 or 400, or consent of instructor. 4 hours or 1 unit.
340. **Principles and Practices in Science Education.** The principles, place, and practice of science education in the school and in the lives of children; stresses the functional nature of science and its place in the curriculum; and considers the organization of the science program, experiences and techniques of value in teaching, and the role of the classroom teacher and specialist. Opportunity for experience in field and laboratory work. Prerequisite: Curriculum and Instruction 237 or 320; two years of college science. 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Principles and Practices in Social Studies Education.** Emphasizes the role of social studies education in the school; the formal instructional program in social studies, including the knowledge, skills, and sensitivities to be taught; the teaching strategies and materials employed; and the organization of learning experiences and the total program in addition to the educative impact of the school as a social system. Prerequisite: Curriculum and Instruction 237 or 320; junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
346. **Culture in the Classroom.** Overview of the social and cultural factors that affect learning and teaching, and application of cultural information to curriculum development, classroom practices, and evaluation. 3 hours, or $\frac{1}{2}$ or 1 unit.
360. **Principles and Practices in Language Arts Education.** Goals, content, and teaching problems involved in the devising of programs in the area of language arts that are cumulative and sequential. Prerequisite: Curriculum and Instruction 237 or 320. 3 hours, or $\frac{1}{2}$ or 1 unit.
367. **Principles and Practices in Teaching Literature to Children and Youth.** Examines literature written for children and youth and the uses of literature in the school curriculum. Prerequisite: Curriculum and Instruction 237 and 320 and one college course in literature. 3 hours, or $\frac{1}{2}$ or 1 unit. Students may not receive credit for both Curriculum and Instruction 367 and Library and Information Science 303.

370. **Principles and Practices in Reading Education.** Basic principles, techniques, and materials for the developmental reading program; emphasizes methods and materials which provide for differentiated instruction. Prerequisite: Junior standing; Curriculum and Instruction 237 or 320. 3 hours, or $\frac{1}{2}$ or 1 unit.
371. **Principles and Practices for Fostering Independence in Reading.** Comprehension, study, and reference skills as they pertain to reading in the content fields; appropriate for elementary and junior high school majors, K through Grade Eight. Prerequisite: Curriculum and Instruction 370. 3 hours, or $\frac{1}{2}$ or 1 unit.
372. **Teaching of Reading in Grades Four Through Twelve.** Developmental reading programs beyond the primary grades; factors related to reading speed and comprehension; vocabulary development, specific comprehension skills, study skills, and reading interests and tastes. Prerequisite: Curriculum and Instruction 370 or Education Psychology 211; junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
399. **Issues and Developments in Education.** A seminar course on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
400. **Elementary School Classroom Programs.** Explores organizational centers for determining selection and sequence of educative experiences in the elementary school classroom; emphasizes the role of the teacher in curriculum construction. 1 unit.
401. **Fundamentals of Curriculum Development.** Examines a variety of definitions of curriculum developments; readings reflect current theories and research related to substantive issues in the field; how learning is influenced by stated goals of education, cultural background of the learners, structure of the school setting, competencies of teachers, psychological characteristics of the learners, and means of measuring student achievement. 1 unit.
402. **Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Vocational and Technical Education 448. See Administration, Higher, and Continuing Education 448.
407. **Problems and Trends in Specialized Fields.** An intensive examination of problems and trends in the subject fields. 1 unit. May be repeated to a maximum of 2 units.
409. **Curriculum Research.** Reviews the principle methodologies used in research on curriculum problems; emphasizes subject-analytical, large-scale survey, experimental, case methods, and clinical studies; emphasizes the conceptual and practical problems in such research. Prerequisite: Education 400 or equivalent. 1 unit.
410. **Linguistic and Logical Analysis of Teaching.** An analysis of teaching from the standpoint of semantic and logical factors; discussion of topics such as theories of meaning, definition, explanation, and justification as employed by a teacher. 1 unit.
414. **Principles of In-Service Education.** Examines theoretical constructs relating to continuing professional growth with particular emphasis on incentive structures and on the organization, delivery, and evaluation of professional development activities. Prerequisite: Curriculum and Instruction 400 and 401. 1 unit.
415. **Theory and Practice of Staff Development.** Surveys the relationship between curriculum change and staff development; gives primary attention to various forms of curricular modification and corresponding staff development requirements; in addition, compares alternative approaches to staff development in order to determine their specific applicability in instructional improvement. Prerequisite: Curriculum and Instruction 414 (recommended), or 400, or 401. 1 unit.
416. **Clinical Supervision of Instruction.** Same as Administration, Higher, and Continuing Education 433. Designed for persons concerned with supervision of classroom instruction. Principally concerned with strategies for helping teachers realize their full professional potential; considers techniques of classroom observation, analysis of observations, and interaction skills; and uses video, audio, and printed protocols to develop observation and analytic skills, and role playing techniques to foster interaction skills. Prerequisite: Practice teaching. 1 unit.
417. **Interventions Used in Programs of Teacher Education.** Considers several teacher education programs, including conventional, humanistic, reinforcement, technical skills, and teacher competencies programs, in terms of selection and retention of candidates, professional preparation, general education and governance. Prerequisite: Satisfaction of college foundations

- requirements (Educational Psychology 311 and 312, and two $\frac{1}{2}$ unit courses in social and philosophical foundations within Educational Policy Studies). 1 unit.
418. **Evaluation of Educational Programs.** Same as Educational Psychology 451. Origins, assumptions, applications, and development of approaches to educational program evaluation in practice over the past twenty years; unobtrusive measures and noneducation evaluation systems; and practice in collecting evaluative data. Prerequisite: Educational Psychology 390, one year of work with children or youth in an institutional setting, or consent of instructor. 1 unit.
419. **Methods of Child Study.** Studies ways in which teachers can evaluate child behavior and development with emphasis on classroom application; instruction and practice in the use and interpretation of observations, anecdotal records, rating scales, interviews, achievement tests, intelligence tests, questionnaires, and sociometric and projective techniques. Prerequisite: Educational Psychology 312 or consent of instructor. 1 unit.
420. **Programs in Early Childhood Education.** Advanced course intended primarily for teachers and supervisors of younger children, ages three to eight; reviews and analyzes research findings, experimentation, and current trends in curriculum organization, procedures, and materials essential to developing classroom programs for children. 1 unit.
421. **Curriculum Problems and Trends in Early Childhood Education.** Includes principles underlying education practices in day care centers, preschool/nursery and kindergarten settings derived from theory and research in developmental psychology, social psychology, anthropology, and other related disciplines. 1 unit.
430. **Trends and Issues in Mathematics Education.** Deals with theories of learning, research studies, curriculum development projects, and other events which have influenced elementary mathematics programs; also considers problems and issues in contemporary programs. Prerequisite: Curriculum and Instruction 400 or 420. 1 unit.
431. **Development of Mathematics Programs.** Deals with procedures for developing curricula in the major content areas of mathematics and alternative instructional procedures. Prerequisite: Curriculum and Instruction 330 or equivalent; or consent of instructor. 1 unit.
435. **Theory and Design of Instructional Simulations.** Introduces theory and design of interactive simulations for teaching decision making in schooling/training situations; includes introduction to models of simulation, a process of simulation construction, identification and interpretation of learning outcomes, computer implementation of selected simulations. Prerequisite: Curriculum and Instruction 335; Computer Science 300 or equivalent. 1 unit.
440. **Current Issues in Science Education.** Advanced seminar in science education for teachers, consultants, and administrators. Identifies major problems and issues; analyzes current trends and research; and develops a philosophical framework related to science education. Prerequisite: Curriculum and Instruction 340 or equivalent, and two years of college science; or consent of instructor. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairperson prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units with consent of advisor and department head.
460. **Research and Trends of the Language Arts Curriculum.** Investigates research, trends, issues, and innovative practices for teachers and educators on the teaching of the language arts; identifies and develops procedures for organizing and implementing new knowledge and research into the school curriculum. Prerequisite: Curriculum and Instruction 360 or equivalent. 1 unit.
461. **Theory and Practice in Children's Composition.** Studies composition or writing, its beginning and progress, gives particular attention to the relationship between creativity and imagination and the basic skills of punctuation, spelling, and other conventions of writing; and examines research studies on functions of writing, motivation, and purposes for writing during the school years. Prerequisite: Curriculum and Instruction 360 or equivalent. 1 unit.
462. **Linguistics and the School Curriculum.** Analyzes linguistics for the school curriculum including dialect diversities, new theories of grammar, lexicography, and variations in oral and written forms of language; gives attention to how teachers apply these principles in the con-

struction or language arts programs. Prerequisite: Curriculum and Instruction 360, or credit in a course in English grammar or linguistics. 1 unit.

467. **Children's Literature and the School Curriculum.** Investigates trends and issues related to teaching literature in the school; focuses attention upon the organization and planning of a balanced literature curriculum (fictional and informational). Prerequisite: Curriculum and Instruction 367 or Library and Information Science 304; and English 101, 103, 106, 115, 116, or consent of instructor. 1 unit.
468. **Contemporary Classics in Children's Literature.** Critically examines children's books that have received major national and international awards and prizes and the requirements for that distinction; gives particular attention to the most recent publications so honored and their implications for use in the classroom. Prerequisite: Curriculum and Instruction 367 or 467, or Library and Information Science 304; and English 106 or 215, or equivalent; or consent of instructor. 1 unit.
470. **Issues and Trends in Reading.** The timing of beginning reading, the influence of certain linguists on methodology and terminology in instructional materials, and the influence of research on methodology are dealt with in a way that provides a historical perspective for evaluating the merit of emerging issues and trends. Prerequisite: Curriculum and Instruction 370. 1 unit.
471. **Field Instruction in Reading Programs.** Directed practice in the area of reading; students are placed in an approved and supervised field position for part of the semester. 1 unit.
472. **The Organization and Supervision of School Reading Programs.** Studies procedures for planning, improving, and evaluating reading programs on a system-wide basis. Open only to those persons who are preparing to supervise reading programs or with approval of graduate adviser. Prerequisite: Curriculum and Instruction 475. 1 unit.
473. **Reading Instruction in Nursery School Through Grade Three.** Planning and evaluating reading instruction and materials in nursery school through Grade Three. Prerequisite: Curriculum and Instruction 370 or 371, or equivalent; or consent of instructor. 1 unit.
475. **Corrective Reading Instruction in the Classroom.** Nature, causes, and diagnosis of reading difficulties; translation of diagnostic information into instructional practice. Prerequisite: Curriculum and Instruction 370 or 371, or equivalent. 1 unit.
476. **Clinical Diagnosis and Remediation in Reading.** Supervised experience in the reading center; special attention to evaluative and interpretative techniques in cases of severe reading disabilities based on the analysis of specific reading needs. Prerequisite: Curriculum and Instruction 475; a course in individual mental testing. 1 unit. May be repeated to a maximum of 2 units.
477. **Clinical Practicum in Corrective Reading.** Diagnostic procedures and individual instruction with small groups of children who have reading difficulties. Prerequisite: Curriculum and Instruction 475. 1 unit.
490. **Seminar for Advanced Students of Education.** Prerequisite: Admission to doctoral study. 0 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Prerequisite: Admission to doctoral study. 1 to 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

DANCE

Head of Department: P. K. Knowles

Department Office: 4-501 Krannert Center for the Performing Arts, 500 South Goodwin, Urbana

100. **Introduction to the Art of Dance.** A survey of major works, figures, and trends in ballet, modern dance, and the dance of musical theatre from the late seventeenth century to the present; lectures supplemented with videotapes and lecture-demonstrations by visiting artists. For non-dance majors. 3 hours.

101. **Beginning Modern Dance.** Introduction to basic dance technique and movement improvisation; the study of motion as an art, group relationships in improvisation, and discussion of choreographic ideas. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
102. **Intermediate Modern Dance.** Intermediate dance technique and improvisation. For nondance majors. Prerequisite: Dance 101 or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
105. **Jazz.** Introduction to basic dance technique and stylistic work in the jazz idiom. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
106. **Jazz Dance, II.** A progressive development of the concepts and skills in Dance 105. For nondance majors. Prerequisite: Dance 105 or equivalent; or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
107. **Ballet Fundamentals, I.** Introduction to ballet for nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
108. **Ballet Fundamentals, II.** A progressive development of the concepts and skills in Dance 107; for the nondance major. Prerequisite: Two semesters of Dance 107 or equivalent; consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
130. **Performance Practicum, I.** Performance laboratory involving the rehearsal and performance of student works under faculty supervision and/or works by faculty and visiting artists. Prerequisite: Consent of instructor. 1 to 3 hours (1 or 2 hours credit per dance). A maximum of 16 hours of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
131. **Production Practicum.** Practical experience in the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. 1 or 2 hours (1 hour credit per concert up to 2 hours per semester). May be repeated to a maximum of 6 hours.
150. **Orientation to Dance.** A survey of the field including dance as a theatre art, careers, injury prevention and nutrition. Also serves to orient incoming students to the faculty, programs, and policies of the Department of Dance, and the production and performing resources in the Krannert Center for the Performing Arts. Prerequisite: Major standing in Dance or consent of instructor. 2 hours.
160. **Modern Technique, I.** Elementary technique for majors with emphasis on a conceptual understanding of movement principles and the development of technical skill and performance sensitivity. Prerequisite: Departmental audition. 1 to 3 hours. May be repeated to a maximum of 18 hours.
162. **Improvisation, I.** Experience in selective, basic processes of movement involvement, both individual and group; special attention to organic, economical bodily use, the dynamics and quality of which are necessary to the activity being performed. 1 hour.
163. **Improvisation, II.** Continuation of Dance 162, with emphasis on expanding bodily activity into various existing or created performing environments; use of sound and music, body coverings, and properties; and special attention to relating these experiences to dance composition. Prerequisite: Dance 162 or consent of instructor. 1 hour.
164. **Beginning Composition.** Theory and practice in principles of dance composition; emphasis on solo creative work using various approaches to composition. Prerequisite: Dance 163 or consent of instructor. 2 hours.
166. **Ballet, I.** Elementary ballet for dance majors; emphasizes placement, refinement of adagio, pirouette, jumps, and connecting steps. 1 or 2 hours. May be repeated to a maximum of 8 hours.
168. **Music Theory for Dancers.** An introduction to basic music theory with a concentration on rhythm. The first half of the semester will concentrate on 1) learning, understanding, and being conversant in basic music parameters; 2) analytical listening; 3) notation; 4) transcripts; 5) reading notation/following a score; 6) performance of simple rhythm patterns. The second half will deal with form and formal analysis as it relates to choreography, as well as more advanced parameters of music theory. Prerequisite: Major standing in Dance. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated to a maximum of 9 hours.
243. **Creative Dance for Children.** Introduction to theories and methods of teaching dance to children, grades 1-5; includes twenty-four hours of assistance, observation, and supervised

- practice teaching in class situations. Prerequisite: Dance 164 and 260, or consent of instructor. 3 hours.
250. **Dance Forms.** Introduction to movement skills and stylistic elements of theatrical and folk forms to be chosen from tap, character, jazz, preclassic and Renaissance forms, and dances of other cultures. Prerequisite: Dance 160 or 166. 1 hour. May be repeated to a maximum of 4 hours.
260. **Modern Technique, II.** A progressive development of the concepts in Dance 160, with emphasis on the qualitative and definitive performance of a variety of technical styles. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours. May be repeated to a maximum of 18 hours.
264. **Intermediate Composition.** Experience in choreographing a minimum of one solo and two small group works utilizing various approaches to choreographic form. Prerequisite: Dance 164 or consent of instructor. 2 hours.
266. **Ballet, II.** Intermediate ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 166, with emphasis on technical development and extended movement combinations. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
269. **Music Literature for Dancers.** Basic analysis of representative pieces from the renaissance, baroque, classical, romantic, and modern periods, emphasizing music of the twentieth century. Students learn to recognize general stylistic characteristics of each period and to understand dance forms related to the music. Prerequisite: Dance 168, or equivalent and consent of instructor. 3 hours.
328. **Composer-Choreographer Workshop.** Same as Music 328. For experienced composers and choreographers; explores the many relationships between musical composition and choreography. Prerequisite: For dance majors, Dance 264 or consent of instructor; for music majors, Music 106 or equivalent, other compositional experience, and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
330. **Performance Practicum, II.** Laboratory for the rehearsal and performance of concert works by graduate choreographers, faculty, and guest artists. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit (1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
331. **Production Practicum.** Practical experience in all aspects of the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. Prerequisite: Dance 131 or equivalent, and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit (1 hour or $\frac{1}{4}$ unit credit per concert up to 2 hours or $\frac{1}{2}$ unit per semester). May be repeated to a maximum of 6 hours or $\frac{1}{2}$ unit.
335. **Dance Repertory Workshop.** Experience in learning, rehearsing, and perfecting concert dance pieces under the direction of experienced choreographers. Prerequisite: Enrollment in advanced technique course; consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
340. **History of Dance, I.** A survey of dance from its beginnings in primitive societies through the early nineteenth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
341. **History of Dance, II.** A survey tracing the development of dance from the rise of Romanticism through the twentieth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
345. **Theories and Fundamentals of Movement.** Approaches to increasing ease and efficiency of movement, including theories of Sweigard, Laban, Bartenieff, Alexander, Feldenkrais, and Rolf. Emphasis on alignment, connectedness, body awareness, strength, and mobility, in pedestrian and dance movement. Introduces study of human anatomy and dance kinesiology. Prerequisite: Major standing in dance, or consent of instructor. 3 hours or $\frac{1}{4}$ unit.
346. **Theory and Philosophy of Dance.** Study of the relationship of aesthetic principles and dance theory to a philosophy of dance in education and of dance as a performing art. Prerequisite: Dance 341 or consent of instructor. 3 hours or 1 unit.
347. **Labanotation, I.** Fundamentals of labanotation, including theory, reading, and writing; introduction to effort/shape analysis. Prerequisite: Dance 260 or consent of instructor. 3 hours or 1 unit.

348. **Labanotation, II.** Intermediate level theory and vocabulary of movement notation, including reading, writing, and or special projects. Prerequisite: Dance 347. 3 hours or $\frac{3}{4}$ or 1 unit. Graduate students enrolled for one unit credit will be expected to do additional reading and writing projects.
351. **Independent Study and Special Topics.** Special projects in research or creative investigation taught on an individual or class basis. Prerequisite: Junior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated for a maximum of 8 hours or 2 units, which may be counted toward degree requirements.
360. **Modern Technique, III.** A progressive development of the concepts in Dance 260, with emphasis on virtuosity and versatility. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 18 hours or 2 units.
363. **Improvisation, III.** Advanced improvisational techniques and forms; theory and practice in advanced concepts of creative improvisational human movement as an overt public art form. Prerequisite: Dance 264 or equivalent. 1 hour or $\frac{1}{4}$ unit.
365. **Advanced Composition.** Choreography for the experienced student; includes performance of at least one original work. Prerequisite: Dance 264 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
366. **Ballet, III.** Advanced ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 266. For dancers of advanced technical level with the ability to execute the ballet vocabulary; includes fundamentals of pointe work. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 8 hours or 1 unit.
369. **Accompaniment for Dance.** Same as Music 369. Theory and practice of musical accompaniment. Will survey and utilize recordings of modern and ballet accompaniment. Prerequisite: Dance 168 (for dance majors). Consent of instructor (for music majors). 1 hour or $\frac{1}{4}$ unit.
410. **Professional Seminar.** Survey of professional organizations, publications, scholarly resources, and trends, culminating in student presentation of projects examining current issues in the field. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit.
420. **Problems in Teaching and Administration.** Recent developments in the teaching of dance, including standards for major programs, curricula planning, performance experiences, administration, evaluation, and theoretical approaches to the teaching of studio courses. Prerequisite: Dance 410. 1 unit.
430. **Dance Touring Company.** A repertory ensemble for the performance of lecture-demonstration programs, off-campus concerts, and short-term residencies; rehearsal and performance of works by resident faculty and guest choreographers. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
431. **Production Practicum.** Practical experience in the technical, design, and administrative aspects of production in conjunction with department concerts. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit. May be repeated to a maximum of 1 unit.
450. **Independent Research.** Independent research of a historical, contemporary, philosophical, or educational facet of dance under the guidance of a faculty advisor. Prerequisite: Dance 340, 341, 346, and 410, or equivalent and consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 1 unit.
451. **Supervised Teaching.** Practical teaching experience under the supervision of a faculty member; weekly conference devoted to evaluation and planning. Teaching areas include major and nonmajor university courses and classes for community adults and children. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units with consent of instructor as topics vary.
460. **Modern Technique, IV.** Modern technique for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.
465. **Choreography.** A structured creative utilization of formal choreographic elements in the creation, rehearsal, staging, and performance of original dance works. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit.
466. **Ballet, IV.** Ballet for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.

475. **Production for Dance.** Examines theoretical and practical aspects of dance production with emphasis on lighting and costuming; includes scenery and props, make-up, audio, video, stage management, and public relations. The design and execution of costumes for a dance production is a required culminating project. Prerequisite: M.F.A. candidacy in dance; Dance 465; concurrent registration in Dance 498. 1 unit.
498. **Creative Project in Dance.** The design, implementation, and completion of a culminating creative project in choreography and/or performance. Prerequisite: Seven units of graduate work in dance, including one unit in choreography. 1 unit. May be repeated to a maximum of 2 units.

ECOLOGY, ETHOLOGY, AND EVOLUTION

Head of Department: L. L. Getz

Department Office: 515 Morrill Hall, 505 South Goodwin, Urbana

105. **Environmental Biology.** Introduction to ecological principles in relation to understanding environmental problems; emphasizes impacts upon ecosystems by human activities such as air and water pollution, usage of pesticides and pest control measures, expansion of agriculture in tropics and arid regions, harvesting the oceans, and development of energy sources. 3 hours.
109. **Sociobiology: The Evolution of Social Behavior.** Same as Anthropology 109. Examines the functional basis of social behavior in animals and humans; explores concepts such as altruism, kin selection and sexual behavior; discusses the "sociobiology debate"; evaluates recent applications of sociobiological concepts to human behavior. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Anthropology and Human Development and Family Ecology 143. See Anthropology 143.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Behavior of Domestic Animals.** Same as Animal Science 203. See Animal Science 203.
212. **Basic Ecology.** Lecture, discussion, laboratory, and field course dealing with the relationships between organisms and their environment; introduction to physiological bases for adaptations, population dynamics, community organization, and the structure and function of ecosystems. Prerequisite: One year of biology or concurrent registration in Biology 111. 5 hours. (Counts for advanced hours in LAS.)
232. **Comparative Vertebrate Anatomy.** Classification and comparative anatomy of vertebrates including functions and evolution of their organs and organ systems. Prerequisite: Biology 111 or equivalent. 5 hours. (Counts for advanced hours in LAS.)
243. **Natural History and Social Behavior of the Great Apes.** Same as Anthropology 243. See Anthropology 243.
246. **Vertebrate Social Organization.** Same as Anthropology, Psychology, and Sociology 246. Introduction to the biosociology of vertebrates; emphasis on the behavioral, physiological, and population aspects of vertebrate social organizations, from fishes to primates. Prerequisite: One year of introductory biology. 3 hours. (Counts for advanced hours in LAS.)
290. **Special Topics.** Supervised participation in research and scholarly activities in ecology, ethology, or evolution, usually as an assistant to the instructor. Prerequisite: Two years of life sciences or cognates, advanced standing, and consent of instructor. 1 to 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
294. **Individual Topics.** Supervised independent investigation of individual topics in ecology, ethology, and evolution; requires a written report to instructor. Prerequisite: Two years of life sciences or cognates, advanced standing, and consent of instructor. 2 to 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined

maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.

301. **Introduction to Evolutionary Biology.** Introduction to the evidence for evolution and the origin and types of genetic variation, stressing various modes of selection and modern observations and experiments illustrating the evolutionary process. Prerequisite: Biology 210 or equivalent. 3 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Ecology, Ethology, and Evolution 301 and Biology 107.
302. **Molecular Evolution.** Introduction to evidence for evolutionary change at the molecular and cellular levels of organization; origin and changes in macromolecules, genes, cells, and their organelles emphasized. Prerequisite: Biology 210 or equivalent. 3 hours or $\frac{3}{4}$ unit.
311. **Evolutionary Ecology.** Emphasizes the evolution of life-history strategies in plants and animals (reproductive rates, life cycles, sex ratios, breeding and mating systems) and the coevolution of animals and plants (pollination, dispersal, and herbivory). Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
320. **Invertebrate Zoology.** Invertebrates; structure and development; application of biological principles; specific and comparative morphology of the invertebrates; and coordination of structure and function, origin, development, and life histories. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit. Offered in alternate years.
332. **The Evolution of Adaptive Systems.** Evolutionary mechanisms underlying adaptations; emphasizes origin and subsequent modification of major complex systems; pertinent evidence considered from several disciplines, including population biology, developmental biology, structural analysis and paleobiology. Prerequisite: Biology 210. 3 hours or $\frac{3}{4}$ unit.
335. **Ornithology.** Structure, function, ecology, behavior, and evolution of the birds of the world; laboratory devoted to anatomy and identification; and field studies devoted to identification and behavior of birds. Independent research project and two optional weekend field trips. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit. Offered in alternate years.
336. **Mammalogy.** Classification, distribution, life history, evolution, and identification of mammals. Lecture, laboratory, and field work. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit. Offered in alternate years.
339. **Field Vertebrate Natural History.** Laboratory and field course. An intensive study of North American vertebrates with emphasis on vertebrates of Illinois; taxonomy, life histories, habitats, and feeding habits of all the common resident species. Prerequisite: Biology 111 or equivalent. 4 hours or 1 unit.
340. **Natural History of the Vertebrates.** Lectures on vertebrate adaptations for survival and reproduction. Prerequisite: Biology 111 or equivalent, and junior standing. 3 hours or $\frac{3}{4}$ unit.
342. **Fish and Wildlife Ecology.** Application of ecological principles and modeling to management of fish and wildlife populations; significance of abiotic and biotic factors, including life-history parameters in population growth and management; and techniques and procedures for the development of management strategies for animal populations, emphasizing vertebrates. Prerequisite: Biology 111 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit.
343. **Limnology.** Fresh water biology; study of the lake, pond, and river with emphasis on the physical environment as well as on the plants and animals which live in fresh water. Lectures, discussions, laboratory, and field work. Prerequisite: Biology 111 or equivalent. 5 hours or 1 unit.
344. **Introduction to Primate Morphology and Behavior.** Same as Anthropology 343. See Anthropology 343.
345. **Population and Community Ecology.** Characteristics of populations and their evolution, population dynamics and regulation, and organization and structure of communities; lecture and field research projects. Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit. Offered in alternate years.
346. **Animal Behavior.** Same as Animal Science and Anthropology 346. An introductory course emphasizing how patterns of behavior promote survival, change through evolution, and are modified by the environment. Prerequisite: Biology 111 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

347. **Animal Behavior Laboratory.** Same as Animal Science and Anthropology 347. An introduction to observational, statistical, and experimental techniques in the field, through the completion of four projects (sequence analysis, variation in FAP's, acoustic discrimination and orientation, and biological rhythms); formal reports are written for each project. Prerequisite: Ecology, Ethology, and Evolution 346 or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
348. **Wildlife and Land Management.** Same as Forestry 348. Introduces principles of wildlife management; applies those principles to land management problems, especially forestry, range, and agricultural land-uses as they relate to aquatic and terrestrial wildlife; and discusses techniques for evaluating and improving wildlife populations. Prerequisite: Botany 100 and Biology 104 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Credit may not be received for both Ecology, Ethology, and Evolution 342 and 348. Offered in alternate years.
350. **Behavior-Genetic Analysis.** Same as Anthropology and Psychology 342. See Psychology 342.
352. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Psychology 347. See Psychology 347.
353. **Hormones and Behavior.** Same as Psychology 343. Survey of the behavioral effects of hormones in vertebrates and invertebrates; emphasizes the extensive literature on hormonal effects on reproductive and social behavior. Students enrolled for graduate credit may write a term paper for an extra $\frac{1}{4}$ -unit credit. Prerequisite: Biology 111 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
359. **Aquatic Ecology.** Same as Civil Engineering 347. See Civil Engineering 347.
382. **Advances in Ethology: Behavior of Marine Animals.** A survey of behavioral adaptations and the ecological and evolutionary forces which have shaped them, as revealed by studies upon marine invertebrate and vertebrate groups. Prerequisite: Biology 111; consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
383. **Advances in Ethology: Behavioral Ecology.** An in-depth examination of areas of current interest at the interface of behavior, ecology, and evolution; focuses on communication, foraging, and social behavior. Prerequisite: Ecology, Ethology, and Evolution 212 and 346 or, consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
407. **Current Concepts in Evolution.** Examines current topics in evolutionary biology, including concepts such as modes of speciation, punctuated equilibrium vs. gradualism, neutralism, macroevolution, and molecular clocks. Prerequisite: Ecology, Ethology, and Evolution 301 or equivalent. 1 unit.
443. **Problems in Primate Behavior and Ecology.** Same as Anthropology 443. See Anthropology 443.
444. **Concepts in Ethology.** Discussion, review, and critical analysis of general concepts and specific problems in behavior with new topics each semester. Prerequisite: Ecology, Ethology, and Evolution 346. $\frac{1}{2}$ unit. May be repeated.
445. **Seminar in Fish and Wildlife Ecology.** Modern ecological principles and concepts to specific problems in fisheries and wildlife. Prerequisite: Ecology, Ethology, and Evolution 342 or 345, or equivalent. $\frac{1}{2}$ unit. Offered in alternate years.
452. **Concepts in Ecology.** Discussion, review, and critical analysis of general concepts and specific problems in ecology with new topics each semester. Prerequisite: An advanced course in ecology or consent of instructor. $\frac{1}{2}$ unit. May be repeated.
490. **Individual Research.** Individual topics in research conducted under the supervision of faculty members in the Department of Ecology, Ethology, and Evolution. Prerequisite: Consent of adviser. $\frac{1}{2}$ to 3 units.
491. **Topics in Population Biology.** Lecture and discussion of problems in population biology, with a different topic each semester. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 4 units.

ECONOMICS

Chair of Department: Daniel Orr

Department Office: 330 Commerce Building (West), 1206 South Sixth, Champaign

101. **Introduction to Economics.** A general survey of the operation of the economic system; emphasizes the determination of the level of national income, the pricing and allocation of products, and factors of production under existing conditions in the United States. 4 hours.
109. **Current Economic Problems.** An economic analysis of specific economic problems dealing with poverty, economic development, international economics, and other contemporary issues. Prerequisite: Credit or concurrent registration in Economics 101. 1 hour.
171. **Introductory Economic Statistics.** Introduces statistical methods as applied in economics and other social sciences: descriptive statistics, probability theory, and distributions; sampling methods and distributions; estimation and hypothesis testing; and simple regression. For non-commerce students only. Prerequisite: Credit or concurrent registration in Mathematics 134 or equivalent. 3 hours. Credit is not given for Economics 171 if student has credit for any of the following: Economics 172 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Health and Safety Studies 321; Forestry 321; Geography 185 or 370; Social Work 327; or Statistics 100, 210, 310, or 311.
172. **Economic Statistics, I.** An introduction to the modern theory and methodology of statistics in the areas of economics and business; topics include descriptive statistics, probability theory, sampling theory and methodology, sampling distributions, estimation, and hypothesis testing. Prerequisite: Credit or registration in Mathematics 134 or equivalent. 3 hours. Students may not receive credit for Economics 172 if they have received credit for Economics 171 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Forestry 321; Geography 185 or 370; or Statistics 100, 210, 310, or 311.
173. **Economic Statistics, II.** Continuation of Economics 172. Emphasizes estimation and hypothesis testing for the linear statistical model; topics include contingency tables, goodness of fit, single and multiple regression, correlation, Bayesian decision theory, time series analysis, and index numbers. Prerequisite: Economics 172; Mathematics 134 or equivalent. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
214. **Introduction to Public Finance.** A general survey of the economics of the public sector at the federal, state, and local levels, including government expenditures, public budgeting, cost-benefit analysis, principles of taxation, tax reform, and intergovernmental fiscal relations. Prerequisite: Economics 101 or equivalent. 3 hours. Credit is not given for Economics 214 if the student has credit for Economics 314. Current or prospective economics majors are encouraged to take Economics 314.
228. **Survey of International Economics.** Introductory survey of major topics and issues in the theory and policy of international economics: theory of international trade, tariffs and commercial policy balance of payments, and adjustment and foreign exchange rate determination. Prerequisite: Economics 101 or equivalent. 3 hours. Credit is not given for both Economics 228 and 328.
236. **American Economic History.** Traces the course of growth and development of the economy from the colonial period to World War I; emphasizes conceptualization of key issues of the American experience and analysis of significant episodes and turning points. Prerequisite: Economics 101 or consent of instructor. 3 hours.
237. **Contemporary Western Europe.** Same as History 237. See History 237.
238. **European Economic History.** Economic structure and development of Europe since 1000 with respect to agriculture, industry, trade, technology, finance, and government; emphasis on those forces which contribute to the economic development of Europe and on the spread of these forces throughout the world. Prerequisite: Economics 101 or consent of instructor. 3 hours.
240. **Labor Problems.** Survey of the problems and analysis of U.S. labor markets and unions; topics include labor force participation, occupations, hours, wage determination, development and attributes of U.S. labor unions, and overview of collective bargaining and the

- effects of unions, unemployment, wages and inflation, and racial and sex discrimination; and selected current policy problems. Prerequisite: Economics 101. 3 hours. Current or prospective majors are encouraged to take Economics 341. Credit is not given for Economics 240 if student has credit for or is currently enrolled in Economics 341.
245. **Women in the Labor Market.** Same as Women's Studies 245. Changing role of women in the labor market and the economy; supply and demand for women in the 1970s: nature, extent, and legal remedies for sex discrimination in employment; "earnings gaps" and variable employment costs, men versus women; new role of multi-earner families; and comparative use of women as a professional resource. Prerequisite: Economics 101 or equivalent. 3 hours. Credit is not given for Economics 245 if student has credit for or is enrolled in Economics 346.
255. **Comparative Economic Systems.** Analyzes the significant similarities and differences in the development, structure, and policies of capitalism, communism, and market socialism. Prerequisite: Economics 101 or equivalent. 3 hours.
273. **Regression and Forecasting.** Covers the methodology of multiple regression, particularly as it applies to time series data and forecasting; also examines the use of various exponential smoothing models, and autoregressive integrated moving average models in business forecasting. Prerequisite: Economics 173 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
288. **Government Regulation of Economic Activity.** Analyzes the economic bases, policies, and consequences of government regulation of economic activity; patterns of regulation in selected areas. Prerequisite: Economics 101. 3 hours.
294. **Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
295. **Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
299. **Undergraduate Open Seminar, II.** An independent study course covering topics not treated by regular course offerings. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the department. While credit toward graduation is normally granted for this course, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. Prerequisite: Junior or senior standing. Economics 101 or equivalent is recommended. 0 to 9 hours. May be repeated.
300. **Intermediate Microeconomic Theory.** Microeconomic analysis including value and distribution theory; analysis of the pricing of the factors of production integrated in a micro-general equilibrium context which builds towards explaining the resource allocation process. Prerequisite: Economics 101 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive graduate credit for both Economics 300 and Business Administration 400. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
301. **Intermediate Macroeconomic Theory.** The modern theory of the determination of the level and rate of growth of income, employment, output, and the price level; discusses alternate fiscal and monetary policies to facilitate full employment and economic growth. Prerequisite: Economics 101 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive credit for both Economics 301 and Business Administration 401. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
303. **Macroeconomic Policy.** Analyzes current macroeconomic policy issues, problems, and techniques; discusses various policy techniques including monetary, fiscal, incomes, and exchange

- rate policies, and their effectiveness for treating inflation, unemployment, productivity, resource and exchange rate problems. Emphasizes current issues in the U.S. but includes some discussion of other developed economies. Prerequisite: Economics 301 or equivalent. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
306. **History of Economic Thought.** The development of economics; the examination of contributions of individual writers and schools of thought as they influenced economic thought and national policy. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{1}{2}$ unit.
312. **Economic Dynamics and Growth.** Analyzes the causes of economic instability; the requirements for economic growth in the national economy; and considers public policy relating to instability and growth. Prerequisite: Economics 101 or equivalent; Economics 301. 3 hours, or $\frac{1}{2}$ or 1 unit.
313. **Economics of Consumption.** Same as Family and Consumer Economics 313. See Family and Consumer Economics 313.
314. **Public Sector Economics.** Economic analysis of government tax and expenditure policies; topics include public good and externality theory, public choice theory, income distribution, cost-benefit analysis, principles of taxation, tax incidence, economic effects and optimal structures of major taxes, and taxation in developing economies. Prerequisite: Economics 300 or consent of instructor; consent of instructor required for student with credit for Economics 214. 3 hours, or $\frac{1}{2}$ or 1 unit.
315. **The Economics of Poverty and Income Maintenance.** Same as Labor and Industrial Relations 315. Analyzes the nature and causes of poverty with special emphasis on critical evaluation of programs to combat poverty in the United States. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
328. **International Economics.** Introduction to the theory of international trade and finance with selected application to current problems of commercial policy, balance of payments adjustment, and the international monetary system. Prerequisite: Economics 300 or equivalent, or consent of instructor; Economics 301 is recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
329. **Contemporary Issues in the International Economy.** Analysis in depth of selected current issues and policy problems of the international economy, including (but not restricted to) the following: new approaches to the theory of international trade, reform of the international monetary system, role of the General Agreement on Tariffs and Trade and the United Nations Conference on Trade and Development in expanding trade between developed and undeveloped economies, problems of stabilizing international commodity markets, and balance of payments problems of the United States and other selected countries. Prerequisite: Economics 328 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
341. **Economics of Labor Markets.** Same as Labor and Industrial Relations 341. Studies the microeconomic determinants of labor demand and supply, economic effects of unions, and macroeconomic labor market problems. Prerequisite: Economics 300 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
343. **Unions, Bargaining, and Public Policy.** Analyzes the legal background and economic issues associated with unions and collective bargaining in the United States including theory of the labor movement; process of union wage determination; analysis of strikes; background, strategies, and principal issues in collective bargaining; and problems and policies of government intervention. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Economics of Human Resources.** Same as Labor and Industrial Relations 345. Education and training in economic growth; labor force characteristics; occupational structure and future human resources requirements; job information networks; economics of discrimination and underutilization; national human resources policies and programs; and private industry and union human resources planning. Prerequisite: Economics 300 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Economics 345 and 444.
346. **Family Economics.** Same as Agricultural Economics 370 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
350. **The Developing Economies.** Analyzes the economic problems associated with newly developing nations; emphasizes their economic structures, their factor scarcities, and their programs for development. Not open for graduate credit to graduate candidates in economics. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ to 1 unit. Graduate credit is not given for both Economics 350 and Economics 450 or 451.

351. **The Development of the Japanese Economy.** Analyzes Japan's international trade, economic structure, standards of living policy-making process, and future prospect; additional attention to U.S.-Japanese economic relations and Japan's role in Asia. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
352. **Economic Development in Latin America.** Same as Agricultural Economics 352. Studies economic activity and the processes of diversification and industrialization in Latin America, with comparative analysis of selected countries. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
353. **Economic Development in India and Southeast Asia.** Same as Agricultural Economics 353. See Agricultural Economics 353.
354. **Economic Development of Tropical Africa.** Same as Agricultural Economics 354. See Agricultural Economics 354.
356. **Economics of Population and Resources.** Same as Sociology 356. Interactions of population size with output, natural and man-made resources, and environment; various policies for management of these interrelated elements; and economics of demographic change. Considers both more developed and less developed countries. Prerequisite: Junior standing or consent of instructor. Economics 101 is recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
357. **The Soviet Economy.** Analytical survey of Soviet economic development; structure and performance of the economy; and problems of planning and control. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
358. **The Economy of China.** Discusses changes in the patterns of production, exchange, and distribution in Communist China, with emphasis on their relation to social transformation; survey of Chinese economic history over the past century, dealing with the institutional background to and the structure of economic activities in China. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
359. **The Israeli Economy.** Analyzes the economic structures, policies, and performance of modern Israel, emphasizing the pre-1948 Palestine economy; the development of the Histadrut, Kibbutz, and Moshav; the economic relations between Arab and Jewish populations; and the impact of post-1948 immigration on Israel's economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
360. **Regional Economics.** Survey of the theory and problems of regional economic development, including regional accounts, interregional income and trade theory, principles of the location of economic activity, theories of regional growth, and public policy for development of regions. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
361. **Urban Economics.** Same as Finance 367. Analyzes the urban economy. The theory of urban spatial structure; the theory of local public finance, pricing, and investment decisions in the urban public sector; and the application of cost-benefit analysis and user-charge pricing to such problems as housing, transportation, land-use controls, and pollution. Prerequisite: Economics 101 or equivalent; Economics 300 is recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
371. **Introduction to Applied Econometrics.** Application of economic theory and statistical inference in the estimation and analysis of economic relations and predicting the outcomes of economic variables. Prerequisite: Economics 173 or equivalent; Economics 300 or 301. 3 hours, or $\frac{1}{2}$ to 1 unit.
372. **Econometrics.** Studies econometric models and methods used in estimation and hypothesis testing in economics. Prerequisite: Mathematics 134, Economics 173, and Mathematics 225 or 315. 3 hours, or $\frac{1}{2}$ or 1 unit.
374. **Mathematical Economics, I.** Mathematical reformulation and interpretation of traditional economic theory. Prerequisite: Mathematics 242 or equivalent; Economics 300 and 301. 3 hours, or $\frac{1}{2}$ to 1 unit.
375. **Mathematical Economics, II.** Introduction to linear and nonlinear economic models; emphasizes the formulation and interpretation of modern economic theory and welfare economics. Prerequisite: Mathematics 125, 225, or 315; Mathematics 242 or equivalent; Economics 300. 3 hours, or $\frac{1}{2}$ to 1 unit.
384. **Economics of Transportation.** Economic aspects of the transportation industry with special emphasis on problems of regulation and public policy. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.

386. **Current Transportation Problems.** Analytical and critical study of selected problems of current interest in transportation. Prerequisite: Economics 384 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
388. **Law and Economics.** Applications of economic theory to problems and issues in both civil and criminal law and the effect of legal rules on the allocation of resources; includes property rights, liability and negligence assignment, the use of administrative and common law to mitigate market failure, and the logic of private versus public law enforcement. Prerequisite: Economics 300 or equivalent. 3 hours or $\frac{1}{2}$ or 1 unit.
389. **Industrial Competition and Monopoly.** The organization and tactics of market control; the development of antitrust law and policy; public policy regarding competitive practices; special policies applying to natural resource industries; and regulated monopoly and government ownership as alternatives to the antitrust approach. Prerequisite: Economics 300 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
400. **General Economic Theory.** Emphasizes microeconomic theory; principal topics include a review of value and distribution theory, the theory of choice by households and firms, general microeconomic theory, and theoretical developments of current interest; and attention given to empirical studies intended to affirm or disaffirm economic principles. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 400 and Business Administration 400. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
401. **General Economic Theory.** Emphasis on macroeconomic theory; principal topics include a review of Keynesian macroeconomic theory, formal growth theory, and selected business cycle theory. Intended for minors in economics and others who have a minimum preparation for graduate study in economics. Prerequisite: Economics 101 or equivalent. 1 unit. Students may not receive credit for both Economics 401 and Business Administration 401. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
402. **Microeconomic Theory, I.** Introduction to the models and methods of modern microeconomic theory, concentrating on individual and firm decision making and on industry equilibrium; brief treatment of general equilibrium theory and welfare analysis. Topics include: consumer utility and demand theory; production and cost functions; firm supply, input demand, and price behavior; competitive, monopolistic, and oligopolistic industry analysis; and distribution theory. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
403. **Macroeconomic Theory, I.** Development of modern macroeconomic theory, including national income accounts and their relation to input-output tables; classical, Keynesian, and monetarist aggregate models; behavior hypotheses of consumption, investment, and government; properties and the role of money and interest; foreign trade and investment; price rigidity, price flexibility, and employment; wage-price interaction and inflation; and ad hoc stabilization models. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
404. **Microeconomic Theory, II.** General market equilibrium theory and welfare economics; discusses the problems of existence, stability, efficiency, and equity of economic equilibrium; and introduces social choice and the special problems created by public goods, externalities, and uncertainty. Prerequisite: Economics 402. 1 unit.
405. **Macroeconomic Theory, II.** Development of modern macroeconomic theory, including disequilibrium theory, optimal short-term stabilization measures, and monetary, fiscal, incomes, and exchange rate policies; large-scale econometric models; linear and neoclassical growth models; aggregate distribution theory; money, capital movements, trade, and growth; optimal growth models; and exhaustible resources and growth. Prerequisite: Economics 403. 1 unit.
406. **History of Economic Thought.** Analyzes economic thought from the Physiocrats to World War II; evaluation of the selected materials both as reflections of their times and as contributions to contemporary economic thought. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
407. **International Macroeconomics.** Deals with the international aspects of macroeconomics. Discusses issues such as the determination of exchange rates, balance of payments, the accumu-

- lation of foreign assets; considers both deterministic and stochastic systems; particularly emphasizes modelling issues. Prerequisite: Economics 405. 1 unit.
408. **Philosophical Problems in Economics.** Studies philosophical problems in economics, with some emphasis on the methodology and epistemology of economic theory; use of the views of leading economists to show the development of broad philosophical problems of economic theory, the relation of theory and certain of its applied areas, and the relation of economics to other selected disciplines. These problems are treated in the light of modern philosophy. Prerequisite: One unit either in economic theory or in the history of economic thought. 1 unit.
409. **Marxian Economics.** Analyzes Marx's economic theory and predictions; concentration on a critical evaluation of Marx's economic theory, a survey of contributions to the theory since Marx, and a Marxist evaluation of the neoclassical synthesis. Prerequisite: Economics 300 and 301, or consent of instructor. 1 unit.
410. **Advanced Topics in Economic Theory, I.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
411. **Advanced Topics in Economic Theory, II.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
413. **Consumption Economics.** Same as Family and Consumer Economics 413. See Family and Consumer Economics 413.
414. **Public Goods Theory.** In-depth analysis of the theory of public goods; includes public goods and externality theory, public choice, theory of cost-benefit analysis, optimal income redistribution, and fiscal federalism. Prerequisite: Economics 300 or equivalent. 1 unit.
415. **Economics of Taxation.** Theoretical and empirical analysis of the impact of taxation on the economic system; topics include tax equity and excess burden, incentive effects of taxation, tax incidence, structure of major types of taxes (income, consumption, and wealth), normative tax analysis, and taxation in developing economies. Prerequisite: Economics 300 or equivalent. 1 unit.
418. **Economics of Education, Health, and Human Capital.** Same as Administration, Higher and Continuing Education 418. Basic economic analysis of human capital and the value of human time, with applications to the economics of education and health; theory and analysis of consumer investment in human and physical capital over the life cycle; the returns to education and health, and their effects on growth; the theory of nonmarket time; public finance of education and health; and implications for the analysis of the distribution of income. Prerequisite: A course in microeconomic theory and a course in statistics, or consent of instructor. 1 unit.
420. **Monetary Theory.** Micro- and macroeconomic theories of the supply of and demand for money; money substitutes and their significance; review of current empirical research; money in closed economy, macroeconomic, and static general equilibrium models; and analysis of inflation and unemployment. Prerequisite: Consent of instructor. 1 unit.
421. **The Theory of Monetary Policy.** Monetarism and other current topics; stabilization policy; money in dynamic models; money in open economy macroeconomic models; and international aspects of monetary theory. Prerequisite: Consent of instructor. 1 unit.
422. **Microeconomics for Business.** Microeconomics for professional business students. Shows relevance of value and distribution theories for business managers. Includes demand and supply theory consumer choice, production and cost theory, industrial structure, and wage and capital theory. Intended for students in the Master of Business Administration program. Prerequisite: Enrollment in the MBA program. 1 unit. Students may not receive credit for both Economics 422 and 300 or 400.
423. **Macroeconomics for Business.** Development of short run macroeconomic models. Analysis of private sector behavior functions, and government policy alternatives. Extensions for open economy models and growth models. Intended for students in the Master of Business Admin-

- istration program. Prerequisite: enrollment in the MBA program. 1 unit. Students may not receive credit for both Economics 423 and 301 or 401.
428. **International Trade Theory.** Development and use of the neoclassical theory of international trade for the analysis of tariffs, customs, unions, and the effects of trade on the distribution of income and welfare; analysis and use of the relations between the balance of payments and national income to study the role of income changes combined with price changes in the balance of payments adjustment process. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
429. **International Financial Economics.** Examines the balance of payments, exchange rate, capital flows and international monetary system; fiscal and monetary policy in open economies. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
430. **Topics in International Economics.** Advanced topics in international economics drawn from history, application, and policy; subject matter varies; no repeat credit. Prerequisite: Economics 428 and 429, or consent of instructor. 1 unit.
436. **American Economic History.** Emphasizes, but is not limited to, the reading and criticism of current literature in American economic history; attempts to facilitate understanding of the use of economic analysis in interpreting events framed in historical context; includes British colonial policy, trade and tariffs, industrialization, technology, slavery and the southern economy, land policy, agriculture, transportation and internal improvements, capital mobilization and financial organization, and the measurement of economic growth. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
437. **General Economic History.** Treatment of selected topics in the economic history of industrialized economies by applying economic theory and quantitative methods of analysis to historical problems; exploration of the implications for contemporary work in economics. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
438. **Economic History of Europe.** Major lines of development since 1450; comparative study of forces and institutions inimical or favorable to growth; and selected readings on organization of economic activity, role of governments and the entrepreneur, commercial policy, monetary systems, land tenure, process of capital formation, industrialization, etc. Prerequisite: Consent of instructor. 1 unit.
440. **Labor Economics.** Same as Labor and Industrial Relations 440. Survey of recent trends in the labor force, of real and money earnings, and of the distribution of national income used as the basis for a critical economic analysis of contemporary English and American wage theory. Prerequisite: Economics 300 and 301. 1 unit.
441. **Labor Economics.** Same as Labor and Industrial Relations 441. Economic issues and implications involved in hours of work, employment and unemployment, and trade union institutionalism (the impact of the trade union upon the basic institution of a free enterprise economy); emphasis in all cases on the development of appropriate public policy. Prerequisite: Economics 300 and 301. 1 unit.
442. **Collective Bargaining.** Same as Labor and Industrial Relations 442. See Labor and Industrial Relations 442.
443. **Problems and Practices of Labor Dispute Settlement.** Same as Labor and Industrial Relations 443 and Law 361. See Labor and Industrial Relations 443.
447. **Labor Union Organization and Administration.** Same as Labor and Industrial Relations 447. See Labor and Industrial Relations 447.
450. **The Economics of Development and Growth.** Review and analysis of the theories and patterns of growth in developed and underdeveloped economies; consideration of the problems and methods of measuring growth; critical examination of the variables thought to be strategic in the growth process; and exploration of the policy implications of different theories. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
451. **The Developing Economies.** Analyzes the newly developing economies, with emphasis on institutional factors affecting development and economic policy relating to development. Prerequisite: Economics 450. 1 unit.
455. **Comparative Economic Systems.** Comparative analysis of the structures and policies of market-directed and planned economies. Prerequisite: Economics 101 or equivalent. 1 unit.
457. **Economic Planning in the Soviet Union and Eastern Europe.** Intensive examination of the structure and performance of the Soviet and the East European economies, emphasizing analy-

- sis of the main theoretic and operational dimensions of economic planning; evaluation of choice, design, and efficacy of central planning instruments from both theoretical and historical perspectives. Prerequisite: Economics 300 and 301, or 357, or consent of instructor. 1 unit.
460. **Urban Economics.** Examines the microeconomic theory of urban land-use and spatial structure (static and dynamic models); analyzes externalities caused by traffic congestion; normative and positive analysis of the provision of local public goods; and public policy issues (i.e., slums and urban decline, pollution). Prerequisite: Economics 402. 1 unit.
461. **Urban and Regional Economic Development.** Measurement and analysis of interregional differences in economic growth. Prerequisite: Economics 300 and 301. 1 unit.
463. **Natural Resource Economics.** Same as Agricultural Economics, Environmental Studies, and Forestry 463. See Agricultural Economics 463.
464. **Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Environmental Studies 464. Examines both theory and policy applications in the environmental area; selectively reviews the literature to provide a framework for understanding the relevant economic relationships and the criteria appropriate for policy assessment; emphasizes the characteristics of major environmental problems and policy choices; and considers the valuation of environmental amenities and the conflict between environmental quality and growth. Prerequisite: Economics 300 or consent of instructor. 1 unit.
466. **Quantitative Analysis for Economics.** Studies topics in optimization: implicit function theorem, multipliers and Kuhn-Tucker conditions; topics in matrix algebra including characteristic roots and vectors, partitioned matrices, quadratic forms, special matrices; topics on difference and differential equations common in economic theory. 4 hours or 1 unit.
467. **Mathematical Economics, I: Statics.** Studies quantitative techniques useful in economic analysis and decision making; mathematical programming; input-output analysis; point-set theory and game theory; existence, optimality, and stability conditions for static general equilibrium; and activity analysis, including welfare economics. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
468. **Mathematical Economics, II: Dynamics.** Studies quantitative techniques useful in economic analysis and decision making; single and systems of difference and differential equations; dynamic programming; Pontryagin maximum principle; interaction of multiplier and accelerator; von Neumann model; Turnpike theorem; growth models; and control systems. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
470. **Economic Statistics.** Classical statistics and regression analysis; descriptive statistics, probability and point and interval estimation; decision theory; variance analysis; and linear regression and least-squares estimates. Prerequisite: A course in statistics or consent of instructor. 1 unit.
471. **Econometric Analysis.** Part 1: the construction of econometric models; characteristics of models and choice of estimating methods; and estimates of parameters by various methods. Part 2: Bayesian statistics and decision theory. Prerequisite: Economics 470 or equivalent. 1 unit.
472. **Applied Econometrics.** Develops a general methodological basis for searching for quantitative economic knowledge; integrates and gives operational content to the topics of economic, statistical, and econometric theory. Prerequisite: Economics 471 or 476, or equivalent. 1 unit.
473. **Time Series Analysis in Economics.** Modern time series analysis techniques for handling economic data which arises in a happenstance fashion through time and their application to specific economic problems. Prerequisite: Economics 471 or Statistics 478, or equivalent. 1 unit.
476. **Econometrics, I.** Estimation of parameters for single-equation models; tests of hypotheses and confidence regions for regression models; large-sample theory in single-equation models; and Bayesian statistics in regression models. Prerequisite: Mathematics 315 and Statistics 310. 1 unit.
477. **Econometrics, II.** Considers the specification of models with systems of simultaneous equations; identification problem, distributed lag models, K-class estimators, maximum likelihood estimators, three-stage least-squares, and effects of specification errors. Prerequisite: Economics 476. 1 unit.
478. **Bayesian Inference in Econometrics.** Examines some standard econometric problems from the Bayesian perspective and compares Bayesian and classical inference. Prerequisite: Economics 476 or equivalent. 1 unit.

480. **Industrial Organization.** Theory of the organization of markets and firms, behavior of firms, functioning of competitive systems, and performance of markets. 1 unit.
481. **Anti-Trust and Business Policy.** Economic analysis of public policy for market structure and conduct; topics include anti-trust and mergers, predatory pricing, advertising, and technological advance. Prerequisite: Economics 480. 1 unit.
482. **Government Regulation of Industry.** Microeconomic and econometric analyses of market failure and government response in selected industries; topics include economic effect of regulation, bureaucratic behavior, optimal policy, and strategies for regulatory reform. Prerequisite: Economics 402; Economics 480; or consent of instructor. 1 unit.
490. **Individual Study and Research.** Directed reading and research. 0 to 1 unit.
491. **Workshop and Research Seminar.** Workshops are offered in all areas of specialization in which graduate students are writing Ph.D. dissertations. The specific format varies, but in general workshop sessions include presentations by graduate students of thesis research, by faculty members of their current research, and by occasional outside speakers. Prerequisite: Admission to the Department of Economics Ph.D. program. $\frac{1}{2}$ unit. One unit of Economics 491 is required of all students in the Ph.D. program.
499. **Thesis Research.** Preparation of thesis required of all students writing master's or doctoral theses in economics. 0 to 4 units.

EDUCATION

Dean of College: P. David Pearson

College Office: 110 Education Building, 1310 South Sixth, Champaign

111. **Introduction to Education.** Introduces American public education, especially the goals, organization, structure and finance of schooling, and some of the typical problems teachers face. 1 hour.
112. **Contemporary Issues in Education.** In depth analysis of how the issues of racism, sexism, IQ, bilingual/bicultural education, and mainstreaming impact on public schooling in the United States. Prerequisite: Education 111. 1 hour.
113. **The Nature of Teaching.** Examines the general nature of the activity called teaching and the nature of the occupation of teaching in the United States; exposes students to various views of the concept of teaching, styles of teaching, teacher characteristics, the nature of the work itself, and an overview of the teacher's "role set." Prerequisite: Education 112. 2 hours.
114. **Field Experience in Education.** Provides students with practical field experience in education; places students considering teaching as a career in public school classrooms where they will have a limited "hands on" experience; and provides students who have decided against teaching as a career the opportunity to investigate educational issues of interest to them under the supervision of the instructor. Prerequisite: Education 113. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
400. **Methods of Educational Inquiry.** Critical consideration of research concepts and methods used in alternative means of contemporary educational inquiry. 0 or 1 unit.
449. **Independent Study.** Offers opportunity of self-directed independent study, that is, develops the individual's ability as an independent student and enables the student to pursue interdisciplinary studies for which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the associate dean for graduate programs prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL POLICY STUDIES

Head of Department: C. J. Karier

Department Office: 360 Education Building, 1310 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Foundations of American Education.** Studies some of the problems of formulating and justifying aims and policies in American education, of designing and systematizing the curriculum, of organization and social context of the public school system, and of the teaching-learning process; examined in terms of perspectives provided by social philosophy, history, sociology, and philosophy of education. 3 hours.
249. **Independent Study.** Designed for students who wish to do advanced readings and research in greater depth and to investigate further ideas and themes that have been explored in Educational Policy Studies 199 and 201. Prerequisite: Educational Policy Studies 201; interest as attested to by instructors; and consent of adviser and staff member who supervises the work. 2 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
299. **Undergraduate Seminar in Educational Policy Studies.** An advanced undergraduate seminar that builds upon introductory work in Educational Policy Studies 201 and includes historical, philosophical, legal, and social science perspectives on education. Requests for activation of this course may come from students or faculty. Prerequisite: Educational Policy Studies 201 or equivalent, and consent of instructor. 0 to 9 hours. May be repeated.
300. **The History of Education.** Brief introductory survey of ancient and medieval education followed by a more extended study of educational developments since the Italian Renaissance; emphasis on the relation of educational trends to broader social, economic, political, and intellectual movements. Prerequisite: Junior standing. 3 hours or $\frac{1}{2}$ unit.
301. **Philosophy of Education.** Philosophical examination of selected educational issues; conveys a grasp of the complexities of the issues and some philosophical methods for dealing with them. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
302. **History of American Education.** The development of American education in relation to political, social, and cultural developments; attention to the influence of movements in the cultural environment upon evolving conceptions of educational theory and practice. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
303. **Comparative Education.** Introduction to the cross-cultural, cross-national study of educational institutions and their relationship to society. Topics may vary. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
304. **Social Foundations of Education.** Introductory survey of the interrelationship between school and society, and of the impact on public education of the major social trends and forces operating in our society. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
305. **History of Educational Ideas.** Studies selected educational theorists and intellectual movements; provides familiarity with the major educational ideas of the past and historical perspectives on current issues and problems in education; and readings in such authors as Aristotle, Plato, Quintilian, St. Augustine, Loyola, Comenius, Rousseau, Pestalozzi, Froebel, Herbart, and Dewey. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
306. **Aesthetics, The Arts, and Education.** Theoretical introduction to the problems involved in teaching critical appreciation of the arts; examines materials from aesthetics, art history, and criticism for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
307. **Aesthetics, Mass Communications, and Education.** Theoretical introduction to the problems involved in teaching a critical understanding of mass communications; examines materials from aesthetics, communication theory, and the social sciences for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
308. **Critical Thinking for Teachers.** An examination of critical thinking dispositions and abilities as an approach to the foundations of knowledge and structure of thinking in subject-matter areas. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.

309. **The Politics of Education.** An overview of the political structure and processes through which many of the major issues in education are treated; analyzes nature of the policymaking process in education and discusses the roles of principal participants in the process of educational decision making, but focuses on fundamental recurring issues in education and the ways these issues have been resolved or not resolved by the overall system. Particular attention to the role that both the federal and state judiciary as well as legislative authority have had in shaping educational policy. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
310. **Economics of Education.** An introduction to economic concepts and their application to education, including investment and consumption theories of education and the role of human capital in economic growth and development; cost-benefit analyses in education, education and the distribution of income, and manpower and educational planning. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
315. **Sociology of Education.** Same as Sociology 315. Education as a social process in various cultures and historical periods, emphasizing current systems in Westernized countries. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **Anthropology of Education.** Same as Anthropology and Educational Psychology 385. Introduction to the contribution of anthropology to the cross-cultural study of education, including discussion of material from representative cultures ranging from primitive social groups to present-day national states; special attention to education of minority ethnic and subordinate cultures; and emphasis on both informal and formal education as cultural process in relation to culture transmission, evolution, change, and development. Prerequisite: A course in anthropology or sociology, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
399. **Issues and Developments in Educational Policy Studies.** Seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
400. **Problems of Educational Theory.** Analysis of the kinds of problems encountered in constructing an educational theory, and of relations between educational theory and other disciplines, especially philosophy and the social sciences. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
401. **Modern Theories of Education.** Critical analysis of the theories of educational research and practice as found in contrasting traditions of educational thought. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
402. **Educational Movements in the Twentieth Century.** Historical study of significant educational trends during the past sixty years, with special reference to their influence on American education; an analytical examination of the principal transition movements in the last decade of the nineteenth century and of efforts to solve the problems since 1900. 1 unit.
403. **The Historical Foundations of American Educational Thought.** Studies the evolution of educational theories and philosophies since the eighteenth century; particular reference to their impact upon educational developments in the United States; a broad view of the general growth of American educational thought; and attention to selected major educational theorists, or schools of thought, exploration of their fundamental ideas, and the relation of these ideas to significant intellectual currents in American culture. Prerequisite: Consent of instructor. 1 unit.
404. **Seminar in Educational Classics.** Reading and group discussion of a limited number of the most important writings in educational philosophy which have had a profound influence on the progress of educational thought and practice. Prerequisite: Educational Policy Studies 305 or equivalent; consent of instructor. 1 unit.
405. **Foundations of Aesthetic Education.** Philosophical approach to the problems of teaching for appreciation in formal education; appraisal of the status of aesthetic education, its nature and function, and its relation to other types of education. Prerequisite: Educational Policy Studies 306 or equivalent. 1 unit.
406. **Seminar in the History of Education.** Intensive group study of a small number of selected problems to assist individual students to develop an understanding of and the ability to use the techniques of historical research in furthering such study; problems studied are selected in the light of the interests and previous training of the group of students enrolled. Prerequisite: Two courses in the history of education or consent of instructor. 1 unit.

407. **Logical Foundations of Methods.** Studies the application of principles of logic (broadly construed) to methods and curriculum at all levels. Prerequisite: A course in philosophy of education and teaching experience, or consent of instructor. 1 unit.
408. **Epistemology in Education.** Explores knowledge and inquiry as they relate to problems of formulating educational policy, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of epistemology (for example, Philosophy 329, 330, or 371), or equivalent; consent of instructor. 1 unit.
409. **Values and Education.** Studies the nature of value as it relates to problems of formulating and justifying educational aims and policies, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of ethics or value theory, or equivalent; consent of instructor. 1 unit.
410. **Seminar in Theories of Educational and Social Change.** Designed to help prospective educational leaders acquire an understanding of current theories of social change as these relate to educational institutions. There is now an extensive body of knowledge on the nature and control of social change; this needs to be made available to all prospective educational leaders in order that they may go about their duties with greater understanding and skill. Designed to aid students in bringing this knowledge to bear upon the problems of leadership in educational and social change. Prerequisite: Educational Policy Studies 304 or equivalent. 1 unit.
411. **Philosophy of Educational Research.** Examines some crucial assumptions and concepts of contemporary research in education from the point of view both of the consumer and the practitioner of educational research. Prerequisite: A course in philosophy of education and a course in the quantitative treatment of educational data, or equivalent, or consent of instructor. 1 unit.
412. **Seminar: Dewey's Philosophy of Education.** Critical study of John Dewey's philosophy of education involving intensive study of original works. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
413. **Seminar in Educational Concepts.** Some significant concepts, such as equality, authority, freedom, neutrality, indoctrination, objectivity, and teaching, are selected and examined in depth. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit. May be repeated.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
483. **Methods in Comparative Education.** Designed to develop skills and understanding for field work related to the cross-national and cross-cultural study of education. Prerequisite: Consent of instructor. 1 unit.
484. **Education in the Industrialized Nations.** Examines the social, political, and economic functions of educational systems in industrialized countries with emphasis upon the development of educational policy; focuses on Western Europe and North America. Prerequisite: Consent of instructor. 1 unit.
485. **Education in the Developing Countries.** Analyzes of the role and functions of education in social, political, and economic development, with particular reference to the new and the developing countries. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in educational policy studies; sections offered in the following fields: (a) history of education; (b) philosophy of education; (c) comparative education; (d) social foundations of education; (e) philosophy of educational research; and (f) historical methods in education. Prerequisite: Consent of instructor. 1 unit. May be repeated.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the

inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.

499. Thesis Research. Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL PRACTICE

Offices for Student Teaching: Secondary Education, 398 Education Building; Elementary Education, 398 Education Building; Special Education, 288 Education Building; Vocational and Technical Education, 347 Education Building; Art Education, 143 Art and Design Building; Music Education, 3004 Music Building; Kinesiology, 129 Freer Hall; Speech and Hearing Science, 901 South Sixth Street; and Foreign Language, 398 Education Building.

Students entering teacher education curricula with 55 or more semester hours should apply for student teaching assignments during the first semester in the curriculum. However, such students must complete at least a semester before they may be admitted to educational practice.

- 150. School and Community Experiences.** Early field experiences in teacher education, including observation and laboratory experiences in public schools: designed to provide opportunities for career exploration, professional orientation, the development of insight into the interrelationship of theory and practice, and the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. Educational Practice in the Education of Exceptional Children.** A course in practice teaching which provides teaching experience with exceptional children. Prerequisite: Senior standing; consent of department; sufficient hours of background courses; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.
- 232. Educational Practice in Elementary Education.** A course in practice teaching to meet certification requirements for teaching in the elementary school. Prerequisite: Elementary and Early Childhood Education 320, or 237 as required by the student's curriculum; senior standing; 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.
- 238. Educational Practice for Special Fields in Elementary Schools.** A course in student teaching to meet requirements for certification in special fields at the elementary school level. Prerequisite: For students in the early childhood education curriculum, Elementary and Early Childhood Education 334 required; consent of instructor; 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 3 to 8 hours.
- 242. Educational Practice in Secondary Education.** A course in practice teaching to meet certification requirements for teaching in the secondary school. Prerequisite: Satisfactory progress in an approved teacher education program, including 100 hours of early field experience; 3.5 cumulative and University of Illinois grade point average. 2 to 8 hours.

EDUCATIONAL PSYCHOLOGY

Chair of Department: Carol A. Ames

Department Office: 210 Education Building, 1310 South Sixth, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Educational Psychology.** Basic undergraduate course in psychology of education for prospective teachers; materials and principles from the various areas of psychology (mental hygiene,

- psychology of learning, etc.) applied to the practical problems of teaching. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
236. **Child Development for Elementary Teachers.** Study of child growth and development designed particularly for those preparing to teach in the elementary school; special emphasis on the significance of the developmental process for educational programs and procedures; and systematic experience in studying and evaluating children's behavior and in supporting their learning and development. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
241. **Sex Role Socialization: Implications for Schooling.** Reviews research and practice related to sex role socialization in education; examines sex differences in academic achievement and motivation and the effect of differential classroom environments on males and females. 3 hours.
249. **Independent Study.** Study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclass status; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructor; consent of adviser and staff member who supervises the work. 1 to 4 hours.
250. **Career Development Theory and Practice.** The design and implementation of an innovative life planning process; a participatory experience that includes a survey of theories, models, and research on life planning and that encourages systematic skill identification, values clarification, and the development of job search strategies. 3 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
311. **Psychology of Learning for Teachers.** A study of the psychology of human learning as it applies to instruction, educational issues, and educational problems. Prerequisite: Educational Psychology 211 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
312. **Mental Hygiene and the School.** Examination of social and emotional adjustment; study of normal personality, integration, feelings of inferiority, adjustment mechanisms, classroom therapy, and behavior disorders in children; and introduction to methods of child study and provision for emotionally disturbed children. Prerequisite: Educational Psychology 211; practice teaching or teaching experience. 2 hours or $\frac{1}{2}$ unit.
313. **Child Language and Education.** Provides an overview of current knowledge about children's acquisition of communicative competence together with a consideration of the educational import of this developmental process. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
314. **Sociocultural Influences on Learning.** Provides a general overview of the relationship of language, culture, and society to the teaching-learning process; gives broad exposure to research and theory concerned with the effects of sociocultural factors on cognition, perception, and motivation; also considers the effect of such factors on classroom interaction. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
315. **Personality and Social Development.** Same as Psychology 365. See Psychology 365.
316. **Discipline and Classroom Management.** A general overview of theories related to analyzing student behaviors in the classroom; the incidence and etiology of conduct problems and behavior disorders in the classroom, with emphasis upon preventive strategies and guiding principles for maintaining classroom discipline. Prerequisite: Educational Psychology 211 or 236, or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
335. **Ethnography of Local Cultures.** Same as Anthropology and Sociology 335. Introduction to ethnographic modes of researching culture in human activities, events, organizations, and thinking through participant observation in local settings; focus on the central tasks of ethnographic research (discovery, representation, presentation, justification) through mastery of field notes and various equipment. Prerequisite: Educational Psychology 314, Anthropology 230, or equivalent work in social sciences. 4 hours or 1 unit.
341. **Applications of Sex Role Theory to Counseling.** Same as Women's Studies 341. Reviews research on sex role socialization related to career, family, and personal roles for both sexes; discusses counseling strategies aimed at freeing persons from attitudes and behaviors that limit their freedom to choose; and reviews strategies for change at policy, agency and individual levels. 4 hours or 1 unit.

343. **Individual Intelligence Testing.** Fundamental concepts relevant to the general problem of the individual testing of learning aptitude; acquisition of psychometric competence in the use of the 1960 Binet and the Wechsler tests; and acquaintance and limited practice in the administration, scoring, and interpretation of results obtained by performance scales and other devices appropriate for use with individuals having sensory, associative, and/or motor impairments. Prerequisite: Consent of instructor and 6 hours of psychology and Special Education 324, or Educational Psychology 392 or Psychology 390. 3 hours or 1 unit.
359. **Professional Skill Development Workshop in Educational Psychology.** Laboratory, pre-practica, or workshops designed to teach practitioner-oriented skills in specialized areas of educational psychology; requests for initiation of sections in this course may be made by students or by faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
362. **Adult Learning and Development.** Same as Administration, Higher, and Continuing Education 362. See Administration, Higher, and Continuing Education 362.
363. **Instructional Design.** Same as Administration, Higher, and Continuing Education 363. The design, systematic development, and evaluation of instructional programs, including delineation of performance outcomes, analysis of concepts, design of instructional sequences, assessment of student performance, and survey of current research. Each student develops an instructional program. Prerequisite: A foundation course in educational psychology or psychology. 4 hours or 1 unit.
364. **Psychological and Social Distortion of Information.** Study of how information is psychologically and socially constructed and distorted; implications for consumerism, political involvement, media monitoring, problem solving, policy making, and education. Prerequisite: Psychology 100. 3 hours or 1 unit.
385. **Anthropology of Education.** Same as Anthropology and Educational Policy Studies 385. See Educational Policy Studies 385.
387. **Computer Use in Education.** Overview of the nature and development of automation in education; use of electronic data processing systems for administrative purposes, for instruction, and for research; discussion of problems of computer management, natural language analysis, and simulation CAI applications; and laboratory experience with on-line terminals, remote entry devices, and peripheral equipment. Prerequisite: Educational Psychology 390 or equivalent, or consent of instructor. 3 hours or 1 unit.
390. **Elements of Educational Statistics.** Designed for terminal value for professional training of students not intending to pursue advanced graduate work, and for introductory value for students continuing graduate study in education; descriptive statistics, introduction to correlation and regression, the normal curve, statistical inference, and the presentation and interpretation of statistical data in educational literature. Prerequisite: Junior standing. 3 hours or 1 unit.
391. **Construction and Use of Tests in Teaching.** The relationship of classroom testing to educational objectives and the curriculum; the construction, administration, and scoring of the various types of essay and short-answer tests; and other means of measuring the attainment of objectives and marking procedures. Designed primarily for classroom teachers. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
392. **Introduction to the Principles of Measurement.** Study of the selection, preparation, administration, and interpretation of psychological and educational tests and diagnostic devices; emphasis on theory at a beginning level, with application to hypothetical school situations as a teaching device; and consideration of the sources of standard tests, criteria for their evaluation, methods of scoring, interpretation, and general and special areas. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
398. **Evaluation Methods.** Introduces the methodology of educational program evaluation, including the design of an evaluation, the data collection techniques, approaches to data summarization, and the reporting and utilization of evaluative information; each student designs and conducts an evaluation project. Prerequisite: Educational Psychology 390. 3 hours or 1 unit.
399. **Issues and Developments in Educational Psychology.** Experimentation or seminar on topics not treated by regularly scheduled courses. Requests for initiation of the course may be made by students or by faculty members. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.

411. **Psychology of Adolescence for Teachers.** Psychological significance of adolescence, its biological and social foundations, and its implications for education. Prerequisite: Educational Psychology 311 and 312. 1 unit.
412. **Advanced Child Development for Students of Education.** Considers the nature of the child and the child's development during the preschool and elementary school years; emphasis on development as a process of social learning; interpretation of the scientific literature as it concerns the educative process; and discussion of methods of studying and evaluating the behavior of the child as an individual and in group situations. Prerequisite: Educational Psychology 311 and 312. 1 unit.
413. **Social Psychology and the Problems of Education.** Consideration of the concepts and methods of social psychology as applied to the professional functions of teachers, administrators, and other persons engaged in education; opportunity to work upon field problems. Prerequisite: Educational Psychology 311, 312, and 390. 1 unit.
414. **The Psychology of College Teaching.** Designed particularly for graduate students minoring in education or preparing for college teaching. Psychoeducational problems in undergraduate and graduate teaching; special emphasis upon individual differences, remedial procedures, principles of learning, the technology of teaching and learning, adjustment problems of college students, counseling and advisory services, test construction, and analysis and use of test results and resource materials. Prerequisite: A course in psychology; consent of instructor. 1 unit.
415. **Psychological Theories Applied to Education.** An advanced course in human behavior; special attention given to contemporary systems of psychology and their relationship to educational practice. Prerequisite: Educational Psychology 311 and 312; Educational Psychology 411 or 412. 1 unit.
416. **Psychology of Reading.** Same as Psychology 426. Overview of psychological research investigating the perceptual and cognitive processes that occur during reading. Examines the development of reading ability, reading disorders, and the measurement of reading ability. Prerequisite: A previous course in experimental or cognitive psychology or linguistics, or consent of instructor. 1 unit.
420. **Professional Seminar in Counseling Psychology.** Reviews the psychologists' professional code of ethics, the history of counseling psychology as a profession, and current theoretical and applied issues within the field of counseling psychology. 0 or 1 unit.
422. **Basic Principles of Counseling.** Study of counseling processes that are especially applicable to the problems of normal individuals; study of the theories of education and personality which underlie counseling procedures for the purpose of developing the student's ability to evaluate these procedures. Prerequisite: Educational Psychology 311 and 312. 1 unit.
423. **Use of Tests in Counseling.** Provides instruction and practice in the critique, selection, administration, and interpretation of tests of four basic types used in counseling: aptitude, achievement, interest, and personality; builds on knowledge and skill obtained in prerequisite courses in measurement and counseling psychology. Prerequisite: Educational Psychology 392 and 422. 1 unit.
424. **Supervised Practice in Educational Psychology.** Intensive supervised experiences in applied educational psychology; use of a wide variety of diagnostic and observational techniques and treatment. Students may take more than one section. Prerequisite: Master's degree in educational psychology or equivalent; consent of instructor. $\frac{1}{2}$ to 2 units.
426. **Interpersonal and Personal Problem Solving for Counselors and Educators.** Studies how to facilitate the growth of persons experiencing difficulty with developmental tasks, stressful transitions, and life crises; builds on a knowledge of the problem-solving process, life span development, and of counseling theory and practice. Prerequisite: Admission to doctoral study or consent of instructor. 1 unit.
427. **Theories and Practice of Group Counseling.** Study of the principles of group process and their application in institutional and other settings; includes a review of the historical development of group processes and study of pertinent research; discussion and experiential activities are supplemented by films, videotapes, and case studies. Prerequisite: Educational Psychology 422 or consent of instructor. 1 unit.
428. **Theories of Career Development and the Use of Occupational Information.** Results of recent occupational research and use of these results by teachers and counselors; attention given

- to research techniques suitable for use in local occupational studies. Prerequisite: An introductory course in counseling or consent of instructor. 1 unit.
429. **Field Instruction in Educational Psychology.** Individual instruction designed to help the advanced student apply basic principles of education or psychology in institutional settings. Each student is assigned to a school, community agency, or other applied settings for a supervised field experience in some aspect of educational psychology. Prerequisite: Master's degree in educational psychology or equivalent, and consent of instructor. 1 to 4 units. May be repeated to a maximum of 4 units; no more than 2 units may be taken in any given semester.
431. **Counseling Process Research.** An overview of research investigating what transpires in counseling and psychotherapy, and what contributes to effectiveness. Focuses on current research design, methodology, and knowledge in examining how counseling contributes to change. Prerequisite: Educational Psychology 496 or equivalent, and a practicum in counseling, or consent of instructor. 1 unit.
440. **Social Development.** Same as Psychology 440. Research and theory relating to the social development of children; special attention to processes of social learning, environmental influences on social behavior, and the role of education in facilitating the development of social skills; and emphasis on experimental research conducted in naturalistic settings. Prerequisite: Educational Psychology 236 or Psychology 216, or equivalent; and Educational Psychology 390, Psychology 235, or equivalent. 1 unit.
442. **Cross-Cultural Studies of Literacy.** Combines anthropological and psychological approaches to literacy in theory and practice, using case studies of cultural meanings and uses of literacy in worldwide array of traditional, historical, and modern settings; topics include origins and definitions of writing systems, psychology of scripts and math notations, issues of cultural cognitive consequences, out-of-school acquisition and uses, autonomous vs ideological meanings of texts, hegemony and writing, roles of readers, and interpretive communities. Prerequisite: Educational Psychology 311 or 314, or Curriculum and Instruction 370 or equivalent. 1 unit.
445. **Motivation and Achievement.** Examines the social, cultural, and psychological antecedents of achievement behavior; reviews current theories of achievement motivation, research, issues, and methodologies; and emphasizes applications to such areas as education, sport, and work. Gives special attention to age-related changes in motivation and achievement patterns. Prerequisite: Educational Psychology 390 or equivalent; Psychology 373 is recommended. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student; and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairperson prior to enrollment. 1/2 or 1 unit. May be repeated for credit with consent of adviser and department chair.
451. **Evaluation of Educational Programs.** Same as Curriculum and Instruction 418. See Curriculum and Instruction 418.
460. **Field Research in Educational Settings.** Examination of the conduct of research in educational settings with a focus on researcher-practitioner research collaboration; considers social psychological and design aspects of field research. Students engage in research in cooperation with local schools. Prerequisite: Educational Psychology 390 or equivalent, and consent of instructor. 1 unit.
461. **School-University Research Practicum.** Focuses on developing skills in field-initiated research; includes research methods, implementation and evaluation of new education programs, and school district policy and operation. Students do a project designed to meet specific school needs under the direction of practicum advisers. Prerequisite: Educational Psychology 460; and Educational Psychology 496 or Psychology 306, or equivalent; or consent of instructor. 1 unit.
470. **The Methodology of Eye Movements in the Study of Cognition.** Same as Psychology 472. Teaches use of eye movement monitoring techniques to study issues concerning perception, attention and cognition. Uses of eye movement monitoring in research in several fields; use of eye-tracking equipment; and writing of computer programs for this type of research. Prerequisite: Consent of instructor. 1 unit.
483. **Single Subject Research Design.** Same as Special Education 483. See Special Education 483.

484. **Methods of Naturalistic Research.** Intended for advanced graduate students approaching dissertation research; develops an understanding of and skill in the use of several data collection techniques associated with naturalistic, cross-cultural, and single-culture research; techniques are employed in a research project of the student's choice. 1 unit.
485. **Multivariate Correlational Techniques in Educational Research.** Same as Psychology 486. Emphasis on educational research applications of correlational techniques; special attention to issues in principles of research design underlying appropriate uses of such techniques as multiple, partial, and part (semipartial) correlation and factor analysis; and illustration of techniques by examples drawn from published studies and projects conducted on this campus. Emphasis will be placed on application and interpretation of techniques rather than on theoretical rationales. Prerequisite: Educational Psychology 496 or equivalent; consent of instructor. 1 unit.
487. **Research on Classroom Instruction.** An advanced course that reviews research findings on efficient and effective instruction in classrooms including research instruments, research procedures, and results; implementation of these findings for inservice and preservice programs; observation in ongoing classrooms; emphasis on conducting research and synthesizing research findings. Prerequisite: Educational Psychology 390; doctoral standing. 1 unit.
488. **Covariance Structure and Factor Models.** Same as Psychology, Sociology, and Statistics 488. See Psychology 488.
490. **Seminar for Advanced Students of Education.** Seminar in educational psychology; topics relate to the areas of specialization represented by the various divisions within the department. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated to a maximum of 2 units in any area of specialization.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
492. **Psychology of Learning and Instruction.** Same as Psychology 492. An advanced course in the nature and conditions of long-term cognitive learning and retention in classroom and similar situations; intended for doctoral students with a special interest in research leading to the improvement of classroom teaching and learning, in psychological aspects of curriculum research, and in the cognitive aspects of military and industrial training. Prerequisite: Consent of instructor. 1 unit.
494. **Multivariate Analysis in Psychology and Education.** Same as Psychology 494 and Sociology 494. See Psychology 494.
495. **Theories of Measurement.** Same as Psychology 495. Classical test theory (true score, error of measurement, reliability and validity of test scores, composite measures); proposed alternatives to the classical model (generalizability theory, matrix sampling, latent trait theory, criterion-referenced measurement). Prerequisite: Educational Psychology 496 or Psychology 307, or equivalent; Educational Psychology 392 or Psychology 390, or equivalent. 1 unit.
496. **Statistical Methods in Education.** Introduction to inferential statistical methods in education; includes probability theory, distribution theory, interval estimation, hypothesis testing, regression and correlational analysis, and analysis of variance. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
497. **Advanced Statistical Methods in Education.** Advanced topics in analyses of variance and covariance, and principles of experimental design; brief introduction to multivariate analysis, including rudiments of matrix algebra. Prerequisite: Educational Psychology 496, Psychology 307, or equivalent. 1 unit.
498. **Theories of Educational Evaluation.** Study of the process of educational program evaluation, its purpose and procedures, with emphasis on settings, personnel, and performance; review of principal theories; and study of models, histories, political contexts, ethics, and epistemology of evidence as they relate to the observation, judging, and reporting of educational programs. Prerequisite: Educational Psychology 390 and 392 and a course in evaluation, or consent of instructor. 1 unit.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ELECTRICAL AND COMPUTER ENGINEERING

Head of Department: T. N. Trick

Department Office: 155 Everitt Laboratory, 1406 West Green, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Seminar.** Discussions of educational programs, career opportunities, and other topics in electrical engineering. For electrical engineering students. 0 hours.
229. **Introduction to Electromagnetic Fields.** Elementary electromagnetic field theory as summarized in Maxwell's equations in integral and differential form; wave propagation; and energy and power in electromagnetic fields. Prerequisite: Electrical and Computer Engineering 260 or 270. 3 hours.
244. **Electrical Engineering Laboratory, I.** Introduction to electronic instruments, basic measurement techniques, and basic electronic components; preparation for experimental projects. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 260 or 270. 2 hours.
246. **Project Laboratory.** Planning, designing, executing, and evaluating various experimental projects by the student along with discussion of the actual examples of experimental design, error control, and data processing. Prerequisite: Senior standing in electrical engineering or computer engineering; consent of instructor. 2 to 4 hours.
249. **Digital Systems Laboratory.** Introduction to the experimental analysis and synthesis of digital networks. Prerequisite: Electrical and Computer Engineering 244 and 290, or consent of instructor. 2 hours.
260. **Introduction to Electric Circuits.** Elementary signals; basic principles of network analysis; and sinusoidal steady-state analysis. Prerequisite: Physics 107 and credit or registration in Mathematics 285 and Computer Science 101 or 121. 3 hours. Credit is not given for both Electrical and Computer Engineering 260 and 270.
270. **Introduction to Circuit Analysis.** Basic principles of circuit analysis including Kirchhoff's laws, node and mesh equations, matrix methods, equivalent circuits, operational amplifiers, transient analysis, sinusoidal steady-state analysis, three-phase circuits, transformers, network functions, and frequency responses. Prerequisite: Physics 107 and credit or concurrent registration in Math 285. 4 hours. Credit is not given for both Electrical and Computer Engineering 260 and 270.
271. **Electrical and Computer Engineering Special Topics.** Prerequisite: As specified by department or instructor. 0 to 4 hours.
272. **Electrical and Computer Engineering Problems.** Prerequisite: Approved written application to department as specified by department or instructor. 0 to 4 hours.
290. **Introduction to Computer Engineering.** Introduction to digital logic and computer systems. Representation of information; combinational network analysis and design; sequential network analysis and design; computer organization and control; machine level programming. Prerequisite: Computer Science 101 or 121. 3 hours. Students may not receive credit for both Electrical and Computer Engineering 290 and Computer Science 231.
291. **On-Line Computing.** On-line computer use; includes assembly language programming, I/O processes and devices, interrupts and priority, semaphores, real-time operations, multi-tasking, data acquisition, and computer-based control and communication. Prerequisite: Electrical and Computer Engineering 290, or consent of instructor. 3 hours. Credit is not given for both Electrical and Computer Engineering 291 and Computer Science 232.
296. **Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
299. **Thesis.** Preliminary reading and investigation. 0 to 3 hours.
302. **Electronic Music Synthesis.** Survey of methods of electronic music production; musical notation translated into engineering terms; analysis and synthesis of sound spectra; electronic circuits

- for synthesis of musical sounds; and digital computer sound synthesis. Prerequisite: Music 100 or equivalent, Electrical and Computer Engineering 290 and 342. 3 hours or $\frac{3}{4}$ unit.
303. **Topics in Audio Engineering.** Sound perception related to audio; review of wave phenomena; acoustics of rooms and auditoriums; characteristics of microphones and loudspeakers; magnetic recording; and topics of specialized interest. Prerequisite: Electrical and Computer Engineering 260 or 270 and 373, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
309. **Signal and System Analysis.** Introduction to continuous-time and discrete time signals and linear systems; includes difference equations, convolution, frequency response, Fourier series, Fourier transform, Laplace transform, z-transform, transfer functions, and stability. Prerequisite: Electrical and Computer Engineering 270. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in Electrical Engineering.
310. **Digital Signals and Systems.** Discrete-time signals and systems; convolution sum; difference equations; Z-transform; sampling theorem and data conversion; digital filter design and implementation; discrete signal analysis and the Fast Fourier Transform; and state variable methods with application to digital control and communications. Prerequisite: Electrical and Computer Engineering 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Microcomputer Laboratory.** Design, construction, and use of a small general purpose computer with a micro-processor CPU; MSI and LSI circuits used extensively; control panel, peripheral controllers, control logic, central processor, and programming experiments; and open lab format. Prerequisite: Electrical and Computer Engineering 249; Electrical and Computer Engineering 291 or Computer Science 232. Credit or concurrent registration in Electrical and Computer Engineering 312 is recommended. 3 hours or $\frac{3}{4}$ unit.
312. **Computer Organization and Design.** Basic computer organization and design, computer arithmetic, control design and microprogramming, memory organization, I/D design, reliability/performance evaluation; laboratory for computer design implementation, simulation, and layout. Prerequisite: Electrical and Computer Engineering 290 or Computer Science 231; and Electrical and Computer Engineering 291 or Computer Science 232. 4 hours or 1 unit. Unit credit not allowed for Electrical Engineering majors.
313. **Probabilistic Methods of Signal and System Analysis.** Introduction to probabilistic methods, analysis of random signals and noise, and applications to electrical engineering problems, including reliability of circuits and systems and effects of noise systems. Prerequisite: Electrical Engineering and Computer 309. 3 hours or $\frac{3}{4}$ unit. Electrical Engineering majors may not receive graduate credit.
314. **Biomedical Instrumentation.** Same as Bioengineering 314. Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical transducers for measurements of biopotentials, ions and gases in aqueous solution, force, displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; and therapeutic and prosthetic devices. Prerequisite: Electrical and Computer Engineering 260 or 270 and 244, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Biomedical Instrumentation Laboratory.** Same as Bioengineering 315. Laboratory to accompany Electrical and Computer Engineering 314. Studies medical instrumentation and transducers for static and dynamic nonbiological inputs and measures actual biomedical signals; requires some animal experiments. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 314. 2 hours or $\frac{1}{2}$ unit.
319. **Applied Modern Algebra.** Same as Mathematics 319. See Mathematics 319.
321. **Introduction to Controlled Thermonuclear Fusion.** Same as Nuclear Engineering 321. See Nuclear Engineering 321.
324. **Analog Filter Design.** Properties of passive network functions; synthesis of RC and LC passive network functions; operational amplifier; RC active circuit synthesis; sensitivity of networks; approximation theory; and practical filter design. Prerequisite: Electrical and Computer Engineering 309. 3 hours or $\frac{3}{4}$ unit.
325. **Introduction to the VLSI System Design.** Same as Computer Science 335. Introduction to the design and layout of VLSI (very large scale integrated) chips for complex digital systems using integrated circuit cells as building blocks and employing hierarchical design methods; novel architectures are designed and implemented, using given technology and design rules on a mini-computer system in the lab. Prerequisite: Electrical and Computer Engineering 249, and Electrical and Computer Engineering 312 or Computer Science 333. 3 hours or $\frac{3}{4}$ unit.

328. **Computer Networks and Distributed Systems.** Same as Computer Science 328. See Computer Science 328.
330. **Electromechanics.** Quasi-static electromagnetic fields; lumped-parameter electromechanics; rotating machines; dynamics of electromechanical systems; fields and moving media; and transducers and actuators. Prerequisite: Electrical and Computer Engineering 229 and 260 or 270. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in electrical engineering.
333. **Electric Machinery.** Theory and laboratory experimentation with three-phase power, power factor correction, single- and three-phase transformers, induction machines, DC machines, and synchronous machines; includes project work on energy control systems; digital simulation of machine dynamics. Prerequisite: Electrical and Computer Engineering 330. 4 hours or 1 unit.
336. **Advanced Electric Machinery.** Advanced rotating machine theory and practice, dynamic analysis of machines using reference frame transformations, tests for parameter determination, reduced order modeling of machines; mechanical subsystems including governors, prime movers, excitation systems, digital simulation of inter-connected machines. Prerequisite: Electrical and Computer Engineering 333. 3 hours or $\frac{3}{4}$ unit.
338. **Communication Networks for Computers.** Same as Computer Science 338. See Computer Science 338.
339. **Computer Aided Design for Digital Systems.** Same as Computer Science 339. See Computer Science 339.
340. **Solid State Electronic Devices.** Semiconductor materials and their electronic properties and applications to electronic devices; p-n junctions, transistors, and other diode and triode devices; and low-frequency applications of diodes. Prerequisite: Physics 108, and credit or concurrent registration in Electrical and Computer Engineering 229. 3 hours or $\frac{3}{4}$ unit.
341. **Advanced Solid State Electronic Devices.** Detailed presentation of advanced concepts such as generation-recombination, hot electron effects, and breakdown mechanisms; includes essential features of small AC signal characteristics, switching and transient behavior of p-n junctions, bipolar and MOS transistors; addresses fundamental issues for device modeling and discusses the perspective and limitations of Si-devices. Prerequisite: Electrical and Computer Engineering 340. 3 hours or $\frac{3}{4}$ unit.
342. **Electronic Circuits.** Introduces analysis and design of analog and digital integrated circuits using bipolar and MOS field effect transistors. Prerequisite: Electrical and Computer Engineering 309 and 340. 3 hours or $\frac{3}{4}$ unit. May not be taken for graduate credit by students in Electrical Engineering.
343. **Electronic Circuits Laboratory.** Laboratory to accompany Electrical and Computer Engineering 342. Prerequisite: Concurrent registration in Electrical Engineering and Computer 342. 1 hour or $\frac{1}{4}$ unit. May not be taken for graduate credit by students in Electrical Engineering.
344. **Theory and Fabrication of Integrated Circuit Devices.** Laboratory and lecture course on the physical theory, design, and fabrication of devices suitable for integrated circuitry; includes the electrical properties of semiconductors and techniques (epitaxial growth, oxidation, photolithography diffusion, ion implantation, metallization, characterization) for fabricating integrated circuit devices such as p-n junction diodes, bipolar transistors, and field effect transistors. Prerequisite: Electrical and Computer Engineering 340. 4 hours or 1 unit.
345. **Senior Design Project Laboratory.** Individual design projects in various areas of electrical and computer engineering; projects are chosen by students with approval of the instructor; a written report, prepared to journal publication standards, and an oral presentation are required. Prerequisite: Electrical and Computer Engineering 343. 2 hours or $\frac{1}{2}$ unit. No credit for graduate students in Electrical Engineering.
346. **Hybrid Circuit Fabrication Laboratory.** Same as Ceramic Engineering 346. Laboratory course on the basics of fabricating thin- and thick-film components as used in hybrid electronic circuits; experiments covering vacuum deposition, sputtering, anodization, resist processes, screen preparation, screen printing, and firing and trimming. Lectures provide background material and cover trade-offs of the two technologies. Prerequisite: Electrical and Computer Engineering 340. 2 hours or $\frac{1}{2}$ unit.
347. **High-Frequency Circuit Design Using Scattering Parameters.** Laboratory and lecture on the use of scattering parameters for the design of high-frequency amplifiers. Prerequisite: Electrical and Computer Engineering 353. 2 hours or $\frac{1}{2}$ unit.

348. **Introduction to Artificial Intelligence.** Same as Computer Science 348. An introductory description of the major subjects and directions of research in artificial intelligence; topics include AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Prerequisite: Electrical and Computer Engineering 291 or Computer Science 225; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
350. **Lines, Fields, and Waves.** Wave equation, free and guided wave propagation, waveguides, and radiation. Prerequisite: Electrical and Computer Engineering 229 and 260 or 270. 3 hours or $\frac{3}{4}$ unit.
351. **Automated Microwave Measurements.** Manual and computer controlled laboratory analysis of circuits at microwave frequencies. Prerequisite: Electrical and Computer Engineering 350. 3 hours or $\frac{3}{4}$ unit.
352. **Electromagnetic Fields.** Plane waves at oblique incidence, wave polarization, anisotropic media, radiation, space communications, and waveguides. Prerequisite: Electrical and Computer Engineering 350. 3 hours or $\frac{3}{4}$ unit.
353. **Radio Communication Circuits.** Design of a radio system for transmission of information; types of receivers, matching techniques, receiver and antenna noise, types of modulation, high-frequency circuitry, and point-to-point and satellite communications. Prerequisite: Electrical and Computer Engineering 309 and 342; credit or concurrent registration in Electrical and Computer Engineering 350. 4 hours or 1 unit.
354. **Antennas.** Antenna parameters; polarization of electromagnetic waves; basic antenna types; antenna arrays; broadband antenna design; and antenna measurements. Prerequisite: Electrical and Computer Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
355. **Optical Electronics.** Optical beams and cavities; semiclassical theory of gain; characteristics of typical lasers; and application of optical devices. Prerequisite: Electrical and Computer Engineering 350 or consent of instructor. 3 hours or 1 unit.
357. **Microwave Devices and Circuits.** Electromagnetic wave propagation, microwave transmission systems, passive components, microwave tubes, solid state microwave devices, microwave integrated circuits, S-parameter analysis, microstrip transmission lines. Prerequisite: Electrical and Computer Engineering 340 or equivalent, and Electrical and Computer Engineering 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.
358. **Applications of Radio Wave Propagation.** Terrestrial atmosphere, radio wave propagation, and applications to radio sensing and radio communication. Prerequisite: Electrical and Computer Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
359. **Analog and Pulse Communication Systems.** Introduction to amplitude, phase, frequency, and pulse code modulation systems; discusses bandwidth requirements, effects of noise and applications in commercial broadcast, and telephone and satellite communications. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 313 or equivalent. 3 hours or $\frac{3}{4}$ unit.
360. **Coherent Optics Laboratory.** Introduction to the properties and applications of coherent laser light; experiments in interferometry, optical processors and spatial filtering, holography, optical communications, fiber optics, and special projects. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 309 and 350; or Physics 371; or equivalent. 3 hours or $\frac{3}{4}$ unit.
361. **Introduction to Digital Communication Systems.** Introduction to signals and noise in digital communication systems; analysis and design of efficient digital communication receivers; and signal design for, and performance of, practical communication systems. Prerequisite: Electrical and Computer Engineering 313 or equivalent. 3 hours or $\frac{3}{4}$ unit.
362. **Logic Design.** Same as Computer Science 362 and Mathematics 391. Design of combinational networks, hazards, finite state testing machines, design of sequential networks in fundamental mode and pulse mode, state reduction, state assignment and races, and fault detection and testing. Prerequisite: Electrical and Computer Engineering 290 or Computer Science 231. 3 hours or $\frac{3}{4}$ unit.
364. **Power Electronics.** Switching functions and methods of control such as pulse-width modulation, phase control, and phase modulation; dc-dc, ac-dc, dc-ac, and ac-ac power converters; power components, including magnetic components and power semiconductor switching devices. Prerequisite: Electrical and Computer Engineering 309 and 342. 3 hours or $\frac{3}{4}$ unit.

366. **Introduction to Surface Acoustic Waves.** Basic ultrasonic principles; piezoelectricity; transducer equivalent circuits; and radar and communication system applications: delay lines, bandpass filters, oscillators, synthesizers, matched filters, convolvers, and Fourier transformers. Prerequisite: Electrical and Computer Engineering 309 and 350, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
368. **Solid-State Motor Drive Systems.** General principles of solid-state motor drives using silicon-controlled rectifiers and integrated circuits; discusses drive systems and components including inverters, frequency converters, motors, generators, and control systems; and industrial applications. Prerequisite: Electrical and Computer Engineering 330. 3 hours or $\frac{3}{4}$ unit.
369. **Power Electronics Laboratory.** Laboratory study of circuits and devices used for switching power converters, solid-state motor drives, and power controllers, including dc-dc, ac-dc, and dc-ac converters and applications; high-power transistors and magnetic components; design considerations, including heat transfer. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 364; Electrical and Computer Engineering 343 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
371. **Topics in Electrical and Computer Engineering.** Lectures and discussions relating to new areas of interest. Prerequisite: Specified by department or instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
373. **Fundamentals of Engineering Acoustics.** Same as Theoretical and Applied Mechanics 373. Development of the basic theoretical concepts of acoustical systems; mechanical vibration, plane and spherical wave phenomena in fluid media, lumped and distributed resonant systems, and absorption phenomena and hearing. Prerequisite: Mathematics 285 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
374. **Ultrasonic Techniques.** Ultrasonic wave propagation, generation, detection, and measurement in liquid and solid media, acoustic impedance concepts, ultrasonic absorption and velocity measurement techniques, piezoelectricity, and discussion of industrial, experimental, bioengineering, and medical applications. Prerequisite: Electrical and Computer Engineering 373 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
375. **Modeling of Bio-Systems.** Same as Bioengineering 375. Application of linear systems theory and feedback control systems analysis to biological systems; sensory receptors, neuro-muscular system models, control of eye movement, the pupil control system, man-machine interactions, parameter identification in biological systems; and optional project laboratory. Prerequisite: General Engineering 222, Mechanical Engineering 265, or Electrical and Computer Engineering 309; or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
376. **Power System Analysis.** Examines the development of power system equivalents, per phase network analysis, load flow, symmetrical components, sequence networks, fault analysis, and digital simulation. Prerequisite: Electrical and Computer Engineering 330. 3 hours or $\frac{3}{4}$ unit.
378. **Power System Operation and Control.** Studies economic operation of power systems, system protection, power system stability, dynamics and control of power systems, high voltage DC transmission, load flow interface, digital simulation. Prerequisite: Electrical and Computer Engineering 376. 3 hours or $\frac{3}{4}$ unit.
382. **Large Scale Integrated Circuit Design.** Bipolar and MOS field effect transistor characteristics; VLSI fabrication techniques for MOS and bipolar circuits; calculation of circuit parameters from the process parameters; and design of VLSI circuits such as logic, memories, charge-coupled devices, and A/D and D/A converters. Prerequisite: Electrical and Computer Engineering 290 and 342. 3 hours or $\frac{3}{4}$ unit.
383. **Linear Integrated Circuit Design.** Basic linear integrated circuit design techniques using bipolar, JFET, and MOS technologies; operational amplifiers; wide-band feedback amplifiers; sinusoidal and relaxation oscillators; electric circuit noise; application of linear integrated circuits. Prerequisite: Electrical and Computer Engineering 342. 3 hours or $\frac{3}{4}$ unit.
386. **Control Systems.** Analysis and design of control systems with emphasis on modeling, state variable representation, computer solutions, modern design principles, and laboratory techniques. Prerequisite: Electrical and Computer Engineering 309 or consent of instructor. 4 hours or 1 unit.
387. **Introduction to Quantum Electronics for Electrical Engineers.** Introduction for the senior electrical engineering student to the application of quantum mechanical concepts to elec-

- tronics problems; specifically, application of elementary quantum mechanics to the detailed study of a calculable two-state laser system; and incidental quantum ideas bearing on electronics. Prerequisite: Physics 383 or consent of instructor. 3 hours or 1 unit.
388. **Compound Semiconductors and Devices.** Advanced semiconductor materials and devices course covering elementary band theory, heterostructures, transport issues, three-terminal devices, and two-terminal devices, including lasers and light modulators. Prerequisite: Electrical and Computer Engineering 340, and either Electrical and Computer Engineering 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
390. **Introduction to Optimization.** Basic theory and methods for the solution of optimization problems; iterative techniques for unconstrained minimization; and introductory presentation of linear and nonlinear programming with engineering applications. Prerequisite: Computer Science 101 or 121, and Mathematics 280, or consent of instructor. 3 hours or 1 unit.
397. **Projects and Lectures in Quantum Electronics.** Studies processes involving quantum mechanical energy transfers in energized media leading to various lasering devices and their applications. A series of lectures, supplementing the special projects, offers background information on spectroscopy, collisional energy transfer, laser pumping schemes, modulation at optical frequencies, holography, and other related topics. Prerequisite: Senior standing; consent of instructor; Electrical and Computer Engineering 387 is recommended. 3 hours or $\frac{3}{4}$ unit.
400. **Seminar.** Required of all graduate students. 0 units.
412. **Computer Architecture.** Advanced concepts in computer architecture; design, management, and modeling of memory hierarchies, stack-oriented processors, associative processors, pipelined computers, and multiple processor systems; and focuses on hardware alternatives in detail and their relation to system performance/cost. Prerequisite: Electrical and Computer Engineering 312 or Computer Science 333, or consent of instructor. 1 unit.
413. **Digital Signal and Spectral Analysis.** Fundamentals of linear least squares estimation of discrete-time signals and their spectra; minimum-norm least squares and total least squares solutions; singular value decomposition; Wiener and Kalman filtering; autoregressive spectral analysis; and the maximum entropy method. Prerequisite: Electrical and Computer Engineering 310 and 313 and Mathematics 318, or equivalent, or consent of instructor. 1 unit.
415. **Control System Theory and Design.** Synthesis of feedback control systems to meet design specifications, including sensitivity; multivariable systems; introduction to systems with random inputs; state variable techniques; and nonlinear systems. Prerequisite: Electrical and Computer Engineering 386 or equivalent, or consent of instructor. 1 unit.
416. **Analysis of Networks and Systems.** Dynamic equations of linear lumped networks and systems; time-domain analysis and state space methods; frequency-domain analysis and transform methods; stability criteria; and applications to various problems in electrical engineering. Prerequisite: Electrical and Computer Engineering 309. 1 unit.
417. **Nonlinear and Adaptive Control.** Studies design of nonlinear control systems based on stability considerations; examines Lyapunov and hyperstability approaches to analysis and design of model reference adaptive systems; identifiers, observers, and controllers for unknown plants. Prerequisite: Electrical and Computer Engineering 415. 1 unit.
420. **Electromagnetic Waves and Radiating Systems.** Fundamental electromagnetic theory with applications to transmission lines, waveguides, and antennas; introduction to the solution of advanced problems in static electric and magnetic fields. Prerequisite: Electrical and Computer Engineering 352. 1 unit.
421. **Advanced Electromagnetic Engineering.** Reciprocity and equivalence principles; formulation of scattering and diffraction problems; approximations for large and for short wavelengths; plane, cylindrical, and spherical wave problems; variational methods; Wiener-Hopf techniques; and applications to antennas and waveguide problems. Prerequisite: Electrical and Computer Engineering 420. 1 unit.
422. **Controlled Fusion Systems, I.** Same as Nuclear Engineering 422. See Nuclear Engineering 422.
423. **Gaseous Electronics and Plasmas.** Basic concepts and techniques, both theoretical and experimental, which are used in the areas of gaseous electronics, gas and solid plasmas, controlled fusion, aeronomy, gas lasers, and magnetohydrodynamics. Prerequisite: Physics 383 or Electrical and Computer Engineering 352, or equivalent; or consent of instructor. 1 unit.
425. **Nuclear-Electrical Energy Conversion.** Same as Nuclear Engineering 425. See Nuclear Engineering 425.

428. **Analysis of Nonlinear Systems.** Same as Theoretical and Applied Mechanics 428. Treatment of singular points and stability considerations; consideration of graphical and analytical methods, including the perturbation method, variation of parameters, Galerkin's method, and the Ritz method for solving nonlinear differential equations. Prerequisite: Mathematics 341; consent of instructor. 1 unit.
431. **Theory of Guided Waves.** Propagation of electromagnetic waves in general cylindrical waveguides; stationary principles; non-uniform inhomogeneously filled waveguides; mode and power orthogonality; losses in waveguides; analytical and numerical techniques; microwave integrated circuits waveguides; and optical waveguides. Prerequisite: Electrical and Computer Engineering 420; Physics 440 and Mathematics 455 recommended. 1 unit.
432. **Compound Semiconductors (Optical Devices).** Properties of III-V and II-VI compound semiconductors and the devices which are unique to these materials; emphasis on materials such as GaAs, Ga(AsP), GaP, CdSe, Cd(SeS), etc., and on luminescence, semiconductor lamps, and semiconductor lasers. Prerequisite: Graduate standing in electrical engineering with some background in modern physics; elementary quantum mechanics; elementary semiconductor theory or equivalent. 1 unit.
433. **Theory of High-Speed Parallel Computation.** Same as Computer Science 433. See Computer Science 433.
434. **Random Processes.** Basic concepts of random processes; spectral analysis; linear systems with random inputs; Markov chains and Markov processes; and applications to communications and control systems engineering. Prerequisite: Mathematics 361 or equivalent, or Electrical and Computer Engineering 361. 1 unit.
435. **Theory of Semiconductors and Semiconductor Devices.** Same as Physics 435. Introductory quantum mechanics of semiconductors; energy bands; dynamics of Bloch electrons in static and high-frequency electric and magnetic fields; equilibrium statistics; transport theory, diffusion, drift and thermoelectric effects; and characteristics of p-n junctions, heterojunctions, and transistor devices. Prerequisite: Senior-level course in quantum mechanics or atomic physics. 1 unit.
436. **Integrated Optics and Optoelectronics.** Integrated optical and optoelectronic devices; theory of optical devices including laser sources, waveguides, photodetectors, and modulations of these devices. Prerequisite: Electrical and Computer Engineering 355, 387, or Physics 386; Electrical and Computer Engineering 388 recommended. 1 unit.
439. **Advanced Theory of Semiconductors and Semiconductor Devices.** Continuation of Electrical and Computer Engineering 435. Selected advanced topics of current interest in the physics of semiconductors and solid-state devices. Prerequisite: Electrical and Computer Engineering 435. 1 unit.
441. **Computer Systems Analysis.** Same as Computer Science 441. See Computer Science 441.
442. **Design of Fault-Tolerant Digital Systems.** Same as Computer Science 436. Advanced concepts in hardware and software fault tolerance; topics addressed include fault models, coding in computer systems, module and system level fault detection mechanism, reconfiguration techniques in multiprocessor systems and VLSI processor arrays, software fault tolerance techniques such as recovery blocks, N-version programming, checkpointing and recovery; survey of practical fault-tolerant systems. Prerequisite: Electrical and Computer Engineering 312 or equivalent. 1 unit.
443. **Digital System Testing and Design for Testability.** Fundamental techniques of detecting failures in complex digital systems, algorithms for automatic test generation, schemes for designing systems to be easily testable and with self test capability; hands-on experience with state-of-the-art computer-aided test tools in the laboratory. Prerequisite: Electrical Engineering 312 and 362, or equivalent. 1 unit.
444. **Design of Computer Problem Solvers.** Same as Computer Science 444. See Computer Science 444.
445. **Advanced Physical Acoustics.** Same as Theoretical and Applied Mechanics 445. Advanced topics in acoustics including physical properties of a fluid; linear propagation phenomena; nonlinear phenomena such as radiation force, streaming, and harmonic generation; cavitation; and absorption and dispersion. Prerequisite: Electrical and Computer Engineering 373 or 420, or Theoretical and Applied Mechanics 458, or equivalent; or consent of instructor. 1 unit.

446. **Advanced Artificial Intelligence Programming Methods.** Same as Computer Science 446. See Computer Science 446.
447. **Image Processing.** Examines fundamental concepts, techniques, and directions of research in image processing; topics include two-dimensional Fourier transform and filtering, image digitization, coding, restoration, reconstruction, analysis, and recognition. Prerequisite: Electrical and Computer Engineering 310 and 313; or equivalent. 1 unit.
448. **Computer Models of Cognitive Processes.** Same as Computer Science 448. See Computer Science 448.
449. **Computer Vision.** Examines information processing approaches to computer vision, and algorithms and architectures for artificial intelligence and robotics systems capable of vision: inference of three-dimensional properties of a scene from its images, such as distance, orientation, motion, size and shape, acquisition and representation of spatial information for navigation and manipulation in robotics. Prerequisite: Electrical and Computer Engineering 348 or Computer Science 225, or consent of instructor. 1 unit.
451. **Digital Signal Processing.** Reviews basic concepts of digital signals and systems; examines computer-aided digital filter design, quantization effects, decimation and interpolation, fast algorithms for convolution and the DFT; and introduces adaptive signal processing. Prerequisite: Electrical and Computer Engineering 310 and 313; or equivalent. 1 unit.
452. **Computational Techniques for Circuit Analysis and Design.** Formulation of circuit equations; sparse matrix algorithms for the solution of large systems, AC, DC, and transient analysis of electrical circuits; sensitivity analysis; decomposition methods. Prerequisite: Mathematics 315 and Electrical and Computer Engineering 309. 1 unit.
453. **Optimum Control Systems.** Formulation of the optimization problem; controllability; observability; stability; Lyapunov's second method; application of variational calculus, maximum principle, and principle of optimality to control problems; stochastic control; and adaptive control. Prerequisite: Electrical and Computer Engineering 415. 1 unit.
454. **Sampled-Data Control Systems.** Analysis and design of feedback control systems with digital and sampled data. Prerequisite: Electrical and Computer Engineering 415 or equivalent. 1 unit.
455. **Control of Stochastic Systems.** Stochastic control models; development of control laws by dynamic programming; separation of estimation and control; Kalman filtering; self-tuning regulators; dual controllers; decentralized control. Prerequisite: Electrical and Computer Engineering 415 and 434. 1 unit.
456. **Coding Theory.** Same as Computer Science 456 and Mathematics 476. General discussion on coding theory with emphasis on the algebraic theory of cyclic codes; error-control procedures and circuits; and applications to computers and data-transmission systems. Prerequisite: Mathematics 317 or equivalent, or consent of instructor. 1 unit.
458. **Multidimensional Digital Signal Processing.** Multidimensional signals, convolution, transforms, stability, sampling, windowing; design of two-dimensional digital filters; fast algorithms for multidimensional convolution, DFT, and corner turning; sensor array processing, including tomography and synthetic aperture radar; multidimensional interpolation. Prerequisite: Electrical and Computer Engineering 451. 1 unit.
460. **Principles of Optical Communications Systems.** Characteristics of optical communication systems; topics include optical fibers, integrated optics, transmitter and receiver optics, detection techniques, photon counting, digital and analog communication, and lidar. Prerequisite: Electrical and Computer Engineering 313 and 420, or equivalent. 1 unit.
461. **Signal Detection and Estimation.** Introduction to detection and estimation theory, with applications to communication, control, and radar systems; decision-theory concepts and optimum-receiver principles; detection of random signals in noise, coherent and noncoherent detection; and parameter estimation, linear and nonlinear estimation, and filtering. Prerequisite: Electrical and Computer Engineering 434 or equivalent, or consent of instructor. 1 unit.
462. **Topics in Signal Detection and Estimation.** Topics selected from the following; nonlinear filtering; robust detection, estimation, and filtering; detection and estimation of point processes; quantum detection; advanced computational methods in linear filtering; white noise calculus for nonlinear systems. Students must complete a project. Prerequisite: Electrical and Computer Engineering 461 or consent of instructor. 1 unit.

463. **Information Theory.** Same as Computer Science, Mathematics, and Statistics 463. See Mathematics 463.
465. **Topics in Automata Theory.** Same as Computer Science 465 and Mathematics 465. See Mathematics 465.
467. **Communication Network Analysis.** A first high-level course in performance analysis and design of multiple-user communication systems; emphasizes rigorous formulation and analytical and computational methods; includes queueing networks, decentralized minimum delay routing and dynamic network flow control. Prerequisite: Computer Science 338, and either Electrical and Computer Engineering 434 or Mathematics 366; or consent of instructor. 1 unit.
468. **Modeling and Control of Electro-Mechanical Systems.** Same as Mechanical Engineering 468. Examines fundamental electrical and mechanical laws for derivation of machine models' simplifying transformations of variables in electrical machines; power electronics for motor control; time-scale separation; feedback linearization and nonlinear control as applied to electrical machines. Typical electromechanical applications in actuators, robotics, and variable speed drives. Prerequisite: Electrical and Computer Engineering 333, or Electrical and Computer Engineering 415, or consent of instructor. 1 unit.
469. **Introduction to Coherent Optics and Holography.** Same as Computer Science 469. The diffraction transformation of aperture distributions between parallel planes and the imaging and Fourier-transforming properties of lenses; the theory of coherence; the principles of optical and digital holography; and devices and systems for optical data processing. Prerequisite: Consent of instructor. 0 or 1 unit.
470. **Nonlinear Optics.** Light propagation in anisotropic crystals; second- and third-order nonlinear susceptibility and electro-optic effect; and discussion of the relationship of these effects along with such applications as light modulation, harmonic generation, and optical parametric amplification and oscillation. Prerequisite: Electrical and Computer Engineering 420. 1 unit.
472. **Quantum Electronics.** Brief theoretical introduction to quantum mechanics and atomic physics, with many applications in spin resonance and modern maser theory. Prerequisite: Physics 383 recommended. 1 unit.
473. **Power System Control.** Studies energy control center functions, state estimation and steady state security assessment techniques, economic dispatch, optimal power flow, automatic generation control, and dynamic equivalents. Prerequisite: Electrical and Computer Engineering 376 or consent of instructor. 1 unit.
474. **Topics in Graph and Geometric Algorithms.** Same as Computer Science 474. Design and analysis of computational methods for problems in graph theory and computational geometry; graph connectivity and isomorphism, flow in networks, and matching and covering; and geometric inclusion, proximity intersection and reachability, and applications to computational statistics. Prerequisite: Computer Science 373, or Computer Science 321 and either Mathematics 319 or Mathematics 313, or equivalent; or consent of instructor. 1 unit.
475. **Ionospheric Radio Propagation.** Propagation in a stratified medium; WKB solution; ray theory; ionospheric sounding; ionospheric transmission problems; scattering by irregularities; propagation in a random medium; cross-modulation and nonlinear effects; magneto-ionic theory; Faraday effect; whistler propagation; coupling of characteristic waves; magnetohydrodynamic waves; formation of ionospheric E-region; and formation of F-region. Prerequisite: Electrical and Computer Engineering 420 or equivalent. 1 unit.
476. **Power System Dynamics and Stability.** Detailed modeling of the synchronous machine and its controls, such as excitation system and turbine-governor dynamics; time-scales and reduced order models; non-linear and linear multi-machine models; stability analysis using energy functions; power system stabilizers. Prerequisite: Electrical and Computer Engineering 376 or consent of instructor. Concurrent registration in Electrical and Computer Engineering 415 is recommended. 1 unit.
477. **Advanced Antenna Theory.** Selected topics from recent engineering literature on antennas supplemented by advanced topics in electromagnetic theory needed for comprehension; current techniques for analysis of wire, slot, horn, frequency independent, quasi-optical, and array antennas. Prerequisite: Electrical and Computer Engineering 420. 1 unit.
478. **Advanced Electromagnetic Diffraction and Radiation.** Asymptotic solutions of Maxwell's equations, geometrical optics, edge diffraction, uniform theories, creeping waves, advanced

antenna theory, and topics of current interest. Prerequisite: Electrical and Computer Engineering 420 or Physics 442; Electrical and Computer Engineering 421 or 477 is recommended for supplemental background. 1 unit.

479. **Computational Complexity.** Same as Computer Science and Mathematics 479. Turing machines; determinism and non-determinism; time and space hierarchy theorems; speed-up and tape compression; Blum axioms; structure of complexity classes NP, P, NL, L, PSPACE; complete problems; randomness and complexity classes RP, RL, BPP; alternation, polynomial-time hierarchy; circuit complexity, parallel complexity, NC, RNC; relativized computational complexity; time-space trade-offs. Prerequisite: Computer Science 373 or 375, or consent of instructor. 4 hours or 1 unit.
480. **Optimization by Vector Space Methods.** Same as Mathematics 480. See Mathematics 480.
482. **Physical VLSI Design.** Basic physical design requirements for VLSI; performance-oriented formulation and optimization of chip partitioning, module placement and interconnection; optimized design and layout of on-chip modules; circuit extraction; high-speed VLSI circuits; yield and reliability analysis; advanced VLSI packaging and parametric testing. Prerequisite: Electrical and Computer Engineering 325 or 382. 1 unit.
490. **Seminar in Special Topics.** Lectures and discussions on current research and literature on advanced topics in electrical engineering. Prerequisite: Advanced standing; consent of instructor. 0 to 1/2 unit. May be repeated for credit.
497. **Electrical and Computer Engineering Problems.** Lectures and discussions relating to new areas of interest. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated for credit.
498. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. 1/4 to 2 units.
499. **Thesis Research.** 0 to 4 units.

ELEMENTARY AND EARLY CHILDHOOD EDUCATION

(See Curriculum and Instruction)

ENGINEERING

Program Administrator: H. L. Wakeland

Program Office: 207 Engineering Hall, 1308 West Green, Urbana

100. **Engineering Lecture.** Engineering lecture for freshmen; selected topics each week. Required of freshmen in the College of Engineering. 0 hours.
101. **Cooperative Engineering Education Seminar.** Discussion seminar for on campus cooperative education students. Topics include industrial work reports, evaluations of experience, tax and financial aid regulations, and experience opportunities. Prerequisite: Enrollment in the Cooperative Engineering Education Program. 0 hours.
102. **Cooperative Engineering Education Practice.** Off-campus practice of engineering in government or industry. Prerequisite: Cooperative student in any engineering curriculum. 0 hours.
110. **Engineering Apprenticeship.** Part-time practice of engineering science in an on-campus research laboratory environment; summary report required. Prerequisite: Completion of freshman year or equivalent. 0 hours. May be repeated.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Engineering Lecture.** Required of off-campus transfer students in the College of Engineering. Meets for first three weeks of each semester; selected topics. 0 hours.
210. **Engineering Internship.** Full-time practice of engineering science in an off-campus industrial or research laboratory environment; summary report required. Prerequisite: Completion of sophomore year or equivalent, or consent of Director of Cooperative Education and Professional Practice. 0 hours. May be repeated.
298. **Executives in the Technological World.** Offers a series of seminars by executives from industrial and technical organizations; provides students an opportunity to better understand the role

of the technological executive as a decision-maker in the contemporary world; and discusses current trends, practices, economic conditions, productivity, government regulation, and foreign trade from the viewpoint of a wide range of industries such as transportation, steel, energy, and electronics. Prerequisite: Junior or senior standing in engineering, or consent of instructor. 1 hour.

299. **Engineering Study Abroad.** Provides campus credit for foreign study and/or provides a mechanism for engineering students to maintain continuous enrollment on this campus. If objective is study abroad for credit, a detailed proposal must be submitted by the student for approval by a committee of the department in which the student is studying and the college office prior to such study abroad. Final determination of credit and its application toward the student's degree is made after a review of the student's work abroad by the above committee and the college office. Prerequisite: Completion of sophomore year in engineering; approval of student's proposed study program by his department and the college office. 0 to 15 hours (summer session, 0 to 7 ½ hours).

ENGINEERING HONORS

Executive Secretary of Program: H. G. Wenzel

Program Office: 207 Engineering Hall, 1308 West Green, Urbana

196. **The Engineer and Society.** Prerequisite: Freshman James Scholar. 2 hours.
198. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester for freshman James Scholars to enable them to explore at their own level various aspects of technology that are of interest to them. Prerequisite: Honors student in the University. 1 to 4 hours.
297. **College Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester in special interdisciplinary subjects of current interest for James Scholars in engineering. Prerequisite: James Scholar in engineering or consent of instructor. 1 to 4 hours.

ENGLISH

(Including Business and Technical Writing and Rhetoric and Composition)

Head of Department: Richard P. Wheeler

Department Office: 208 English Building, 608 South Wright, Urbana

Business and Technical Writing

Business and Technical Writing Office: 100 English Building

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
251. **Business and Administrative Communication.** Study of communication as a tool of administration and management; practice in writing a wide variety of types and forms of communication; and inclusion of oral and visual communication with the written to provide an integrated approach. For the student whose career will be in administration and management requiring a broad range of communication skills. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
252. **Technical Communication.** Advanced writing course dealing with the problems, principles, and techniques of presenting technical information; includes reports, proposals, procedures, manuals, and technical articles. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.

271. **Sales Writing.** Same as Advertising 288. Direct mail campaigns and company magazine copy. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
272. **Report Writing.** Personal direction in a report writing project which can be integrated with research in another course; study of report-writing principles and practices. Classes meet for the first month after which the student and the instructor arrange a conference schedule. Small group meetings are arranged for presentation of proposals, progress reports, and summary reports. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
290. **Individual Study.** Independent research with a chosen tutor leading to the writing of a formal report or preparation of some other type of major presentation of information. Enroll in Business and Technical Writing office, 100 English Building, Urbana. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours.
302. **Descriptive English Grammar.** Same as English 302. See English 302.
400. **Technical and Professional Writing.** Grammar, syntax, diction, paragraph development, and logic as they relate to technical and professional exposition; practice in defining problems for scientific investigation, organizing information and outlining, preparing headings and abstracts, drafting and revising papers, and presenting information graphically and orally. Prerequisite: Graduate standing. 3 hours. No graduate credit.

English

101. **Introduction to Poetry.** Reading and discussion of representative poems of several periods and types. 3 hours.
102. **Introduction to the Drama.** Reading and discussion of representative plays of several periods and types. 3 hours.
103. **Introduction to Fiction.** Reading and discussion of representative fiction of several periods and types. 3 hours.
104. **Introduction to Film.** Understanding of narrative films through the viewing and discussion of a representative body of film classics drawn from the entire range of world cinema; emphasizes the basic elements of cinematic expression, and concerns major movements, periods, and genres. 3 hours.
106. **Literature and Experience.** Understanding of the relationship between literature and human experience through the study of significant, recurrent themes. 3 hours. May be repeated once as topics vary.
107. **Law in Literature.** The portrayal of law and the legal system in literature with particular emphasis on the impact of that system on society and the relationship between private morality and public law; includes guest speakers from the legal profession. 3 hours.
113. **The Idea of Comedy.** A selective introduction to the theory and practice of comedy; examines a number of influential theories of comedy and a variety of comic forms including poetry, novels, essays, plays, and short stories. 3 hours.
114. **The Bible as Literature.** Same as Religious Studies 101. See Religious Studies 101.
115. **Masterpieces of English Literature.** Study of selected major writings. 3 hours.
116. **Masterpieces of American Literature.** Study of selected major writings. 3 hours.
118. **Introduction to Shakespeare.** Representative readings of Shakespeare's drama and poetry in the context of his age, with emphasis on major plays; selections vary from section to section. Does not fulfill Shakespeare requirement for the English major. 3 hours.
119. **The Literature of Fantasy.** Same as Comparative Literature 119. Surveys masterworks in the romance-tradition from Shakespeare's time to the present; as distinct from science fiction, the materials feature magic and the supernatural rather than technology; and includes stage romance, fairy tale, horror tale, and fantasy-novel. Individual works are set in their historical and literary contexts. 3 hours.
120. **Science Fiction.** A literary and historical study of science fiction from Mary Shelley to Ursula K. LeGuin with particular emphasis on the achievement of science fiction as a literary form in the romance tradition. 3 hours.

180. **Drama in Production.** Study, discussion, and production of a dramatic text. 3 hours. May be repeated once as topic varies.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars. Prerequisite: Consent of honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Honors Seminar.** Introduction to the study of literature, with emphasis on individual work in fundamental problems of literary analysis; works studied are usually a combination either of short poems and short stories or of novels and plays. Prerequisite: James Scholar standing or other designation as a superior student. 4 hours. May be repeated once as topics vary.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Medieval Literature and Culture.** Same as Comparative Literature 253. British and continental authors (including Chaucer) read in modern English. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
204. **Renaissance Literature and Culture.** Same as Comparative Literature 255. Readings in English and continental literary masterpieces with attention to the significant cultural influences of the period. 3 hours.
206. **Literature and Culture of the Enlightenment.** Same as Comparative Literature 257. Readings in English and continental literature of the eighteenth century, with attention to significant cultural influences. 3 hours.
209. **English Literature from the Beginning to 1798.** Historical and critical study of selected works of English literature to 1798 in chronological sequence. 3 hours.
210. **English Literature from 1798 to Present.** Historical and critical study of selected works of English literature after 1798 in chronological sequence. 3 hours.
211. **Introduction to Modern African Literature.** Same as African Studies 210 and Comparative Literature 210. See African Studies 210.
215. **Practical Criticism.** Introduction to applied literary criticism. Prerequisite: English 101. 3 hours.
240. **The English Romantic Poets.** Blake, Wordsworth, Scott, Coleridge, Byron, Shelley, and Keats. 3 hours.
241. **The Beginnings of Modern Poetry.** American and British poets including Frost, Robinson, Sandburg, Lindsay, Hardy, Hopkins, Housman, Yeats, Lawrence, the Imagists, and the early Pound and Eliot. 3 hours.
242. **Poetry Since 1940.** 3 hours.
243. **Development of the Modern Drama.** Same as Comparative Literature 265. Ibsen to O'Neill. 3 hours.
244. **Development of the Modern Drama.** Same as Comparative Literature 266. Pirandello to the present. 3 hours.
245. **The Short Story.** Same as Comparative Literature 267. Historical and critical study of the short story (American and European) from the early nineteenth century to World War I; major emphasis on such authors as Hawthorne, James, Crane, Gogol, Chekhov, Maupassant, Flaubert, Joyce, and Mansfield. 3 hours.
246. **The Short Story.** Same as Comparative Literature 268. Historical and critical study of the short story (American and European) from World War I to the present; major emphasis on such authors as Anderson, Hemingway, Faulkner, Porter, Mann, Kafka, Maugham, Lawrence, Salinger, and Camus. 3 hours.
247. **The British Novel.** Critical study of representative British novels from different literary periods. 3 hours.
248. **Modern British and American Fiction in Relation to Continental Fiction.** Same as Comparative Literature 269. An examination of important thematic and structural relationships— influences, parallels, and variations—among selected major works of the nineteenth and twentieth centuries; readings chosen from works of Bronte, Hardy, Lawrence, Woolf, James, Faulkner, Bellow, Oates, Dostoevsky, Tolstoy, Stendhal, Flaubert, Camus, Kafka, Mann, Hesse, Moravia, and Pavese. All works read in English. 3 hours.
249. **The American Novel.** Study of major and representative novels from the beginnings to the present. 3 hours.
255. **Survey of American Literature, I.** American literature and its cultural backgrounds to 1870. 3 hours.

256. **Survey of American Literature, II.** American literature and its cultural backgrounds after 1870. 3 hours.
259. **Afro-American Literature, I.** Same as Afro-American Studies 259. Historical and critical study of Afro-American literature in its social and cultural context from the beginning to 1915. 3 hours.
260. **Afro-American Literature, II.** Same as Afro-American Studies 260. Historical and critical study of Afro-American literature in its social and cultural context since 1915. 3 hours.
273. **Intermediate Film Studies: Directors, Genres, Themes.** Critical study of narrative films, with viewing and discussion of a major film each week; in-depth study of selected directors, genres, and themes; emphasis on aspects of film aesthetics, criticism, and history. Prerequisite: English 104 or a college-level course in literature or film. 3 hours.
274. **Literature and Society.** Major literary works presented within the context of social issues of their time. 3 hours.
275. **Literature and Psychology.** Psychological and psychoanalytical theories as they bear on the interpretation of literature. 3 hours.
280. **Women Writers.** Same as Women's Studies 280. Study of British and American women authors. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
281. **Women in the Literary Imagination.** A study of the way various writers, both men and women, have portrayed woman's image, social role, and psychology in English or American literature. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
283. **Jewish Sacred Literature.** Same as Comparative Literature and Religious Studies 283. See Religious Studies 283.
284. **Modern Jewish Literature.** Same as Comparative Literature and Religious Studies 284. Surveys imaginative literature by Jewish authors from the Enlightenment to the present; fiction, poetry, drama, and autobiography written in English or translated from other languages. 3 hours.
285. **Third World Literature in English; the Post-Colonial Period.** Introduction to great works of modern African, Asian, and Caribbean fiction, drama, and poetry within their historical contexts. Emphasis on the emergence of new traditions of literature written in English in the Third World. 3 hours.
290. **Individual Study.** Study of selected topics. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours. Students may register in this course more than once in the same term.
291. **Honors Individual Study.** Study of selected topics. Restricted to English and English education majors with a 4.25 average who are working towards the degree with Distinction in English or in English education. Enrollment in appropriate honors office necessary. Prerequisite: Consent of English honors or English education honors adviser. 1 to 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Independent research with a chosen tutor leading to the writing of a thesis. Restricted to English or English education majors with a 4.25 average who have satisfied all other requirements towards the degree with distinction; enrollment in the English Honors Office necessary. 3 hours. (Counts for advanced hours in LAS.)
296. **Honors Seminar, I: Themes, Movements, and Forms in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department majors, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
297. **Honors Seminar, II: Periods in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department majors, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. Offered every semester with varying topics; may be repeated as topic varies. 3 hours.
298. **Honors Seminar, III: Major British and American Authors.** Each seminar considers one or two major authors. Prerequisite: James Scholar status in any department; for English Department majors, a 4.25 grade-point average or consent of director of honors program. Enrollment through the English Honors Office necessary. 3 hours. May be repeated as topic varies.
301. **Introduction to the Study of the English Language.** Language theories and modes of language study applied to English. 3 hours or 1 unit.

302. **Descriptive English Grammar.** Same as Business and Technical Writing 302. 3 hours or 1 unit.
303. **Historical Introduction to the English Language.** 3 hours or 1 unit.
311. **Chaucer.** A selection read in Middle English. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
315. **Poetry and Prose of the English Renaissance, 1500-1600.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
316. **The Drama of Shakespeare's Contemporaries.** Tudor and Stuart drama. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
318. **Shakespeare, I.** Earlier tragedies, comedies, and history plays. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
319. **Shakespeare, II.** Mature tragedies, dark comedies, and late romances. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
321. **Poetry and Prose from the Metaphysicals to 1660.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
323. **Milton.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
326. **The Age of Dryden, Pope, and Swift.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
327. **The Age of Johnson.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
328. **English Drama of the Restoration and Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
329. **Restoration and Eighteenth-Century Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
331. **English Romantic Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
334. **Victorian Poetry and Nonfiction Prose.** Study of such major poets as Tennyson, Browning, Arnold, and Hardy; and of prose writers including Carlyle, Mill, Arnold, Pater, and Huxley. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
335. **Nineteenth-Century British Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
341. **British Literature in the Twentieth Century to 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
342. **British Literature in the Twentieth Century Since 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
343. **The Plays of Bernard Shaw.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
347. **Literature of the American Renaissance.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
350. **American Literature from the Civil War to the First World War.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
351. **American Literature from the First World War to the Present.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
355. **Major Authors.** Intensive study of the work of one or two major authors. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
361. **Topics in English and American Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
362. **Topics in Modern Fiction.** Topics including theme, genre, and literary movements, predominantly in English or American nineteenth- and twentieth-century fiction, with occasional consideration of continental fiction in English translation; topics may vary from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
365. **Comedy.** Same as Comparative Literature 365. History and theory of stage comedy. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
366. **Topics in Modern Drama.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.

367. **The International Folk Tale.** Same as Comparative Literature 359. Origin, nature, and distribution of the folk tale. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
368. **The Ballad and Folksong in the United States.** English-language traditional songs and ballads, transplanted and native. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
370. **Modern African Fiction.** Same as African Studies, Comparative Literature, and French 310. See African Studies 310.
373. **Special Topics in Film Studies.** Extended investigation of major subjects and issues in narrative film; topics vary and typically include studies of author/directors, genres, historical movements, critical approaches, and themes. Prerequisite: One college-level film studies course and one additional college-level course in film studies or literature; or consent of instructor. 3 hours or 1 unit.
375. **Topics in the Relation of Other Disciplines to the Study of Literature.** See *Timetable* for current topics. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
381. **Theory and Practice of Written Composition.** History and theory of written composition; basic rhetorical principles; and guidance and criticism of student writing. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
383. **Literary Criticism from 1800 to the Present.** Same as Comparative Literature 305. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
385. **Literature for the High School.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
387. **Topics in Folklore.** Same as Comparative Literature, German, Slavic and Speech Communication 387. Presents selected topics in folklore studies that deal with a particular theme, ethnic group, region, genre, or interpretive approach; topics vary. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary to a maximum of 6 hours or 2 units.
400. **Introduction to Research and Critical Techniques.** Introductory course in methods and techniques in research and literary criticism. 1 unit.
404. **Seminar in the English Language.** Study of English linguistics. 1 unit.
407. **Old English.** Introduction to the language before 1000 A.D. 1 unit.
408. **Beowulf.** Prerequisite: English 407 or consent of instructor. 1 unit.
411. **Chaucer: Troilus and Criseyde and the Minor Poems.** 1 unit.
412. **Chaucer: The Canterbury Tales.** 1 unit.
414. **Seminar in Medieval Literature.** Prerequisite: A college course devoted entirely to an aspect of medieval studies, or consent of instructor. 1 unit. May be repeated as topic varies.
419. **Seminar in Shakespeare.** Prerequisite: A college course devoted entirely to an aspect of Shakespeare's work, or consent of instructor. 1 unit. May be repeated as topic varies.
420. **Seminar in Sixteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
424. **Seminar in Seventeenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topic varies.
427. **Seminar in Restoration and Eighteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of eighteenth-century studies, or consent of instructor. 1 unit. May be repeated as topic varies.
433. **Seminar in Romantic Literature.** Same as Comparative Literature 452. Prerequisite: A college course devoted entirely to an aspect of Romantic studies, or consent of instructor. 1 unit. May be repeated as topic varies.
437. **Seminar in Victorian Literature.** Prerequisite: A college course devoted entirely to an aspect of Victorian studies, or consent of instructor. 1 unit. May be repeated as topic varies.
443. **Seminar in Modern British Literature.** Prerequisite: One college course devoted entirely to an aspect of modern British studies, or consent of instructor. 1 unit. May be repeated as topic varies.

447. **Seminar in Earlier American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
453. **Seminar in Later American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topic varies.
463. **Seminar in Literary Themes and Movements.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
464. **Seminar in Literary Modes and Genres.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
478. **Seminar in the Relation of Other Disciplines to the Study of Literature.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topic varies.
481. **Seminar in Literary Theory and Criticism.** Prerequisite: A college course devoted entirely to criticism, or consent of instructor. 1 unit. May be repeated as topic varies.
491. **Research in Special Topics.** Independent study under the guidance of a member of the graduate faculty. 1 unit. May be repeated to a maximum of 2 units.
492. **Master's Comprehensive Examination Tutorial.** Reading for the Master's Comprehensive Examination under the guidance of the candidate's graduate adviser. 6 or 12 hours. May be taken once for 12 hours or twice for 6 hours each. No graduate credit.
493. **Professional Seminar in the Teaching of College English.** Prerequisite: Graduate standing in the Department of English or consent of instructor. 0 or 1 unit. May be repeated by Ph.D. candidates as the topic varies but without credit after two units have been earned in this course. Students needing the proseminar for their programs will be given priority enrollment.
499. **Thesis Research.** Guidance in writing theses for doctoral degrees. Prerequisite: Doctoral candidate standing. 0 to 4 units.

Rhetoric and Composition

102. **Introduction to Composition.** Instruction in basic formats of expository writing; provides preparatory semester of composition for students with special needs; to be taken prior to Special Options Rhetoric 105. Does not fulfill campus rhetoric requirement. Prerequisite: Concurrent registration in Rhetoric 103; placement by the English Department based on ACT-English scores, reading test when pertinent, and writing samples. 3 hours.
103. **Writing Laboratory.** Intensive tutoring in basic writing skills to be scheduled at the Writing Laboratory. Open only to students in the EOP Rhetoric Program or to those in the special option sections. Prerequisite: Concurrent registration in Rhetoric 102, 104 or 105; or written consent from the EOP Rhetoric Program Office. 1 hour. May be repeated to a total of 2 hours.
104. **EOP Rhetoric.** An introductory writing course designed for EOP students. Concentrates on exposition and must be taken concurrently with Rhetoric 103, a 1-hour course offered at the Writing Laboratory. To be taken prior to EOP Rhetoric 105. Does not fulfill campus rhetoric requirement. 3 hours.
105. **Principles of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. This course fulfills the campus rhetoric requirement. 4 hours. Students with credit in Rhetoric 105 may not receive additional credit for Rhetoric 108 and Speech Communication 111 and 112.
108. **Forms of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. Students are admitted on the basis of ACT verbal scores or equivalent. Students will type and revise their work at the computer. This course fulfills the campus rhetoric requirement. 4 hours. Students with credit in Rhetoric 108 may not receive additional credit for Rhetoric 105 and Speech Communication 111 and 112.
133. **Principles of Composition.** Practice in exposition, with emphasis on organization, paragraphing, and sentence structure. For the student whose career will require competence in writing clear, precise prose as an adjunct to another professional activity. Credit is not given for

- Rhetoric 133 and Rhetoric 143. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
143. **Intermediate Expository Writing.** Practice in expository types, with emphasis on style and critical analysis. Recommended for rhetoric majors. Credit is not given for Rhetoric 143 and Rhetoric 133. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours.
144. **Introductory Narrative Writing.** Practice in the writing of narrative prose, with primary emphasis on short fiction. Prerequisite: Fulfillment of campus rhetoric requirement. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 146 or 306. 3 hours.
146. **Introductory Poetry Writing.** Practice in the writing of poetry; experimentation with a number of fixed forms and free verse, but emphasis mainly on the student's freedom to develop a personal style. Prerequisite: Fulfillment of campus rhetoric requirement. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 144, 204, or 304. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Communications Workshop.** Independent writing projects and examination of literature as the cultural basis of the student's specialized fields. 3 hours.
204. **Intermediate Narrative Writing.** Practice in the writing of fiction, with emphasis on the short story. Prerequisite: Rhetoric 144 or equivalent. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 306 or 146. 3 hours.
227. **Advanced Expository Writing.** Types of nonfiction prose, including the essay, criticism, biography, and historical writing. Prerequisite: Rhetoric 133 or 143, or equivalent, or consent of instructor. 3 hours.
302. **Advanced Writing Topics.** Practice in various literary genres and in their combinations for mature students who have some writing experience and a background of data and impressions which they wish to develop in writing of near-professional quality. Individual conferences at hours to be arranged. Prerequisite: Rhetoric 133 or 143, or equivalent; or consent of instructor. 3 hours or 1 unit.
304. **Advanced Narrative Writing.** Continued practice in the writing of fiction, with emphasis on the longer story. Prerequisite: Rhetoric 204 or equivalent. Student must petition Director of Creative Writing to take this course concurrently with Rhetoric 306 or 146. 3 hours or 1 unit.
306. **Advanced Poetry Writing.** Practice of the writing of poetry aided by intensive study of examples. Prerequisite: Rhetoric 146 or equivalent. Student must petition Director of Creative Writing to take this course concurrently with Rhetoric 304. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
355. **Creative Writing Tutorial.** Personal direction in a writing project: fiction (novel or short stories), poetry, criticism, narrative, etc. Frequency of conference to be determined by the type of project. Prerequisite: Rhetoric 227, 304, or 306 and consent of the Director of Creative Writing. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units. Undergraduate Rhetoric majors with a 4.25 average who are working towards the degree with Distinction or High Distinction in Rhetoric may, with the consent of the Director of Creative Writing and the English honors advisor, take this course for honors credit.

ENGLISH AS AN INTERNATIONAL LANGUAGE

(Including English as a Second Language)

Director of Division: Braj B. Kachru

Division Office: 3070 Foreign Languages Building, 707 South Mathews, Urbana

English as an International Language

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
301. **Topics in Applied TESL/TEFL Theory.** Implications of TESL/TEFL theory and research for classroom practice: preparation of teaching and testing materials; evaluation of materials on the basis of ESL/EFL teaching experiences; adaptation to needs of different learner ages, language, and achievement backgrounds; and new teaching formats. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated as topic varies to a maximum of 8 hours or 2 units.
302. **Descriptive English Grammar for ESL Teachers.** Adapts modern English grammar to the needs of the ESL teacher, emphasizing the development of analytical skills that can be applied to syntactic and lexical analysis. 3 hours or $\frac{3}{4}$ unit.
305. **Introduction to Applied Linguistics.** Same as Linguistics 305. See Linguistics 305.
335. **Neurolinguistics and Second Language Learning.** Same as Linguistics 335. Introduces theoretical, methodological and applied research on the relationship between neurolinguistics and second language acquisition with special emphasis on the "bilingual brain." Prerequisite: Linguistics 200, 225, 300, or 400; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
350. **Introduction to Sociolinguistics.** Same as Linguistics 350. See Linguistics 350.
356. **Impact of Cultural Differences in TESL.** Examines people as cultural beings; studies the effect of cultural differences on communication, both in the ESL classroom and in the community; and presents various methods of incorporating relevant elements of American culture into the ESL classroom. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as French, German, and Spanish 360. Studies theoretical and practical aspects of language testing: examines purposes and types of language tests in relation to theories of language use and language teaching goals; discusses testing practices and procedures related to language teaching and language research; and includes the planning, writing, and administration of tests, basic descriptive statistics, and test analysis. A project is required. Prerequisite: English as an International Language 389. 3 hours or $\frac{3}{4}$ unit.
371. **Teaching Composition in the ESL Classroom.** Applies select principles of linguistics, rhetoric, crosscultural communication, and second language acquisition to developmental instruction in ESL writing; required projects: article reviews, instructional materials analysis and preparation, and ESL class observation. Prerequisite: English as an International Language 301. 3 hours or $\frac{3}{4}$ unit.
380. **Classroom Language Acquisition.** Same as French, German, Italian, Portuguese, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, French, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
386. **Reading in a Second Language.** Same as Linguistics 385. Treats current research and reading theory with a view toward developing maximally efficient materials designed to teach reading in a second language; analyzes and evaluates teaching practices, however, places primary emphasis on materials development. Project is required. Prerequisite: English as an International Language 302 and an introductory course in linguistics. 3 hours or $\frac{3}{4}$ unit.
388. **English Phonology and Morphology for ESL Teachers.** Same as Linguistics 388. Application of linguistics to language learning with special emphasis on learning the sound system of English. Prerequisite: Two years of a foreign language or equivalent; consent of instructor. 3 hours or $\frac{3}{4}$ unit.

389. **Theoretical Foundations of TESL Methodology.** Same as Linguistics 389. Applied linguistics in teaching and learning English as a second language with special emphasis on the applications of interdisciplinary research into second language acquisition. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
402. **Introduction to General Linguistics.** Same as Anthropology and Linguistics 400. See Linguistics 400.
410. **Generative Phonology in English Teaching.** Generative phonological analyses of English and the teaching of English pronunciation: reevaluation of teaching goals, content, presentation, and methodology; required projects involve research into English phonology leading to the development and evaluation of lesson materials for ESL classes. Prerequisite: English as an International Language 301 and English as an International Language 388. 1 unit.
412. **Pedagogical Grammar.** Same as Linguistics 413. Surveys English grammar and texts for teaching grammar in ESL, with special emphasis on the development of skills in explanation of grammatical phenomena in ESL classes. Prerequisite: English as an International Language 302 or equivalent. $\frac{3}{4}$ unit.
419. **Contrastive Linguistics.** Same as Linguistics 419. See Linguistics 419.
435. **Seminar in Neurolinguistics and Second Language Learning.** Research-oriented seminar in neurolinguistics of second-language learning; students conduct supervised research projects on topics including bilingual speech perception, cerebral laterality, age-related effects upon L2 learning, and aphasia in bilinguals and multilinguals; consult *Timetable* for specific topics. Prerequisite: English as an International Language 335. 1 unit.
460. **Research Methods in Language Learning.** Seminar focusing on the formulation of language learning and teaching issues as research questions. Specific topics include: types of research problems, research designs, methods, and strategies; and the analysis, interpretation, and reporting of research findings. Discusses illustrative research and evaluation studies. Students participate in seminar presentations and develop a research proposal. Prerequisite: English as an International Language 360 or consent of instructor, and English as an International Language 389. $\frac{3}{4}$ unit.
463. **College Teaching of Foreign Languages.** Same as French, Russian, German, Italian, Portuguese, and Spanish 463. See French 463.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, German, Russian, Portuguese, and Spanish 481. See French 481.
487. **Seminar in the Teaching of English as a Second Language.** Discussion of and research into various topics of current interest to persons involved in teaching English as a second language; emphasis on new approaches to problems facing the field and the development of understanding methods; study of materials leading to possible solutions. Prerequisite: English as an International Language 388 or 302, or consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated as the topic varies.
491. **Research in Special Topics.** Independent study under guidance of a member of the graduate faculty. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. Prerequisite: Consent of thesis supervisor. 0 to 2 units. May be repeated to a maximum of 2 units.

English as a Second Language

109. **English as a Second Language.** Intensive course in basic English structure for international students who are inadequately prepared for either English as a Second Language 111 or 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois English as a Second Language Placement Test. 0 hours
110. **English as a Second Language.** Study of the sounds and intonation patterns of American English and the relation of sound to spelling; designed to improve the international student's ability to speak and understand English at normal conversational speed. May also be taken with English as a Second Language 111 and 114. Prerequisite: Reading knowledge of English

and ability to understand simple instructions; recommendation from Illinois English as a Second Language Placement Test. 0 hours.

111. **English as a Second Language.** Continuation of English as a Second Language 109. Rapid and intensive review of basic English structure and a study of more complicated sentence patterns with practice in simple oral and written composition. Designed for international students inadequately prepared for English as a Second Language 114. Prerequisite: English as a Second Language 109, recommendation from Illinois English as a Second Language Placement Test. 0 hours.
113. **English Structure and Paragraph Development.** Examines basic English structure and paragraph development for undergraduate international students. Recommendation from Illinois English as a Second Language Placement Test determines placement in course and in section for specified credit. Prerequisite: Recommendation from Illinois English as a Second Language Placement Test. 3 or 6 hours. Students should consult their college concerning use of credit from this course toward graduation.
114. **English as a Second Language.** Composition for undergraduate international students. Prerequisite: English as a Second Language 113 or recommendation from Illinois English as a Second Language Placement Test. 3 hours.
115. **Research Paper Writing Skills for ESL Students.** Composition for undergraduate international students. Prerequisite: English as a Second Language 114 or equivalent, recommendation from Illinois English as a Second Language Placement Test. 3 hours.
400. **Verbal Communication in English as a Second Language for Graduate Foreign Students, I.** Language laboratory course concentrating on the typical writing problems that an international graduate or research student encounters in an American university. Prerequisite: Graduate standing and English as a Second Language 111, or consent of instructor. 0 to 4 hours. No graduate credit.
401. **Verbal Communication in English as a Second Language for Graduate Foreign Students, II.** Language laboratory course dealing with individual, immediate, and specialized speaking and writing problems, with particular attention to orienting international graduate or research students to the techniques of the American university in thesis and other specialized writing, and in the oral presentation of such material. Prerequisite: Graduate standing and English as a Second Language 400, or consent of instructor. 0 to 4 hours. No graduate credit.
404. **English Pronunciation for Teaching Assistants.** Sounds, rhythms, and melody of spoken English for current and potential international teaching assistants who are required to teach in English. Includes word and phrase level study; special emphasis on the pronunciation of English vocabulary in students' own academic disciplines. Prerequisite: Placement based upon SPEAK or Illinois ESL Placement Test score. 0 units.
406. **Oral Communication for International Teaching Assistants.** Focuses on use of English at the discourse level, with videotaping and critique of student presentation and development of teaching strategies related to university classroom and laboratory contexts. Prerequisite: Consent of instructor. 0 units.

ENTOMOLOGY

Head of Department: S. Friedman

Department Office: 320 Morrill Hall, 505 South Goodwin, Urbana

105. **Insects and People.** Same as Biology 105. Fundamentals of insect biology as reflected in human culture; insect physiology, ecology, and behavior discussed in the context of art, literature, movies, medicine, sports, law, and history. Optional 2 hour laboratory for one hour additional credit. 3 or 4 hours.
118. **Insects, Man, and Environment.** Nontechnical course which considers basic aspects of entomology and ecology, especially as they relate to problems in the use of pesticides and environmental pollution. 3 hours.

120. **Introduction to Applied Entomology.** Same as Forestry 120. Lectures, laboratory, and field practice in the recognition and management of important insect pests of agricultural, forest, and urban ecosystems: classification, structure, and physiology; life histories and behavior involved with injury; methods of control. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Special Problems.** For students ready to undertake a special investigation to be completed as an undergraduate study or as the beginning of a thesis problem for an advanced degree. It also may be used to prepare a thesis for honors at graduation. Prerequisite: Consent of instructor. 2 to 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
301. **Introduction to Entomology.** Integrated studies of the principal morphological, physiological, ecological and behavioral relationships among insects. Tutorials, field experience, and/or insect collections will be required for 4 or 5 hours, or 1 unit credit. Prerequisite: Biology 111 and Chemistry 131. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.
302. **Classification and Evolutionary History of Insects.** Analytical survey of the classification and evolution of the orders and principal families of insects, with practical experience in the identification of insects at these taxonomic levels; field trips required. Prerequisite: Entomology 301 or consent of instructor. 4 hours or 1 unit.
304. **Genomic Analysis of Insects.** A comprehensive and integrated presentation of insect genomic analysis from the molecular level to that of the population; concepts are applied to certain aspects of insect population regulation. Prerequisite: Biology 210 and 371 and Biochemistry 350, or equivalents; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
310. **Insect Physiology.** Study of the principal physiological and biochemical functions of insects. Prerequisite: Entomology 301 or equivalent, organic chemistry, and consent of instructor. 4 hours or 1 unit.
315. **Insect Ecology.** Discussion of the practical and theoretical aspects of ecology in relation to insects as individuals, populations, and communities; emphasis on the role of insects in the environment. Prerequisite: Ecology, Ethology, and Evolution 212 or consent of instructor. 3 or 5 hours, or $\frac{3}{4}$ or 1 unit. (Lecture only, 3 hours or $\frac{3}{4}$ unit; with laboratory, 5 hours or 1 unit.)
319. **Fundamentals of Insect Pest Management.** Study of the principles underlying the control of important insect pests of agriculture and of human and animal health; emphasis on integrated pest management involving a systems approach which combines biological, cultural, and chemical suppressive factors into ecologically sound and socially and economically acceptable technology. Prerequisite: Entomology 120, or 301 and 302, or consent of department. 4 hours or 1 unit.
320. **Insect Pathology.** Examines the general principles of pathology as they apply to insects; includes non-infectious and infectious diseases caused by viruses, bacteria, fungi, protozoa, and nematodes. Studies the epizootiology of naturally occurring insect disease and the use of insect pathogens as microbial control agents. Lecture and laboratory. Prerequisite: Entomology 319 and Microbiology 200 or equivalent. 4 hours or 1 unit.
321. **Biological Control of Insect Pests.** Same as Agronomy 321. Examines the use of biological methods for the control of insect pests; emphasizes the use of natural enemies in control programs; and discusses life history characteristics of parasitoids and predators, ecological principles of population regulation, techniques and protocols in implementation of control programs and related topics. Prerequisite: Entomology 315 or 319, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
323. **Chemistry and Toxicology of Insecticides.** Comprehensive study of the relation of chemical structure to toxic action of insecticides, their physiological and biochemical modes of action, and their fate and degradation in the total environment; overall emphasis on the environmental toxicology of insecticides. Prerequisite: One year of biology or equivalent in animal science; organic chemistry; or consent of instructor. 4 hours or 1 unit.
413. **Medical and Veterinary Entomology.** Training in recognition, classification, methods of injury, habits, and control or destruction of insects, mites, and ticks which are predators, parasites,

or disseminators of disease among humans and domestic animals. Prerequisite: Entomology 302; or consent of instructor. 1 unit.

426. **Seminar in Entomology.** Discussions, reviews, and appraisals of special topics in the field of entomology. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
490. **Individual Topics.** Individual topics in research and/or reading conducted under the supervision of faculty members in the Department of Entomology; particularly designed for students enrolled in the entomology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their advanced degrees. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units. May be repeated.
499. **Thesis Research.** Work may be taken in the following subjects: insect genetics; insect behavior; applied entomology; systematic entomology; biology and ecology of insects; and insect physiology. 0 to 4 units.

ENVIRONMENTAL STUDIES

Director of Institute: R. A. Minear

Institute Office: 408 South Goodwin Avenue, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
236. **Tomorrow's Environment.** Same as Health and Safety Studies 266. Introduction to interdisciplinary methods of analysis of environmental problems in a finite world; examination of the concept of the limits to growth; development of a working understanding of natural systems and environmental economics; and examination of various management strategies (technical, economic, and social) that can be used to improve environmental quality. Prerequisite: One course in the life sciences and one course in the social sciences, or consent of instructor. 3 hours.
241. **Introduction to Radiation Protection.** Same as Nuclear Engineering 241. See Nuclear Engineering 241.
283. **Introductory Ecology for Educators.** Same as Forestry 283. See Forestry 283.
299. **Individual Studies of Environmental Topics.** Individual studies of environmental problems and their solutions. Studies are accomplished under the immediate supervision of faculty of the Institute for Environmental Studies. Prerequisite: Consent of instructor. 0 to 4 hours.
317. **Introduction to Natural Resources Economics.** Same as Agricultural Economics and Forestry 317. See Agricultural Economics 317.
319. **Environment and Plant Ecosystems.** Same as Agronomy and Forestry 319. See Agronomy 319.
331. **Toxic Substances in the Environment.** Explores toxicological, public health, environmental, industrial, economic, and legal aspects of the use and release of toxic substances in the environment; emphasizes biochemical toxicology and epidemiological aspects of environmental pollution; and features case histories of environmental toxicants. Prerequisite: One year of college chemistry or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
332. **Genetic Toxicology.** Same as Agronomy 332 and Biology 332. Introduces the field of genetic toxicology; includes the study of physical and chemical induced mutagenesis, survey of genetic indicator organisms and genetic assays, distribution of environmental mutagens and their biochemistry, analysis of case histories of environmental mutagens and risk assessment. Prerequisite: Biology 210 or Agronomy 110; Chemistry 102; Biochemistry 350, or 352 and 353, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
341. **Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Geography 341, and Urban and Regional Planning 375. See Civil Engineering 341.
344. **Social Impact Assessment.** Same as Leisure Studies 344 and Rural Sociology 344. Social Impact Assessment and Social Soundness Analysis are methodologies that identify the human and social consequences of man-made alterations in the natural and physical environment; teaches the SIA and SSA methods within the context of planned change based on environmental

- and technological assessment of project development in both first and third world countries. Prerequisite: Rural Sociology 100 or Sociology 101; Rural Sociology 277 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
347. **Environmental Sociology.** Same as Rural Sociology 347 and Sociology 347. Examination of historical and modern consequences of environmental alteration and pollution and resource limitations on human populations in the context of various social change theories. Explores the environmental movement, population explosion, the "limits to growth debate," and the impacts of environmental change on food production, land, and water quality. Prerequisite: Rural Sociology 110 or Sociology 101 or equivalent introductory social science course. 3 hours or $\frac{3}{4}$ unit.
348. **Atmospheric Chemistry.** Same as Civil Engineering 348. See Civil Engineering 348.
349. **Basic Toxicology.** Same as Veterinary Biosciences 349. Emphasizes the physiology and biochemistry of intoxication; discusses the types of cellular response to toxic compounds and the role of species variation in the economic use of toxins as pesticides and therapeutic agents. Prerequisite: Biochemistry 350 or 352, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
351. **Organic Compounds in the Aquatic Environment.** Surveys the natural and anthropogenic constituents of water and their physical, chemical, and biological transformations; emphasizes adsorption, evaporation, photochemical reactions, hydrolysis, and microbial metabolism; discusses oxidative processes in detail. Prerequisite: Chemistry 131 or 136, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
372. **Environmental Psychology.** Same as Psychology 372. Survey of theory and research in environmental psychology; topics include environmental perception and cognition, environmental stress, environmental quality assessment, ecological psychology, and historical and theoretical perspectives on the interaction between people and their environments. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.
374. **General Epidemiology.** Same as Health and Safety Studies, Medical Sciences, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
397. **Selected Environmental Problems.** Advanced study of problems related to the environment. Each unit of instruction focuses on a coherent problem area centered primarily within the subject matter of one or more interrelated disciplines comprising the Institute and taught by one or more faculty members from these disciplines. Prerequisite: Senior or graduate standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
414. **Neurotoxicology.** Same as Psychology 414 and Veterinary Biosciences 414. See Veterinary Biosciences 414.
427. **Statistical Techniques in Epidemiological Research.** Same as Health and Safety Studies 427, Medical Sciences 463, and Veterinary Pathobiology 426. See Health and Safety Studies 427.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Forestry 440, Landscape Architecture 440, Leisure Studies 440, Rural Sociology 440, and Urban and Regional Planning 440. Current topics in public involvement in resource management and environmental planning. Topics include public involvement methods, theory, program evaluation, and needs assessment. Case studies of public involvement programs are used to illustrate concepts and methods. Prerequisites: Graduate standing and three hours of Social Science, or Environmental Studies 236, or permission of instructor. $\frac{3}{4}$ or 1 unit.
449. **Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Mechanical Engineering 412. See Civil Engineering 449.
463. **Natural Resource Economics.** Same as Agricultural Economics, Economics, and Forestry 463. See Agricultural Economics 463.
464. **Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Economics 464. See Economics 464.
468. **Molecular Toxicology.** Same as Veterinary Biosciences 468. Examines the biochemical processes involved in the interaction of toxic compounds and their metabolites with the body; enzyme alteration, membrane integrity, receptor interaction, and the biochemical basis for the primary site of toxicity. Prerequisite: Environmental Studies 349 or consent of instructor. $\frac{3}{4}$ unit.
495. **Environmental Studies Seminar.** Interdisciplinary seminar on topics of current interest. Students, faculty, and visiting lecturers present seminars based upon their study, research, and/or professional activities in the selected environmental topic area. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated as topic varies.

496. **Interdisciplinary Toxicology Seminar.** Same as Veterinary Biosciences 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
497. **Studies of Environmental Topics.** Individual or group research and study of environmental topics. Subjects for individual study, selected by the student, must be approved by the student's adviser and by the Director of the Institute. (Note: This is not a thesis research course.) Group study focuses on environmental problems and their solutions. Prerequisite: Consent of instructor. 0 to 4 units. May be repeated.

FAMILY AND CONSUMER ECONOMICS

(See Consumer Sciences)

FINANCE

Chair of Department: Charles M. Linke

Department Office: 340 Commerce Building (West), 1206 South Sixth, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
235. **Investment Analysis.** The investment environment; analysis of the aggregate market, industry, and the individual firm analysis; valuation methods, with a concentration on applications to common stocks and bonds. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
237. **Portfolio Analysis.** Examines alternative investment instruments; conceptual foundations of portfolio theory; methods of selecting, evaluating, and revising portfolios of assets. Prerequisite: Finance 235. 3 hours. (Counts for advanced hours in LAS.)
238. **Speculative Markets.** Examines speculative securities: options and futures contracts for non-agricultural commodities and financial assets; introduction of the markets; pricing the speculative securities; examination of institutional aspects; trading strategies; hedging strategies, portfolio insurance. Prerequisite: Finance 235. 3 hours. (Counts for advanced hours in LAS.)
252. **Structure, Regulation, and Management of Financial Institutions.** Studies the functions, policies, organization, historical development, management, and regulation of financial institutions. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
254. **Introduction to Business Financial Management.** Development and study of a decision framework for financial management; an introduction to the analysis of past and future needs; an analysis of the management of short-term assets; an introduction to a decision framework for capital investment management with an analysis of the cost and sources of long-term capital; and integration of the concepts of financial management into a total systems approach to business decision making. Prerequisite: Accountancy 200 or 202; credit or concurrent registration in Economics 172. 3 hours.
258. **Money, Credit, and Financial Markets.** Surveys the structure and activity of the financial sector of the economy; impact of money on output, employment, and prices; financial asset types and their uses; interest rates; roles played by financial intermediaries; influence of macroeconomic policies on the financial sector. Prerequisite: Economics 301. 3 hours. (Counts for advanced hours in LAS.)
260. **Economics of Insurance.** Survey course in insurance which serves as a common introductory course to the fire, marine, casualty, surety, and life branches of the insurance business. Prerequisite: Economics 101 or equivalent. 3 hours.
262. **Life Insurance and Related Financial Services.** Introductory study of the life insurance industry and related financial services, including banks, investment companies, and government financial security programs, personal income, gift, and estate taxation, inflation, risk-adjusted returns, legal rights, and savings-investment alternatives; develops techniques for contin-

- gent present value calculations, life insurance cost comparisons, and personal financial analysis; uses computer systems, including PLATO, as tools for financial analysis. Prerequisite: Economics 101 or equivalent. 3 hours.
264. **Fundamentals of Real Estate.** Surveys real estate finance, appraisal, investment brokerage, and management; gives special attention to the analysis of aggregate real estate and mortgage markets to the individual transactions of which the markets are composed and to the legal and institutional factors which have an impact on these markets. Prerequisite: Economics 101 or equivalent. 3 hours.
280. **Advanced Financial Management.** Integration of the capital investment, long-run financing working-capital decision processes; use of simulation, cases, and other techniques to study each decision process. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
281. **Short-Run Financial Management.** Introduces short-run financial planning and integrates it into the capital investment model; uses cases and simulation to study fund-flow analysis and the management of liquidity, receivables, inventory, payables, and operating leverage. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
294. **Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
295. **Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
354. **Multinational Business Finance.** Development and study of a framework for the financial decisions of multinational business; includes the management of working capital, investment and financing decisions of the firm in an international environment, foreign exchange markets, exchange risk, and international diversification. Prerequisite: Finance 254. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **Financing Small Business.** Size and nature of small business; significance and limitations of small business; financial structure and problems; financial assistance to small business; and future prospects of small business. Prerequisite: Finance 254. 3 hours, or $\frac{3}{4}$ or 1 unit.
360. **Employee Benefit Plans.** Same as Labor and Industrial Relations 360. Analysis of the economic and financial issues involved in designing and administering employee benefit plans; major emphasis on group life, disability income, and medical care plans, and on qualified pensions and profit-sharing plans for regular employees; and some attention to special supplementary plans for the executive employees. Prerequisite: Finance 260, Economics 240, or Business Administration 351, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
363. **Life Insurance in Estate Planning.** Studies wealth accumulation, conservation, and liquidation; analyzes personal and business financial planning techniques, methods of developing and marketing financial products, and case studies of planning applications. Gives special emphasis to federal and state income, gift and estate taxes; concentrates on the role the life insurance industry plays in financial planning. Prerequisite: Credit or concurrent registration in Finance 262, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Urban Real Estate Valuation.** Examines the terminology, theory, and techniques of real estate appraisal; a modern view of the three approaches to value: market comparison, income, and cost. The first half of the course emphasizes residential property, while the second half emphasizes income property. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
366. **Real Estate Investment.** An approach to the evaluation of real estate investment opportunities; begins with the identification of the investor's goals and ends with an investment decision; also considers legal, physical, locational, and financial constraints, aggregate real estate and financial markets, tax considerations, and investment criteria. Prerequisite: Finance 264 or 464, and Finance 254; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

367. **Urban Economics.** Same as Economics 361. See Economics 361.
368. **Real Estate Financial Markets.** Discusses theory and institutions of the real estate credit market and the impact of the credit market on the real estate markets; emphasizes creative financing techniques. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
369. **Legal Environment of Real Estate.** Overviews the legal environment in which the real estate business functions; stresses terminology, sources, principles, and issues of real estate law. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
370. **Risks and Risk Management.** Analysis of the financial problems in the risks of property damage or bodily injury (in business situations), and evaluation of the alternative methods for dealing with such problems. Prerequisite: One of the following: Accountancy 200 or 202, or Finance 254; Economics 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
371. **Seminar in Property and Liability Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving property-liability insurance; analysis of legal problems involving insurance coverages, financial aspects, and governmental regulation of the property-liability insurance enterprise, and economic aspects of the insurance industry. 3 hours, or $\frac{3}{4}$ or 1 unit.
400. **Theory of Financial Decision Making.** Examines theoretical frameworks for financial decision making under certainty and uncertainty, as well as perfect and imperfect capital markets; discusses state preference, mean-variance, and continuous time models; emphasizes the structure of individual utility functions. Prerequisite: Economics 402; Statistics 310; and admission to doctoral program or consent of instructor. 1 unit.
420. **Macrofinance: Policies, Institutions, and Markets.** Overview of the workings of the financial sector of the macro economy; includes the roles of financial institutions, financial markets, macroeconomic policies, interest rates, and the flows of funds. Prerequisite: Economics 301 or 401, or Business Administration 401. 1 unit.
425. **Management of Financial Institutions.** Studies the portfolio behavior, policies, risks, and management of a variety of financial institutions including commercial banks, savings institutions, mutual funds, pension funds, and insurance companies; includes flow of funds, regulation, and industry structure. Prerequisite: Finance 254 or Finance 451, or equivalent. 1 unit.
427. **Seminar in Macrofinance and Financial Institutions.** Reports and explores research in areas of commercial bank models and behavior, bank structure and regulation, interest rate theories, financial markets, and the impact of macroeconomic policies and procedures on financial markets and institutions; discusses current research and research procedures. Prerequisite: Finance 400 and Economics 403. 1 unit.
444. **International Financial Management.** Studies international financial markets to include Euromarkets and foreign exchange markets; studies the financing and investment decisions of multinational organizations to include working capital, capital budgeting cost of capital, and capital structure decisions in an international environment. Prerequisite: Finance 254 or Finance 451; or equivalent. 1 unit.
451. **Financial Management.** An introduction to financial management and decision making. Topics include risk-return relationships for financial securities; financial statement analysis and forecasting; working capital management; capital budgeting and the resource allocation process; long-term and short-term sources of funds; capital structure and the cost of capital; dividend policy. Prerequisite: Enrollment in the MBA program. 1 unit.
452. **Long-Term Financial Decision Making.** Same as Business Administration 452. An analytical approach to the theoretical and applied aspects of decision making in business finance; assumes a long-term planning horizon; and emphasizes valuation and cost of capital theories, capital investment decisions, risk analysis, and capital structure and dividend policies. Prerequisite: Finance 254 or Finance 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
453. **Working Capital Management.** Same as Business Administration 453. A study of working capital management processes and of theoretical linkages between working capital and long-run financial management; uses a variety of models to study the theory of working capital management and to analyze relationships among variables in the short-run financial decision-making process; and combines theory and applications to provide insight into the total financial

- decision-making process. Prerequisite: Finance 254 or Finance 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
454. **Seminar in Corporate Financial Theory.** Theories, paradigms, and models of nonfinancial corporations: investigates the theoretical foundations and empirical evidence regarding corporate resource allocation, capital structure decisions, and dividend policies; covers in detail contingent claim analysis, signaling theory, and agency theory. Prerequisite: Finance 400 and Economics 471. 1 unit.
455. **Seminar in Investments.** Investigates portfolio theory, CAPM, OPM, and arbitrage pricing theory theoretically and empirically; uses both mathematical statistics and modern econometric models to empirically analyze investment decisions and portfolio management. Prerequisite: Finance 400 and Economics 471. 1 unit.
456. **Investment.** Same as Business Administration 456. Introduction to investment analysis, including the functioning of capital markets, changes in markets, and analysis and tests of the efficient markets hypothesis; introduction to portfolio theory; and consideration of valuation theory applied to the aggregate market, alternative industries, and individual firms. Prerequisite: Finance 451 or equivalent. 1 unit.
457. **Security Analysis.** Same as Business Administration 457. A theoretical and empirical analysis of selected financial markets; considers markets for stock options, bonds, warrants, and convertibles, as well as foreign exchange and financial futures; covers the mechanics of participation in these markets in addition to the analytical material. Prerequisite: Finance 456. 1 unit.
458. **Portfolio Management.** Same as Business Administration 458. Conceptual foundations and implementation of strategies for the selection, evaluation, and revision of portfolios of financial assets; examination of research related to portfolio and capital market theory. Prerequisite: Finance 456. 1 unit.
464. **Real Estate and Urban Land Economics.** Discusses the theory and practice of real estate and urban land economics; emphasizes real estate market analysis, finance, appraisal, and investment. Prerequisite: Economics 300, or consent of instructor. 1 unit.
469. **Problems in Urban Land Economics.** Examines theoretical and empirical research into selected problems in urban land economics. Prerequisite: Finance 264 and Economics 300; or Finance 464; or consent of instructor. 1 unit.
470. **Risk Management and Control.** Same as Business Administration 455. Analysis of the risk management problem in the business enterprise with emphasis on methodology for risk analyses; techniques for risk and loss control; models for risk management decision making; and procedures for administering risk management policy relating to nonspeculative (insurable) risk. Prerequisite: Finance 452 and Business Administration 460, or equivalent, or consent of instructor. 1 unit.
471. **Seminar in Insurance.** Reviews recent contributions to the insurance literature concentrating upon current issues and research methodology; requires students to review selected recent articles on a variety of topics; gives attention to application of finance and economic theory to insurance issues and to empirical techniques for testing hypotheses. Examples of issues include the application of asset pricing models to insurance pricing, portfolio optimization for insurance companies, capital markets and insurance cycles, moral hazard and adverse selection. Prerequisite: Finance 400. 1 unit.
490. **Individual Study and Research.** Directed reading and research. $\frac{1}{2}$ to 1 unit.
499. **Thesis Research.** Required for those writing master's and doctoral theses in finance. 0 to 4 units.

FINE AND APPLIED ARTS

Program Administrator: J. H. McKenzie

Program Office: 116 Architecture Building, 608 East Lorado Taft, Urbana

185. **Kabuki.** Same as Asian Studies 185. Combines academic studies in the Japanese and Asian theatre arts and the actual production of a Japanese classic kabuki play or some other Asian theatre art form; includes all the essential elements of the theatrical arts. 2 hours. May be repeated once with consent of instructor.
190. **Exploring the Arts.** An introduction to the fine arts through lecture-discussions with a teacher-practitioner in each of the arts and through written critiques of exhibits, concerts, and plays; provides creative experiences by a final individual or small group project. 2 or 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
206. **Practicum in Teaching the Arts to Preschool Children.** Laboratory for teaching art and music to preschool children augmented with a seminar, including classroom preparation and evaluation. Prerequisite: Art Education 203 and Music 240. 4 hours. Arrange 2 hours set-up Friday afternoon.
299. **FAA Study Abroad.** Provides campus credit for foreign study and/or travel. A detailed proposal for study abroad must be submitted for approval by the appropriate committee of the department in which the student is studying and the college dean's office prior to such study abroad. Final determination of credit and its application toward the degree is made after a review of the student's work abroad by the above committee and college office. Prerequisite: Junior standing in the department; approval of the student's proposal by the departmental committee and the college office. 0 to 12 hours (summer session, 0 to 6 hours).
399. **Off Campus Study.** Provides opportunity for off-campus study. Detailed proposal for study off campus must be submitted for approval to the appropriate committee in the College prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the Associate Dean. Prerequisite: Junior or graduate standing in Fine and Applied Arts and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.

FOOD SCIENCE

Head of Department: Bruce M. Chassy

Department Office: 103 Agricultural Bioprocessing Laboratory, 1302 West Pennsylvania, Urbana

101. **Food in Modern Society.** Emphasizes the importance of food in providing adequate nutrients for modern society; introduction to processing and preservation of foods as well as the historical, geographical, chemical, and microbiological ramifications which exist in the food industry. 3 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students; credit may be given to juniors and seniors with consent of instructor.
202. **Sensory Evaluation of Foods.** Same as Foods and Nutrition 202. See Foods and Nutrition 202.
206. **Field Trip.** Inspection of typical food preservation and manufacturing plants. Four-day trip required of all seniors in food science and food industry; see *Timetable* for current fees. Prerequisite: Junior or senior standing in food science or consent of instructor. 1 hour.
213. **Food Analysis, I.** Principles and application of the chemical, physical, and instrumental methods used to determine the constituents of foods; special considerations applicable to the analysis of certain foods. Lecture and lab. Prerequisite: Chemistry 131. 4 hours.
214. **Survey of Food Chemistry.** Chemical composition of foods and the chemistry of the processing of meats, vegetables, fruits, milk, and cereals. Prerequisite: Chemistry 131. 3 hours. Credit is not given for both Food Science 214 and 314.

- 260. Raw Materials for Processing.** Problems involved with procurement, harvesting, handling, and storage of fruits, vegetables, cereal grains, dairy products, red meat, poultry, fish, and eggs for the food-processing industry. Field trips to specialized operations. Prerequisite: One course in biological science and Food Science 101. 4 hours.
- 298. Senior Seminar.** Discussion of specialized topics and literature relating to Food Science. Required of all seniors in the food science or food industry curricula. Prerequisite: Senior standing. 1 hour.
- 300. Special Problems.** Supervised research on special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. Not open to undergraduates who are on probation. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department with consent of the instructor. 1 to 5 hours, or $\frac{3}{4}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 2 units.
- 301. Food Processing, I.** Principles, unit operations, and applications of food preservation and processing by high temperature, refrigeration, and freezing processes; includes heat transfer, kinetics, chemical and microbial changes in food as a result of processing; lecture, laboratory, and field trip. Prerequisite: Food Science 213, 260, and 363; and Food Science 214 or 314 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 302. Food Processing, II.** Principles and applications of food preservation and processing including evaporation, dehydration, freeze-concentration, membrane processing, extrusion and water activity control; lectures, laboratories, and field trips. Prerequisite: Food Science 301 or consent of instructor. 3 hours or $\frac{3}{4}$ units.
- 311. Food and Industrial Microbiology.** Same as Microbiology 311. See Microbiology 311.
- 314. Food Chemistry and Nutrition, I.** Examines the chemical aspects of major food components: water, carbohydrates, proteins, and lipids; properties of pigments, salts, and food dispersions. Prerequisite: Chemistry 131 and 134. 4 hours or 1 unit. Credit is not given for both Food Science 214 and 314.
- 315. Food Chemistry and Nutrition, II.** Examines metabolism and nutritional aspects of carbohydrates, proteins, lipids, vitamins, minerals, food additives and toxicants of food; studies chemical changes that occur in these food components during processing and storage and their effects upon nutritional quality. Prerequisite: Food Science 214 or 314, and Chemistry 131 and 134; or equivalent. 4 hours or 1 unit.
- 316. Food Analysis, II.** Emphasizes the application of modern analytical techniques to food component analysis; consists of laboratory exercises, lectures/discussions, and assigned readings. Prerequisite: Chemistry 122 or equivalent; Food Science 314 and 315. 4 hours or 1 unit.
- 324. Biochemical Aspects of Human Nutrition.** Same as Foods and Nutrition 324 and Nutritional Sciences 324. Advanced treatment of human nutrition, with emphasis on the biochemical functions of nutrients essential for humans; integrates, throughout the course, the molecular mechanisms by which individual nutrients interact to allow for homeostasis or create imbalances. Prerequisite: Biochemistry 350 or both Biochemistry 352 and 353, and a course in nutrition. 3 hours or $\frac{3}{4}$ unit.
- 332. Sanitation in Food Processing.** Studies the principles of sanitation with emphasis on practical considerations as they apply to various food-processing industries; control of insects, rodents, and micro organisms; fundamentals of detergency; sanitation of water supplies; waste disposal methods; and government and public health regulations. Field trips to local food-processing plants. Prerequisite: Chemistry 102 and Microbiology 101. 2 hours or $\frac{1}{2}$ unit.
- 335. Economics of Food Marketing.** Same as Agricultural Economics 335. See Agricultural Economics 335.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Forestry and Horticulture 340. See Agronomy 340.
- 363. Engineering for Food Processing.** Fundamentals of material and energy balances, thermodynamics, fluid flow, heat transfer, psychrometry, refrigeration, and process control for the food process industry. Prerequisite: Introductory courses in physics and calculus, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 401. Physical Chemistry of Food Processes.** Studies physicochemical processes in foods during food processing; places special emphasis on methodological and experimental aspects of food processes, such as water activity, rheology of foods, food extrusion, protein hydration, gela-

- tion, aggregation, and food process analyses. Prerequisite: Food Science 314 or Biochemistry 350. 1 unit.
402. **Advanced Topics in Food Science.** Studies of selected topics in Food Science. Study may be on specialized topics in any one of the following fields: food chemistry, food microbiology, nutrition, food processing/engineering. Lectures and/or laboratory. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. Students may register only once for a given topic.
406. **State and Metabolism of Lipids.** Advanced study of the state of lipids in animal tissues and in biological fluids, and of the metabolism of lipids in relation to dietary fats and other food constituents. Prerequisite: Biochemistry 350 or consent of instructor. 1 unit.
410. **Current Topics in Nutritional Research.** Same as Animal Sciences 410 and Nutritional Sciences 410. See Nutritional Sciences 410.
411. **Chemistry of Nutritional Processes.** Same as Animal Sciences and Nutritional Sciences 411. See Nutritional Sciences 411.
421. **Seminar.** Discussions on specialized topics and current literature relating to food technology. Required of all graduate students in food science. 0 or $\frac{1}{4}$ unit.
450. **Membrane Separations Technology.** Examines theory and applications of synthetic semipermeable membranes in reverse osmosis, ultrafiltration, microfiltration, and electrodialysis processes; thermodynamics of bioseparations, membrane chemistry and properties, process engineering, equipment design, fouling of membranes, selected applications. Prerequisite: Food Science 363 or consent of instructor. $\frac{1}{2}$ or $\frac{3}{4}$ unit. (Lecture is $\frac{1}{2}$ unit and lab is $\frac{1}{4}$ unit.)
473. **Advanced Food Microbiology.** Detailed examination of food and industrial processes dependent on fermentation and other microbial activities. Prerequisite: Organic chemistry, calculus, and Microbiology 311. $\frac{3}{4}$ unit. Offered in alternate years.
481. **Advanced Special Problems in Food Science.** Supervised individual study on advanced special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. $\frac{1}{4}$ to 2 units (summer session: $\frac{1}{2}$ to 1 unit).
491. **Chemistry of Lipids in Foods.** Detailed examination of the chemical and physical properties of lipids in foods. Offered in alternate years. Prerequisite: Food Science 314 or consent of instructor. $\frac{3}{4}$ unit.
499. **Thesis Research.** 0 to 4 units.

FOODS AND NUTRITION

Chair of Division: Barbara P. Klein

Division Office: 386 Bevier Hall, 905 South Goodwin, Urbana

120. **Contemporary Nutrition.** Fundamental principles of human nutrition and their application to the selection of adequate diets; current topics of nutritional importance. 3 hours.
130. **Food Selection and Preparation.** Elementary study of foods in relation to market selection, preparation methods, and standards; comparative costs and food values; and principles of meal planning. 3 hours.
131. **Food Management.** Application of food preparation principles and techniques in the preparation of standard food products; principles of food management and their application in the planning and preparation of meals. A laboratory fee is assessed each student. Prerequisite: Foods and Nutrition 130. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Sensory Evaluation of Foods.** Same as Food Science 202. The physiology, psychology, and chemistry of flavor and flavor perception; tactual, visual, and auditory components affecting food acceptability; principles and application of preference and discrimination testing; and interpretation of panel evaluation data. 3 hours.
220. **Principles of Nutrition.** Nutritive value of foods and metabolism of essential nutrients; application of principles of nutrition to the requirements of normal individuals throughout the life cycle. Prerequisite: Chemistry 102 or 103; Physiology 103. 3 hours.

231. **Science of Foods.** Fundamental composition and behavior of foods; applies chemistry and other physical sciences to principles of food preparation and preservation. A laboratory fee is assessed. Prerequisite: Chemistry 102 or equivalent; Foods and Nutrition 131. 3 hours.
240. **Quantity Food Production and Service.** Application of the principles of food preparation and service to institutional and commercial food service facilities. Prerequisite: Foods and Nutrition 231. 4.
250. **Foods and Nutrition Internship.** Supervised learning experience through a cooperative program with a foods and nutrition related agency, business, or industry. Prerequisite: Junior standing and consent of department head; not open to students on probation. 4 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
305. **Pediatrics and Nutrition.** Same as Curriculum and Instruction 324 and Human Development and Family Studies 305. Basic principles of nutrition, health and disease relevant to infants and children in group settings. Presents bio-medical concepts necessary for an understanding of subject matter. Not recommended for students majoring in nutrition or related field of study. Prerequisite: 3 hours of social sciences and 6 hours of natural sciences courses. 3 hours, or $\frac{3}{4}$ or 1 unit.
320. **Nutritional Aspects of Disease.** Same as Nutritional Sciences 320. Examines nutritional, biochemical, and physiological aspects of disease processes and studies the role of nutrition in prevention, management, and treatment of disease. Prerequisite: Foods and Nutrition 220 or comparable course with a physiology prerequisite; Biochemistry 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.
322. **Nutrition Through the Life Cycle.** Examines physiological changes that occur during gestation, postnatal growth, and aging and the influence of these changes on nutritional requirements. Prerequisite: Foods and Nutrition 220; senior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
323. **Recent Advances in Foods and Nutrition.** New developments in foods and nutrition; readings, lectures, and discussions. Offered every other summer only. Prerequisite: Foods and Nutrition 220 and 231, or equivalent. 2 hours or $\frac{1}{2}$ unit.
324. **Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Nutritional Sciences 324. See Food Science 324.
325. **Problems in Nutrition Research.** Individualized instruction in experimental nutrition. Prerequisite: Biochemistry 350, Biochemistry 355, and credit or concurrent registration in Foods and Nutrition 324. 1 to 5 hours, or $\frac{1}{4}$ to 1 $\frac{1}{4}$ units.
326. **Communications in Foods and Nutrition.** Selection of problems and organization of materials for demonstrations and other presentations in foods and nutrition subject matter. A laboratory fee is assessed. Field trip; see *Timetable* for approximate cost. Prerequisite: Foods and Nutrition 120 or 220 and 231, or equivalent; senior standing. 4 hours or 1 unit.
328. **Community Nutrition.** Same as Nutritional Sciences 328. Application and integration of the principles of nutrition and their delivery in the context of social, political, and economic environments in local, national, and international settings. Prerequisite: Foods and Nutrition 220 or equivalent, one introductory statistics course, and one course in the social or behavioral sciences. 3 hours of $\frac{3}{4}$ unit.
330. **The Experimental Study of Foods.** Principles and techniques of foods research, including consideration of the effects of formula and preparation variations on chemical, physical, and sensory qualities of food. A laboratory fee is assessed. Prerequisite: Foods and Nutrition 231 or equivalent. 4 hours or 1 unit.
331. **Problems in Foods.** Individual problems in food preparation and preservation. Prerequisite: Foods and Nutrition 330. 3 hours or $\frac{3}{4}$ unit.
345. **Food Purchasing and Equipment Selection.** Purchasing food and selecting equipment for quantity food service; factors affecting the purchase of food; and the relationship of floor plans and equipment to service. Field trip; see *Timetable* for approximate cost. Prerequisite: Credit or concurrent registration in Foods and Nutrition 240; Economics 101. 3 hours or $\frac{3}{4}$ unit.
350. **Institution and Restaurant Management: Organization and Administration.** Organization and administration of food service operations; management problems in various types of

- food services; personnel, costs, and sanitary control. Field trips; see *Timetable* for approximate cost. Prerequisite: Foods and Nutrition 120 and 240. 4 hours or 1 unit.
355. **Specialized Quantity Food Production and Management.** Advanced application of food production and management principles to specific food service demands; emphasis on artistry in preparation, serving, and merchandising high quality food in quantity. Prerequisite: Foods and Nutrition 345 and credit or concurrent registration in Foods and Nutrition 350. 4 hours or 1 unit.
422. **Seminar in Nutrition.** Discusses and evaluates current literature related to topics in nutrition. Prerequisite: Undergraduate degree in foods and nutrition, or comparable undergraduate degree in biochemistry, microbiology, physiology, or other biological science; consent of instructor. ½ unit.
430. **Selected Topics in Foods Chemistry.** Advanced studies of recent research in specialized topics in food chemistry. May be repeated to a maximum of 1 ½ units. Prerequisite: Foods and Nutrition 330 or Food Science 314 or 315. ¼ or ½ unit.
432. **Seminar in Foods.** Discusses and evaluates current literature related to specialized topics in foods. Prerequisite: Undergraduate degree in foods and nutrition, or comparable background in chemistry, microbiology, physiology, or other biological science; consent of instructor. ½ unit.
445. **Current Topics in Food Service Systems Research.** Studies recent research related to food service systems; extensive investigation of research data and techniques on special topics each semester. Prerequisite: Graduate standing in foods and nutrition or related fields; Food Science 340; consent of instructor. ½ or 1 unit. May be repeated to a maximum of 1 unit.
493. **Advanced Studies in Foods and Nutrition.** Library or experimental research on specific problems of limited scope; cannot be supervised by thesis advisor. Prerequisite: Consent of instructor. ½ to 1 unit.
499. **Thesis Research.** Original research designed and conducted under graduate faculty supervisor. 0 to 4 units.

FORESTRY

Head of Department: G. L. Rolfe

Department Office: 110 Mumford Hall, 1301 West Gregory, Urbana

101. **Introduction to Forestry.** The forest as a renewable natural resource; the aims and scope of forestry; economic and social importance of forests to the nation; the principal forest regions and species; forests for timber supply, for water conservation, for recreation, and for wildlife; the principles of forest management and protection; and the development of public and private forestry in the United States. 3 hours.
120. **Introduction to Applied Entomology.** Same as Entomology 120. See Entomology 120.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Supervised research on special problems in forestry. Prerequisite: A minimum grade-point average of 3.75; senior standing; consent of instructor and head of department. Specific approval of the associate dean is required in advance of registration for a second and/or third special problem course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 3 hours.
201. **Wildland Recreation (Summer Field Studies).** Field study of wildland recreational resources and facilities, user characteristics and preferences, and management techniques within the multiple-use concept. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
211. **Forest Ecology (Summer Field Studies).** Introduction to forest ecology and the application of ecological principles in silviculture and management practices. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.

213. **Silviculture.** The art and science of controlling forest establishment, composition, and growth to best fulfill the objectives of the owner. Required field trip. Prerequisite: Forestry 211 and 220. 3 hours.
220. **Dendrology.** Taxonomy, geographical distribution, economic importance, and elementary silvics of the important forest trees in the United States and Canada. Prerequisite: Plant Biology 100. 4 hours.
221. **Forest Measurements (Summer Field Studies).** Introduction to forest measurements, including individual tree and stand measurements, inventory methods, and determination of the growth of trees and stands; topics in surveying and aerial photogrammetry. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
231. **Wood Utilization, I (Summer Field Studies).** Field and classroom exercises in logging and milling, conversion of raw wood to useful products, visits to plants, and industrial aspects of wood use. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
232. **Wood Utilization, II.** Principles and methods of harvesting trees; conversion processes and uses of lumber, veneer, plywoods, pulp, paper, particles and chemical derivatives. Harvesting and the environment, recycling, and wood for energy are also discussed. 3 hours.
236. **Physical Properties of Wood and Wood-Base Materials.** Physical properties of wood materials, emphasizing the influence of anatomy, density, and moisture content; wood-liquid relations; thermal, electrical, and acoustical properties; and study of the theory and practice of wood seasoning for determining dimensional stability. Prerequisite: One year of college physics and one year of college chemistry, or consent of instructor. 3 hours.
256. **Surveying Agricultural and Forest Lands.** Same as Agricultural Engineering 256. See Agricultural Engineering 256.
260. **Forest Land Policy and Administration.** Examines forest land policies and their administration emphasizing the relations among resources, politics, and people; current major problems in forest land policy administration and progress toward their solution. Prerequisite: Economics 101 or consent of instructor. 3 hours.
261. **Wood Anatomy and Identification.** Study of the structure of wood and the identification of woods by means of anatomical characteristics; the characteristics of wood are related to growth in trees and use as products. 3 hours.
273. **Adhesives and Laminates.** Bonding and composite theory are related to wood structure and products; adhesives, processing and characteristics of laminated beams, plywood, flakeboard, particleboard and paper are discussed. 3 hours.
277. **Interpretation of Aerial Photographs.** Same as Geography 277. See Geography 277.
281. **Introduction to Forest Resource Management (Summer Field Studies).** Field introduction to forest resource management, including wildlife management, watershed management, and forest protection. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
283. **Introductory Ecology for Educators.** Same as Environmental Studies 283. Intended primarily for education students. Basic ecological concepts and how they may be incorporated into the classroom; includes ecosystem structure and function, communities and population, energy flow and nutrient cycling, and integrating ecology/environmental education into the classroom. Eight-hour field trip required; see *Timetable* for approximate cost. 3 hours.
290. **Urban Forestry.** The management of wooded areas in urban and community settings, including how trees improve the urban environment and how they react to urban stresses. Includes laboratory. Prerequisite: Forestry 220, Horticulture 202, or Landscape Architecture 252, or equivalent. 3 hours.
301. **Forest Recreation.** Same as Leisure Studies 301. The management of forest lands for recreational uses; biological and physical resources; users' behaviors, needs, and desires; and principles involved in managing the forest resource and the users. Prerequisite: Leisure Studies 100, Forestry 201, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
312. **Diseases of Urban Trees.** Same as Plant Pathology 312. See Plant Pathology 312.
313. **Forest Genetics and Tree Improvement.** Principles contributing to heritable variation in forest trees, tree improvement strategies, and genetic considerations in silviculture; topics include: genetic concepts (including population and quantitative genetics), experimental methods, popu-

- lation dynamics in forest regeneration, and strategies for tree improvement and management of genetic resources. Overnight weekend field trip required. Prerequisite: Forestry 213 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Diseases of Forest Trees.** Same as Plant Pathology 314. See Plant Pathology 314.
315. **Forest Soils.** Advanced study of the chemical, physical, and biological properties of forest soils; includes the relationship of forest soils to site productivity, forest fertilization, intensive forest management, and environmental problems. Prerequisite: Soils 101. 3 hours or $\frac{3}{4}$ unit.
316. **Advanced Forest Ecology.** Relationship between environmental factors and the structure and function of forests, including carbon, water and nutrient cycles. Integrates a basic understanding of forest ecology into forest resource management. Two Saturday field trips required. Prerequisite: Forestry 211 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
317. **Introduction to Natural Resources Economics.** Same as Agricultural Economics and Environmental Studies 317. See Agricultural Economics 317.
318. **Tropical Forest Ecosystems.** Examines the interactions between climate and soils and the structural and functional characteristics of natural and managed tropical forests, and the relation of tropical forests to global issues such as greenhouse effect and biodiversity. Prerequisite: Forestry 316 or 319, or Plant Biology 381 or equivalent. 3 hours or $\frac{3}{4}$ unit.
319. **Environment and Plant Ecosystems.** Same as Agronomy and Environmental Studies 319. Examines relationships between environmental factors and structural characteristics and processes in ecosystems; impact of human activities on the environment and their effect on plant ecosystems. Draws examples from agricultural and forest ecosystems. Prerequisite: One course in biology, and Chemistry 102 or equivalent; or equivalent. 3 hours or $\frac{3}{4}$ unit.
321. **Forest Biometrics.** Introduction to statistical methods used in the management of natural resources; includes applied regression analysis and survey of sampling methods, with computer applications. Prerequisite: Forestry 221. 3 hours or $\frac{3}{4}$ unit.
326. **Tree Physiology.** The study of tree functions as they relate to tree structure, environment, and cultural practices; emphasizes photosynthesis, carbohydrate metabolism, nitrogen metabolism, water relations, and symbiotic associations of trees. Prerequisite: Plant Biology 100 and Chemistry 102 or 103. 3 hours or $\frac{3}{4}$ unit.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science and Horticulture 340. See Agronomy 340.
345. **Statistical Methods.** Same as Agricultural Engineering and Animal Science 345. See Animal Science 345.
348. **Wildlife and Land Management.** Same as Ecology, Ethology, and Evolution 348. See Ecology, Ethology and Evolution 348.
351. **Forest Resource Economics.** Applies principles of economics to the establishment, development, and use of forest and related natural resources; major concepts studied include production economics, capital budgeting, forest taxation, financial maturity, and supply, demand, and valuation of major forest products. Prerequisite: Economics 101 and Forestry 321; or consent of instructor. 4 hours or 1 unit.
372. **Mechanical Properties of Wood and Wood-Base Materials.** Static mechanics, strength properties, and structural designs of wood, plywood, particleboard, and hardboard, emphasizing the standard methods of testing wood and fibrous material, wood beam and column designing, and other factors concerning the strength of wood materials, particularly the derivation of allowable stresses. Prerequisite: Physics 101. 3 hours or $\frac{3}{4}$ unit.
377. **Aerial Photograph Interpretation and Remote Sensing.** Same as Geography 377. See Geography 377.
381. **Forest Resource Management.** An integration and synthesis of forestry concepts and quantitative decision making techniques applied to managing forests to meet the objectives of both public and private forest land owners. Prerequisite: Forestry 351 or consent of instructor. 4 hours or 1 unit.
400. **Forestry Seminar.** Discussions of current research and specialized topics in forestry; a seminar must be given by all students in order to receive credit. Required of all graduate students in forestry. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
401. **Special Problems.** Individual studies or investigations in selected branches of forestry. 0 to 1 unit. Not more than 2 units may be offered toward an M.S. degree.

414. **Discussions in Forest Ecology and Physiology.** Individual and group discussions of developments and techniques in forest ecology and physiology based on classic and current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
415. **Linear and Non-Linear Statistical Models for Biologists.** Same as Animal Sciences 415. See Animal Sciences 415.
431. **Plant Cell Metabolism.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Horticulture, and Plant Pathology 433. See Biology 433.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Landscape Architecture, Leisure Studies, Rural Sociology, and Urban and Regional Planning 440. See Environmental Studies 440.
446. **Plant Gene Regulation.** Same as Agronomy 446 and Horticulture 436. See Agronomy 446.
447. **Gene Expression During Seed Development.** Same as Agronomy 447 and Horticulture 437. See Agronomy 447.
450. **Advanced Forest Biometry.** Examines and discusses developments and techniques used in forest inventory, growth models and ecological models. Prerequisite: Forestry 321, Agronomy 440, or consent of instructor. $\frac{1}{2}$ unit. Offered in alternate years.
460. **Discussions in Forest Policy and Administration.** Individual and group discussions of the major relevant problems in the field of forest resources policy and administration (both public and private) based on current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
463. **Natural Resource Economics.** Same as Agricultural Economics, Economics, and Environmental Studies 463. See Agricultural Economics 463.
499. **Thesis Research.** Research may be conducted in various phases of forestry; subject must be approved by departmental committee. 0 to 3 units.

FRENCH

Head of Department: Emile A. Talbot

Department Office: 2090 Foreign Languages Building, 707 South Mathews, Urbana

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

101. **Elementary French, I.** Four-skill course leading to proficiency in oral expression, listening comprehension, reading, writing, and cultural understanding. Open only to students with no previous study of French. All students are required to attend language laboratory sessions several times a week, as needed. 4 hours. Credit is not given for both French 101 and 105.
102. **Elementary French, II.** Continuation of French 101. Introduces cultural and supplementary enrichment materials; requires laboratory sessions as in French 101. Prerequisite: French 101 or one year of high school French. 4 hours. Credit is not given for both French 102 and 105.
103. **Intermediate French, I.** Continuation of French 102. Introduces students to a full range of structures to complete their initial study of the grammatical system; emphasizes the development of all four skills and cultural understanding through readings and audiovisual enrichment materials. Students planning to major or minor in French should take French 133 in lieu of French 103. Prerequisite: French 102 or equivalent, or a placement score showing high school achievement equivalent to French 102. 4 hours. Credit is not given for both French 103 and 106.
104. **Intermediate French, II.** Continuation of French 103. Comprehensive grammar review with emphasis on oral expression and the continued development of reading and written skills.

- Completion satisfies graduation requirement in the College of Liberal Arts and Sciences. Students planning to take advanced French courses should take French 134 in lieu of French 104. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
105. **French Active Review, I.** Reviews materials covered in French 101 and 102 in preparation for entrance into French 103 or 133. Open to students with high school French; by placement score or consent of department only. Not open to students with credit in French 101 or 102. Prerequisite: one or two years of high school French and placement score in 101 range. 4 hours.
106. **French Active Review, II.** Reviews materials covered in French 102 and 103 in preparation for entrance into French 104, 114, 124, or 134. Not open to students with credit in French 101, 102, or 103. Open to students with high school French; by placement score or consent of department only. Prerequisite: Three or four years of high school French with placement at 102 levels. 4 hours.
113. **Conversational Practice.** Oral practice for the development of elementary conversational skill and the improvement of pronunciation; designed as a supplement to third and fourth semester French courses. Prerequisite: Concurrent enrollment in third or fourth semester French course, or consent of instructor. 1 hour.
114. **Conversational French.** Practice in spoken French. May be substituted for French 104 to satisfy the graduation requirement in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
124. **Readings in French Literature.** Additional readings in English of authors treated will be assigned according to demonstrated interest. May be substituted for French 104 to satisfy the graduation requirements in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103; placement by virtue of high school units (usually three years). 4 hours.
133. **Accelerated Intermediate French, I.** Similar to French 103, but accelerated for those interested in pursuing French in advanced courses; includes comprehensive grammar review and readings in literature and culture. Prerequisite: French 102 or two semesters of college French, or a placement score showing high school achievement equivalent to French 102. Normally for students with a "B" average in French or with consent of instructor. 4 hours.
134. **Accelerated Intermediate French, II.** Continuation of French 133. Comprehensive grammar review and readings in French literature and culture preparatory for continued work at the advanced level; emphasizes all four skills and culture. Prerequisite: French 133, or French 103 with department approval, or three semesters of college French, or a placement score showing high school achievement equivalent to French 103. 4 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
205. **Oral French, I.** Training for the development of oral facility; exercises for the improvement of pronunciation and diction; and optional practice in the language laboratory. Prerequisite: French 104, or 103 and 113, or four years of high school French. 3 hours.
206. **Oral French, II.** Continuation of French 205; optional practice in the language laboratory. Prerequisite: French 205. 3 hours.
207. **Grammar and Composition.** Training in French syntax, translation from English into written French, and directed composition. Prerequisite: Four years of high school French or equivalent, or French 134 or, with departmental approval, French 104. 3 hours.
209. **Introduction to French Literature, I.** Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
210. **Introduction to French Literature, II.** Continuation of French 209. Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
217. **Advanced Oral French.** Intensive practice in oral French to improve fluency, vocabulary, comprehension, pronunciation and syntax; activities include reports, discussion and role-play on topics selected and prepared by class participants; also includes weekly written assign-

- ments based on class activities. Prerequisite: French 206 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
220. **Sixteenth-Century Literature.** General survey of the literature of the French Renaissance. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
223. **French Literature of the Seventeenth Century, I.** Major French writers of the preclassical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
224. **French Literature of the Seventeenth Century, II.** Major French writers of the classical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
227. **French Literature of the Eighteenth Century, I.** Montesquieu, Voltaire, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
228. **French Literature of the Eighteenth Century, II.** Diderot, Rousseau, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
230. **French Literature of the Nineteenth Century, I: 1800-1850.** Major prerealist and romantic writers. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
231. **French Literature of the Nineteenth Century, II: 1850-1900.** The evolution of romanticism and realism into the naturalist and symbolist movements. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
233. **French Literature of the Contemporary Period, I.** Modern poetry from Baudelaire to Valéry; prose writers from 1900 to 1940. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
234. **French Literature of the Contemporary Period, II.** Continuation of French 233. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
270. **Parateaching.** Same as German, Latin, Russian, and Spanish 270. Parateaching prior to the practicum in local schools under the direct supervision of University of Illinois faculty and the teaching staff of participating schools. Students must preserve a 4-hour block of time for observation in the schools. Prerequisite: Enrollment in a foreign language teaching curriculum or consent of an advisor in a foreign language teaching curriculum. 2 hours. May be repeated.
279. **Introduction to Foreign Language Education.** Same as German, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
280. **Teachers Course.** Survey of resources, classroom materials, standard practices, and problems in the teaching of French with practical application to actual classroom situations. Required for teacher training majors in French. This course does not meet during the period teacher-training majors are off campus. Prerequisite: French 205, 206, 207, 209 and 210; or equivalent. 4 hours.
287. **French Language and Culture Through Literary Analysis, Scriptwriting, and Recording.** Deepened appreciation of French culture and advanced practical language training through reading and discussion of key works of literature and other cultural documents, followed by the writing and recording in French of scripts based on these works. Prerequisite: French 205, 207, and 209, or equivalent, or consent of instructor. 3 hours.
288. **French and Comparative Cinema, I.** Same as Comparative Literature 288. Selected world cinema trends to approximately 1960, with emphasis on French directors (Clair, Vigo, Renoir, Carne, Clouzot, etc.); aesthetic, sociopolitical, historical, literary, and technical aspects; meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French majors, one college-level film studies course or consent of instructor; no prerequisite for French majors. 4 hours.
289. **French and Comparative Cinema, II.** Same as Comparative Literature 289. Continuation of French/Comparative Literature 288. Selected world cinema trends since approximately 1960, with emphasis on French directors (Chabrol, Godard, Truffaut, Resnais, Marker, Rohmer, etc); meets six hours a week. No knowledge of French necessary. Prerequisite: For non-French majors, one college-level film studies course or consent of instructor; no prerequisite for French majors. 4 hours.
290. **Individual Study: Major Tutorial.** A tutorial taken by students in the course of two of their last four semesters of undergraduate study. Students read the works on a departmental reading list with the guidance of a tutor, repeating enrollment for a total of 2 hours credit, normally

- at the rate of 1 hour per semester. Prerequisite: French 205, 207, 209, and 210, or equivalent; a declared major in French; junior standing. 1 to 2 hours. (Counts for advanced hours in LAS.)
292. **Senior Thesis.** For candidates for honors in French and for other seniors. Prerequisite: Senior standing. 2 hours. May be repeated for a maximum of 4 hours credit. (Counts for advanced hours in LAS.)
298. **Senior Seminar.** Studies in authors, genres, themes, and movements in French literature; conducted entirely in French. Prerequisite: Senior standing. 3 hours. May be repeated for credit. (Counts for advanced hours in LAS.)
299. **Study Abroad.** Lectures, seminars, and practical work in French language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: French 209 and two of the following: French 205, 206, or 207; 3.75 overall average; 4.0 average in French courses. 0 to 17 hours per semester, to a maximum of 34 hours per academic year.
310. **Modern African Fiction.** Same as African Studies and Comparative Literature 310 and English 370. See African Studies 310.
313. **French Phonetics and Diction.** A systematic study of the sounds and sound patterns of French; training in the improvement of French pronunciation with special attention to the problems of teachers. Prerequisite: French 206, or equivalent. 3 hours or $\frac{3}{4}$ unit.
314. **Advanced Grammar and Style.** Advanced theoretical and practical study of present-day French, with free composition and some consideration of stylistics. Prerequisite: French 207 (with a grade of C or better), or equivalent. 3 hours or $\frac{3}{4}$ unit.
316. **Structure of the French Language.** Same as Linguistics 316. General survey of the linguistic structure of modern standard French, including phonology, morphology, and syntax; emphasis on the differences between its spoken and written forms. Prerequisite: French 313 or equivalent training in phonetics. 3 hours or $\frac{3}{4}$ unit.
319. **Techniques in Translating.** A practical course in the techniques of translating technical, commercial, scientific, and literary texts from English into French and vice versa. Prerequisite: French 314 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
320. **Techniques in Interpreting.** A practical course in the technique of oral translation of spoken material covering a wide range of subject matter in a variety of settings. Prerequisite: French 319 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
335. **French Civilization, I.** Survey of French life and French institutions, intended as a background for literary studies and as a preparation for the teaching of French; given in French. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
336. **French Civilization, II.** Continuation of French 335. May be taken independently of French 335. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
343. **Studies in French.** See *Timetable* for current topics. Prerequisite: Junior standing. 3 hours, or $\frac{3}{4}$ to 1 unit.
355. **France Today, I.** Social structures of France today and their manifestation in daily life and culture; study of the workings of various institutions and systems (political judicial, economic, educational, etc.) for an understanding of current problems, providing background for closer study, in the second semester, of the forces affecting daily life. 3 hours, or $\frac{3}{4}$ to 1 unit.
356. **France Today, II.** Study of the conditions of daily life in France today, its organization, the major forces and issues affecting it; topics include class structure, youth culture, urban and minority problems, the press, media, and popular culture and the arts. 3 hours, or $\frac{3}{4}$ to 1 unit.
360. **Principles of Language Testing.** Same as English as an International Language, German, Italian, Portuguese, and Spanish 360. See English as an International Language 360.
362. **Introduction to Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
379. **Studies in Francophonie.** Same as Comparative Literature 334. Studies of various genres, periods, and topics of French literature outside of France, with a different geographical emphasis each semester. Regions include black Africa, the Caribbean, Canada, North Africa, the Middle East, and Switzerland. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 12 hours or 4 units.

380. **Classroom Language Acquisition.** Same as English as an International Language, German, Italian, Portuguese, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
385. **Commercial and Economic French, I.** Studies French business practices: company structures, selling and buying techniques, banking, import/export and other commercial negotiations, employment, formalities, and conventions of letter-writing; involves both theory and practice. Prerequisite: French 314 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
386. **Commercial and Economic French, II.** Emphasizes business correspondence and simulation of business practices in the areas introduced in French 385; also focuses on geographic and economic topics pertaining to France within the European community and Europe in general. Prerequisite: French 385 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
399. **Study Abroad.** Lectures, seminars, and practical work in francophone literature and civilization, in a French-speaking country. Prerequisite: French 209 and 210, and two of the following: French 205, 206, and 207; or equivalent. Not open to undergraduates in the Paris program. 0 to 16 hours, or 0 to 4 units.
400. **Beginning French for Graduate Students.** Basic grammar, vocabulary, and reading practice; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. 4 hours. No graduate credit.
401. **Reading French for Graduate Students.** Grammar, vocabulary, and general and special reading; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. Prerequisite: French 400, or French 101 and 102, or equivalent. 4 hours. No graduate credit.
403. **The Study of Culture: Fine Arts, History, and Literature, I.** A study of major artistic, historical, political, and literary aspects of France up to the French Revolution with emphasis on the relationship between literature and other aspects of French culture. 1 unit.
404. **The Study of Culture: Fine Arts, History, and Literature, II.** Continuation of the approaches and emphases of French 403 from the French Revolution to the present. Prerequisite: French 403 or consent of instructor. 1 unit.
405. **Techniques in Teaching College and Secondary French.** Examination and discussion of classroom procedures and language laboratory techniques in teaching French at the college and secondary level, associated with demonstration class and supervision of teaching practice. Required of new teaching assistants in the Department of French. $\frac{1}{2}$ unit.
425. **Studies in Contemporary Critical Problems.** Same as Comparative Literature 425. Introductory course to some aspect of modern French critical theory; normally taught in English and texts may be read in English. 1 unit. May be repeated as topic varies.
429. **Studies in French Linguistics.** A variable topics course dealing with both synchronic and diachronic aspects of the French language. 1 unit. May be repeated as topic varies.
430. **Introduction to Research and Textual Criticism.** Proseminar in literary studies: research and methods; approaches to the literary text. Required of all M.A. and Ph.D. candidates. 1 unit.
431. **Introduction to Old French Language.** Outline of Old French grammar and training in reading Old French (twelfth and thirteenth centuries). 1 unit.
432. **Studies in Medieval French Literature.** Close study of one or more topics in Old French literature. See *Timetable* for current topics. Prerequisite: French 431 or consent of instructor. 1 unit.
433. **Studies in Sixteenth-Century French Literature.** Close study of one or more topics in sixteenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topic varies.
435. **Studies in Seventeenth-Century French Literature.** Close study of one or more topics in seventeenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topic varies.
437. **Studies in Eighteenth-Century French Literature.** Close study of one or more topics in eighteenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topic varies.
439. **Studies in Nineteenth-Century French Literature.** Close study of one or more topics in nineteenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topic varies.

441. **Studies in Twentieth-Century French Literature, I.** 1 unit.
442. **Studies in Twentieth-Century French Literature, II.** 1 unit.
443. **French Studies.** A flexible course limited only by the concentration of its material in French; may be activated by student request or faculty proposal. 1 unit.
445. **Studies in French Canadian Literature.** Close study of one or more topics in French Canadian literature; see *Timetable* for current topics. 1 unit. May be repeated as topic varies.
452. **Studies in French and Comparative Cinema.** Same as Comparative Literature 472. Historical, aesthetic, social, and technical studies of the French cinema; its development and relation to world cinema and to literature. 1 unit. May be repeated to a maximum of 3 units.
462. **Seminar in Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, German, Italian, Portuguese, Russian, and Spanish 463. Rationale for curricular objectives for college courses in foreign languages; the teaching and testing of pronunciation, listening comprehension, speaking, reading, writing, cultural understanding, and literary appreciation; the use of technology; and recent experimentation. $\frac{1}{2}$ or 1 unit.
470. **Seminar in Old French Literature.** Discussion and research on some specialized topic in Old French literature. See *Timetable* for current topic. Prerequisite: French 431 or consent of instructor. 1 unit. May be repeated.
471. **Seminar in Sixteenth-Century French Literature.** Discussion and research on some specialized topic in sixteenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
472. **Seminar in Seventeenth-Century French Literature.** Discussion and research on some specialized topic in seventeenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
473. **Seminar in Eighteenth-Century French Literature.** Discussion and research on some specialized topic in eighteenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
474. **Seminar in Nineteenth-Century French Literature.** Discussion and research on some specialized topic in nineteenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
478. **Seminar in Twentieth-Century French Literature.** Same as Comparative Literature 478. Discussion and research on some specialized topic in twentieth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
479. **Seminar in French Literature.** Discussion and research on some specialized area in French literature. See *Timetable* for current topic. 1 unit. May be repeated.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, German, Portuguese, Russian, and Spanish 481. Language teaching problems considered in the light of theoretical and experimental work in language acquisition, verbal learning and memory, motivation, speech perception, reading, error analysis, and language as an aspect of culture and societal relations. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar in Contemporary Criticism, Methods and Theory.** Same as Comparative Literature 490. Deals with a particular individual, school, method or problematic in structuralist or post-structuralist thought; normally taught in English, and texts may be read in French or English, if available. Prerequisite: An introductory course in criticism, or consent of instructor. 1 unit. May be repeated as topic varies.
491. **Individual Topics.** Prerequisite: Graduate standing with a major or minor in French. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

GENERAL ENGINEERING

Head of Department: T. F. Conry

Department Office: 117 Transportation Building, 104 South Mathews, Urbana

- 103. Engineering Graphics and Design.** Use of traditional and microcomputer methods as instructional tools in engineering graphics; topics include: text creation, formal and sketch-mode drawing, scaled inquiry and layout; charts and diagrams; pictorial representations; multiview orthographic representations; principal auxiliary views; sectioned views; dimensioning; production drawings; introduction to engineering design; and fundamental descriptive geometry. 3 hours. Credit is not given for both General Engineering 103 and General Engineering 105.
- 105. Elements of Drawing.** Theory, techniques, terms, symbols, and conventional practices used in making various types of projection and nonprojection drawings with instruments and free-hand. For students in the aircraft maintenance curriculum. Prerequisite: High school plane geometry. 3 hours. Credit is not given for both General Engineering 105 and General Engineering 103.
- 193. Special Problems.** Individual investigations of any phase of general engineering selected by the students and approved by the department. Prerequisite: Consent of instructor. 0 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. History of Engineering.** Survey of the major contributions of the science and art of engineering from prehistory to the present; integrates the impact of engineering with the cultural aspects of the various periods. Prerequisite: Junior standing or consent of instructor. 3 hours.
- 221. Introduction to General Engineering Design.** Fundamental concepts in the classical and computer-based analysis and design of structural and machine components and assemblies; external loads, internal forces and displacements in statically determinate and indeterminate configurations; kinematics of linkages, gears, and cams; static forces in machines. Prerequisite: Theoretical and Applied Mechanics 212 and 221, and Computer Science 101. 3 hours.
- 222. Simulation and Analysis of Dynamic Systems.** Introduction into the operational techniques used in describing the behavior of dynamic systems; elements of modeling; equilibrium points and linearization; Laplace transformation techniques; system response via the transfer function; block diagrams and computer simulation; matrix operations; system response via state variables; stability and performance specifications controller design in via transfer functions and state space techniques. Prerequisite: Mathematics 285; concurrent registration in Computer Science 101. 3 hours.
- 232. Engineering Design Analysis.** Studies stress/strain conditions, both analytical and numerical (CAD) solution techniques, analysis of various engineering materials and configurations, as applied to the development and application of design analysis criteria. Prerequisite: General Engineering 221. 4 hours.
- 234. General Engineering Laboratory.** Prepares students for experimental projects, introduces mechanical and electrical instruments; basic measurement techniques; simulation of dynamic systems; applies microcomputers to control problems; measurement errors, relative and absolute; determines mechanical properties of selected materials; transducers and signal conditioning. Prerequisite: General Engineering 221 and 222. 3 hours. Credit is not given for both General Engineering 234 and either Theoretical and Applied Mechanics 223 or Mechanical Engineering 261.
- 241. Component Design.** Design of basic engineering components: structural members, machine parts, and connections; principles applied include: material failure (yield, fracture, fatigue); buckling and other instabilities; design reliability; and analytical simulation. Prerequisite: General Engineering 222 and 232. 4 hours.
- 242. Project Design.** Design of various engineering devices and systems. Teams of two to four students work toward the development of engineering solutions to problems supplied by industry. A midterm and final report summarize the work of the semester for sponsor and faculty. Prerequisite: Credit or concurrent registration in General Engineering 241 and senior standing. 3 hours.
- 288. Economic Analysis for Engineering Decision Making.** Introduction to an operations research approach to engineering decision making; covers economic analysis of alternatives, methods of optimization, including linear, integer, and dynamic programming, decision theory and

and probability, and simulation. Prerequisite: Junior standing or consent of instructor. 3 hours. Credit is not given for both Electrical and Computer Engineering 288 and General Engineering 288.

290. **Law and the Construction Process.** Same as Civil Engineering 290. Nature and development of the legal system; the law as it relates to the construction process; contracts, specifications, torts, agency, workers' compensation, professional liability, government regulation, property. Prerequisite: Senior standing. 3 hours. Credit is not given for both Civil Engineering/General Engineering 290 and General Engineering 292.
291. **General Engineering Seminar.** Series of lectures and discussions by department faculty and visiting professional engineers on ethics, professional registration, the role of technical societies, and the relation of engineering to such disciplines as economics, sociology, and government. 0 hours.
292. **Engineering Law.** Nature and development of the legal system; legal rights and duties important to engineers in their professions; contracts, uniform commercial code and sales of goods, torts, agency, workers' compensation, labor law, administrative law, property. Prerequisite: Senior standing or consent of instructor. 3 hours. Credit is not given for both General Engineering 290 and 292.
293. **Special Problems.** Individual investigations or studies of any phase of general engineering selected by the students and approved by the department. Prerequisite: Junior standing; consent of instructor. 0 to 4 hours.
324. **Digital Control of Dynamic Systems.** Examines theory and techniques for control of dynamic processes by digital computer; linear discrete systems, digital filters, sampling signal reconstruction, digital design, state space methods, computers, state estimator, laboratory techniques. Prerequisite: General Engineering 222 or equivalent. 4 hours or 1 unit.
334. **Introduction to Reliability Engineering.** Same as Industrial Engineering 334. See Industrial Engineering 334.
389. **Robot Dynamics and Control.** Kinematics, dynamics, and control of robotic manipulators; emphasis on fundamental concepts and analytical methods for analysis and design of robotic systems; laboratory experiments and computer simulation complement the theoretical development. Prerequisite: General Engineering 222, Aeronautical and Astronautical Engineering 258, and Electrical and Computer Engineering 386 or Mechanical Engineering 240. 4 hours or 1 unit.
392. **Legal Problems in Engineering Design.** The law as it affects engineering design; products liability and legislation; professional liability; intellectual property problems; computer law. Prerequisite: Senior standing or graduate standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
393. **Special Problems.** Studies advanced problems related to general engineering. Prerequisite: Senior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
491. **Simulation of Dynamic Systems.** Modeling and simulation of dynamic engineering systems; distinct modeling approaches for engineering devices; analog and digital computer simulation of dynamic systems; design criteria and performance and design measures; and extensive use of case studies and projects. Prerequisite: General Engineering 222 and Industrial Engineering 385, or equivalent. 1 unit.
493. **Special Problems.** Advanced problems related to general engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated.
495. **Evaluation and Management of Engineering Design Projects.** Quantitative evaluation and optimization of project plans, using mathematical programming and multiple-criteria decision making; optimal design and sizing of engineering projects; reliability of designs, studied by acyclic network analysis and network simulation; and implementation and control of engineering designs by network analysis. Prerequisite: General Engineering 288 and Industrial Engineering 385, or equivalent. 1 unit.
497. **Project Design.** Engineering design projects emphasizing advanced engineering analysis, synthesis, optimization, and engineering economics. $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.
499. **Thesis Research.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.

GENETICS AND DEVELOPMENT

School of Life Sciences, 393 Morrill Hall, 505 South Goodwin, Urbana

- 290. Individual Topics.** Laboratory work or reading in fields selected in consultation with a School of Life Sciences faculty member. Restricted to students in the Genetics and Development option in the Life Sciences concentration. Prerequisite: Fifteen hours of life science courses and consent of School of Life Sciences faculty sponsor. 2 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.

GEOGRAPHY

Head of Department: G. J. D. Hewings

Department Office: 220 Davenport Hall, 607 South Mathews, Urbana

- 101. Geography of Developing Countries.** Examines the manner in which climate, landforms, resources, and cultural factors promote and inhibit change in developing countries (i.e., India, Iran, Egypt, Nigeria, China, Kenya, Brazil, Venezuela, Guatemala); makes comparisons between these countries and others in both the developing and the developed world. 3 hours.
- 102. Weather and Climate.** Introduction to the processes responsible for the spatial variation of weather and climate with a survey of world climatic patterns. 4 hours.
- 103. Earth's Physical Systems.** Systems approach to the physical environment, including landform, soil, vegetation, and animal elements, from a human ecological perspective. 4 hours.
- 104. Social and Cultural Geography.** Introduces the basic concepts of social and cultural geography, and the application of these concepts to a variety of topics; mental maps, territoriality, cultural regions, cultural elements and their diffusion, population movement and migration, settlement patterns, environmental hazards, and spatial patterns of social problems. 4 hours.
- 110. Geography of International Conflicts.** Focuses on contemporary cultural conflicts, competition among nations for economic and mineral resources; treats territorial disputes from a cultural and geographic perspective. Case studies vary to illustrate types of contemporary conflicts. 3 hours.
- 185. Introduction to Social Statistics.** Same as Sociology 185. See Sociology 185.
- 198. Freshman Honors Seminar.** Through discussions and research projects, the seminar is designed to provide an in-depth understanding of topics in the field of systematic or regional geography which are selected for group study. Appropriate geographic methodology is emphasized. Prerequisite: James Scholar standing or other designation as a superior student. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Regional Analysis of Landforms.** Examines global and regional variations in the morphology of the earth's surface; emphasizes the role that climate plays in producing these variations. Prerequisite: Geography 103 or Geology 101, 107, or 143. 3 hours.
- 204. Cities of the World.** Introduces the form and function of cities around the world; emphasizes cross-cultural comparisons of urban landscapes and living environments as illustrated by case studies of specific cities. 3 hours.
- 205. Business Location Decision-Making: Theory and Practice.** Same as Business Administration 205. Analyzes location decision-making emphasizing industrial and commercial location patterns; identifies important institutional factors and their changing roles over the recent past; and focuses on plant closings, economic disruptions, and problems of structural change. Prerequisite: Economics 101, or equivalent. 3 hours.
- 210. Contemporary Social and Environmental Problems.** Geographic perspectives on contemporary national and international problems. Topics vary each semester and include such

themes as environmental quality, food production, urban problems, and particular social and political conflicts. 3 hours.

214. **Conservation of Natural Resources.** Survey of distribution of natural resources and major forms of utilization of these resources; emphasizes consequences of utilization systems which deplete or degrade resources and systems which conserve these resources with respect to future needs of human populations. 3 hours.
224. **Geographic Patterns of Illinois.** A systematic analysis of the environmental and human processes that have shaped the regional landscapes of rural and urban Illinois. 3 hours.
271. **Spatial Analysis.** An overview of the spatial analysis (nomothetic) approach to geographic research, both physical and human; includes discussion of the scientific method, with explanations and uses of analytic geographic concepts in studying real world problems. Prerequisite: A course in geography. 4 hours. (Counts for advanced hours in LAS).
273. **Spring Field Course.** Field observation and mapping of human and physical phenomena using basic geographic field techniques; required ten-day field trip during spring semester break. Prerequisite: Geography majors, or nonmajors with consent of instructor. 4 hours.
277. **Interpretation of Aerial Photographs.** Same as Forestry 277. Principles and techniques in extraction and analysis of information derived from aerial photographs, including black and white, color, and color infrared; applications to problems in the natural and social sciences stressed in the laboratory. A beginning FORTRAN programming course is highly desirable but not required. Prerequisite: Knowledge of trigonometry (Math 114 or equivalent). 3 hours.
284. **Population Geography.** Problems and issues surrounding the geographic distribution of populations at the world, regional, and local levels; emphasizes problems associated with population growth and decline, recent population redistribution, births and deaths, and elderly and minority populations. 3 hours.
290. **Individual Study.** Supervised independent study of special topics or regions; required for students graduating with departmental distinction. Prerequisite: Junior standing; at least one formal course in the topic or region of interest; consent of instructor. 2 to 4 hours. May be repeated once. (Counts for advanced hours in LAS.)
291. **Honors Individual Study.** Individual study and research projects for students who are working toward the degree with distinction in geography. Prerequisite: Junior standing; consent of honors adviser. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
294. **Special Topics in Social Geography.** Introduction to current research in social geography; includes such topics as access to public facilities, geography of crime, innovation diffusion, geography of communications, spatial assimilation of minorities, and geography of social well-being. See *Timetable* for current topics. 4 hours. May be repeated.
303. **Advanced Physical Geography: Methodology and Applications of Landform Studies.** Systematic analysis of the basic elements of physical geography and their interaction through time and surface expression, including the modifying effects of humans. Complementary to Geology 301. Prerequisite: Geography 103 or consent of instructor. 4 hours or 1 unit.
304. **Soil Geomorphology.** Same as Geology 304. Analysis and review of the principles of soils as applied to geomorphology, archaeology, and geography. One weekend and several one-day field trips; student fees reflect actual field expenses. Prerequisite: Geography 103 or equivalent, or consent of instructor. 4 hours or 1 unit.
305. **Zoogeography.** Introduction to the principles of zoogeography; the central theme explains present distribution of animals, chiefly mammals. Prerequisite: Geography 102 and 103, Geology 102, Biology 104, or consent of instructor. 3 hours or 1 unit.
306. **Fluvial Geomorphology.** Same as Geology 306. Systematic overview of the forms and processes associated with rivers and drainage basins; topics include basin hydrology, drainage networks, river hydraulics, sediment transport processes, channel morphology, channel change, and human impacts on fluvial systems. Prerequisite: Physics 101, and Geography 103 or Geology 107, or consent of instructor. 4 hours or 1 unit.
307. **Periglacial Geomorphology.** Same as Geology 307. Examination of periglacial landscapes through analysis of the formative processes and their interaction with the resulting forms. Prerequisite: Geography 303, Geology 301, or consent of instructor. 4 hours or 1 unit.
308. **Geomorphology of Coasts.** An analysis of the morphology of marine coasts including study of their distributions and of the physical factors that have influenced their development and

- distribution; analyzes effects of human-induced stress on modern beaches. Prerequisite: Geography 103 or equivalent. 4 hours or 1 unit.
315. **Physical Climatology.** Surveys the basic concepts of energy balance climatology, with emphasis on the topoclimatic scale; lectures supplemented by calculations and field observations examining the effects of location and surface characteristics on determination of climate. Prerequisite: Mathematics 112, Physics 101, and Geography 102; and Computer Science 103 or equivalent; or consent of instructor. 3 hours or 1 unit.
325. **Historical Geography of American Landscapes to 1880.** Same as Landscape Architecture 325. Changing patterns of spatial organization in the United States and Canada, circa 1400 A.D. to 1880; focuses on landscape patterns through time (especially the built environment), perception of relic landscapes in the present day, and contemporary preservation of historic areas as historic places. 4 hours or 1 unit.
326. **Historical Geography of American Landscapes Since 1880.** Same as Landscape Architecture 326. Review of the values and technologies which underlie the structuring of the American built environment during the past century; emphasizes the changing meaning of urban, suburban, small town, rural, and wilderness places in American life and is concerned with the image of place as a basis for historic preservation. 4 hours or 1 unit.
327. **American Vernacular: The Cultural Landscape.** Same as Landscape Architecture 327. Focuses on vernacular structures in the cultural landscape, especially common houses, barns, and commercial and industrial structures; examines origin and geographical diffusion of vernacular architecture in the United States. 4 hours or 1 unit.
331. **Geography of Caribbean America.** Surveys the physical environment and the sequent occupancy processes that have shaped contemporary rural and urban population and land use patterns in Mexico, Central America, Panama, and the West Indies. 3 hours or $\frac{3}{4}$ unit.
332. **Geography of South America.** Surveys the physical environment and the sequent occupancy processes that have shaped contemporary rural and urban population and land use patterns in South America. 3 hours or $\frac{3}{4}$ unit.
341. **Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Environmental Studies 341, and Urban and Regional Planning 375. See Civil Engineering 341.
342. **Geography of Europe.** Analysis of the changing social, economic, and political geography of western Europe; special consideration to population changes and labor migrations and to planning problems in the underdeveloped regions and conurbations of the continent. 3 hours or $\frac{3}{4}$ unit.
353. **Geography of the U.S.S.R.** Physical and cultural regionalism; a survey of natural resources and patterns of human occupancy including industry, agriculture, and transportation. 3 hours or $\frac{3}{4}$ unit.
355. **Geography of Central and South Africa.** Regional geography of Africa south of the Sahara. 3 hours or $\frac{3}{4}$ unit.
361. **Geography of Agricultural Land Utilization.** Geographic consideration of the nature of agricultural land utilization from the world, continental, and regional viewpoints; special emphasis on the geographical implications of various types of agricultural land use and upon the interrelationships between areas of different types of land utilization. 3 hours or $\frac{3}{4}$ unit.
365. **Transportation Systems and Spatial Development.** Descriptors of transportation systems; allocation models; transportation as an industrial activity and public good; and transportation and spatial development, including the role of transportation in developing countries and in urban and regional development and problems involved in measuring the impact of transport investment. 3 hours, or $\frac{1}{2}$ or 1 unit.
366. **Location of Industry and Other Economic Activities.** Industrial site selection in theory and practice; examines the effect of factors such as materials, markets, labor, transportation, and environmental constraints on industrial location; and evaluates urban commercial patterns and factors affecting the location of commercial activities. 3 hours or $\frac{3}{4}$ unit.
367. **The Origins and Impact of Energy Scarcity.** Examines the development of the physically based theories of scarcity and a comparison to the historical and most recent economic theories of scarcity of critical resources, especially energy, and their expected application in

- local, regional, national, and international situations. The course is a more technical extension of Geography 215. Prerequisite: Mathematics 132 or equivalent; or Economics 101. 3 hours, or $\frac{3}{4}$ or 1 unit.
368. **Biological Modeling.** Same as Agronomy 368 and Biology 368. An interdisciplinary modeling course for students interested in dynamic system modeling of living processes; each student will build a model by the end of the course. No special mathematical background required. Prerequisite: Ecology, Ethology, and Evolution 212, Plant Biology 381, Entomology 315, or equivalent, depending on curriculum. 3 hours or 1 unit.
370. **Introduction to Quantitative Methods in Geography.** Introduction to statistical, numerical, and mathematical techniques used in geographic research; introduction to computer usage in geographic research. Prerequisite: Geography 185, one year of college mathematics, or one course in statistics, or equivalent. 4 hours or 1 unit.
371. **Recent Trends in Geographic Thought.** Examines trends in geographic thought since 1950; gives attention to developments in positivism, phenomenology, and structuralism with regard to geographic research; introduces students to the research methodologies of the department's faculty. 2 hours or $\frac{1}{2}$ unit.
372. **Geographical Epidemiology.** Same as Health and Safety Studies 375. See Health and Safety Studies 375.
373. **Map Compilation and Construction.** Instruction and practice in the basic techniques of map making followed by a consideration of problems involved in the construction of maps for presentation in a reproduced form (i.e., printed, photographed); the selection of proper source materials for the base and body of the map, the compilation and correlation of these materials, and methods of mechanical and photographic reproduction. 4 hours or 1 unit.
374. **Thematic Map Design and Production.** Applies modern design principles to making thematic maps for various uses; the production of maps and atlases, emphasizing multicolor reproduction. Prerequisite: Geography 373 or equivalent. 4 hours or 1 unit.
375. **Computer Cartography.** Introduction to concepts and techniques for computer mapping with spatial or statistical data; universal computer mapping strategies, with applications in the laboratory; cartographic data capture, covering data structures, devices, manipulation, and display; and a synthesis of geographic information systems. Prerequisite: Geography 185 or equivalent. 4 hours or 1 unit.
377. **Introduction to Remote Sensing.** Same as Forestry 377. Fundamentals of energy-matter interaction mechanisms, and the manifestation of reflected and emitted radiation on photographs and images; introduces characteristics of aerial films and filters, electro-optical scanners, and digital processing are introduced; and emphasizes applications in environmental problems. Prerequisite: Geography 277 or equivalent, Geography 185 (beginning statistics) or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
378. **Techniques of Remote Sensing Image Analysis.** Optical and digital information processing of imagery acquired from aircraft and satellite remote sensing platforms; includes systems design, mensuration theory, photographic enhancement techniques, and automatic digital classification for all of the standard sensor systems; and laboratory focusing on the design and implementation of information processing techniques with application limited to a survey of uses. Prerequisite: Geography 370 and 377, or equivalent. 4 hours or 1 unit.
380. **Urban Form and Function in Pre-Industrial Western Society.** A review of urban landscapes and functions and of the development of city systems in the historical geography of western civilization prior to industrialization. Previous course work in history or historical geography is desirable. 3 hours or $\frac{3}{4}$ unit.
382. **Siberian Culture History and Ethnology.** Same as Anthropology 382. See Anthropology 382.
383. **Urban Geography.** Distribution, functions, and internal structures of cities; emphasizes contemporary metropolitan and central city problems. 3 hours or $\frac{3}{4}$ unit.
384. **Migration and Spatial Interaction.** Theories and models of migration; contemporary migration patterns; information flow and individual movement in geographic space; and individual level and aggregate models of spatial interaction. 3 hours or 1 unit.
386. **Political Geography.** Territorial behavior of nation-states; boundary conflicts and influences; regional voting patterns in the United States; malapportionment and gerrymandering; voting behavior of American minorities; and metropolitan fragmentation and spatial access to public services. 3 hours or $\frac{3}{4}$ unit.

391. **Research in Geography.** Detailed examination and discussion of the methods of initiating and executing research projects in human or physical geography (taught in separate sections); requires students to write a research proposal of a quality suitable for a graduate thesis. Prerequisite: Geography 371; either graduate standing in geography or senior standing as a geography major and consent of department. 2 hours or $\frac{1}{2}$ unit.
403. **Physical Systems in Landform Analysis.** Same as Geology 403. A study of the phenomena of the physical landscape in terms of the basic principles of systems theory. Prerequisite: Geography 303 or equivalent, or consent of instructor. 1 unit.
404. **Critical Analysis of Concepts and Models in Geomorphology.** The interpretation of a landscape and its evolution is dependent on which of the available models the geomorphologist accepts; the course focuses on the importance and ramifications of this choice. Prerequisite: Graduate standing and consent of instructor. 1 unit.
405. **Seminar in Physical Geography.** Advanced study of one of several topics that vary from semester to semester and include: (a) mathematical models/numerical analysis in physical geography; (b) problems in physical geography; and (c) professional seminar. Prerequisite: Advanced course work in physical geography and consent of instructor. $\frac{1}{2}$ to 1 unit.
406. **Urban and Regional Analysis.** Same as Urban Planning 406. See Urban Planning 406.
450. **Issues in Regional Development.** Same as Urban Planning 450. Establishment and articulation of regional development goals; includes trade-offs, the role of government in regional development, analytical problems in the evaluation of regional public policy, and comparison and evaluation of regional development programs in a number of countries. Prerequisite: Urban Planning 406. 1 unit.
456. **Regional Science Methods: Economic and Demographic.** Same as Urban Planning 456. Examines models of regional growth and development, including export base, input-output and econometric, cohort component and spatial interaction; emphasizes socioeconomic impact analysis and forecasting subnational economic and demographic change. Prerequisite: Urban Planning 406 or consent of instructor. 1 unit.
457. **Seminar in Regional Science.** Same as Urban Planning 457. Discusses advanced topics in regional science; prepares students for dissertation and thesis research, applied study for public agency, or other student research. Prerequisite: Urban Planning 456, Economics 461, or consent of instructor. 1 unit.
463. **Historical Geography.** History and philosophy of historical research in geography. Research strategies for the analysis of individual and aggregate spatial behavior in the past, derived geographical patterns, changing spatial behaviors and patterns through time, and historical values underlying contemporary geographical decision making. 1 unit.
464. **Problems in Historical Geography.** Research seminar focused on the interests of participating students and faculty; application of geographic theory to the study of past geography, geographic change in the past, spatial behavior in the past, and/or evidence of spatial behavior in the contemporary scene. Prerequisite: Geography 370 or equivalent; prior preparation in historical geography. 1 unit.
470. **Advanced Spatial Analysis.** Advanced techniques of spatial analysis, including spatial autocorrelation, trend surface analysis, grouping and regionalization procedures, and point pattern analysis. Prerequisite: Geography 370 or equivalent. 1 unit.
473. **Problems in Cartography.** Subjects for map presentation are selected in the student's field of specialization or area of interest. Data are collected and maps compiled and carried to completion in final drafted form suitable for publication. Prerequisite: Geography 373 or consent of instructor. 1 unit.
494. **Seminar in Social Geography.** Advanced study of a current research topic in social geography. Topic varies from semester to semester; prepares students for dissertation and thesis research through study of advanced literature and the completion of a research paper. Prerequisite: Geography 370 and 371, or equivalent; graduate coursework in social geography or in one of the social sciences. 1 unit.
495. **Advanced Studies in Geography.** Seminar and directed individual investigation of selected problems or regions; designed to develop ability to conduct independent investigation. Scheduled seminars are detailed in each semester's *Timetable*. All students are required to register each semester in section Z (the departmental colloquium) for 0 units in addition to other 495 work which may be selected. 0 to 2 units.

497. **Development of Geographic Thought.** Historical survey of the discipline from the Graeco-Roman period to the present. $\frac{1}{2}$ unit.
499. **Thesis Research.** 0 to 4 units.

GEOLOGY

Head of Department: R. J. Kirkpatrick

Department Office: 245 Natural History Building, 1301 West Green, Urbana

100. **Planet Earth.** Introduces non-science majors to physical aspects (earthquakes, volcanoes, tsunamis, mountains, continental drift) and historical aspects (formulation of the earth and life, dinosaurs, ice age, evolution of climate) in earth science. Presents information on earth resources, natural hazards, and development of natural landscapes. Focuses on humanistic issues; provides a context for understanding the concept of environmental change. Optional lab demonstrations and field trips with co-registration in Geology 110. 3 hours. Students may not receive credit for both Geology 100 and Geology 101.
101. **Introduction to Physical Geology.** Focuses on the physical features of our planet and their origin. Topics include: plate tectonics, mountain building, glaciers, earthquakes, volcanoes, coastlines, rivers, deserts, geologic structures, weathering, minerals, and rocks. Introduces the fundamental methodology for observing and interpreting earth features. Optional field trips. Intended for non-physical science majors. 4 hours. Credit may not be received for both Geology 100 and Geology 101.
102. **History of the Earth.** Examines the birth and evolution of our planet including the oceans and atmosphere. Studies the geologic record, and measuring geologic time; the record of the origin and evolution of life. Explores the influence of life on planetary physical and chemical processes and the impact of major events such as drifting continents, meteorite impacts, astronomical cycles, advance and retreat of the seas, and natural catastrophes on geology and life. Optional field trips. Prerequisites: Geology 100 and 110, or Geology 101, or Geology 104, or Geology 107. 3 hours. Students may not receive credit for both 102 and 108.
104. **Geology of the National Parks and Monuments.** Develops geologic background, concepts, and principles through study of selected national parks and monuments. Examines the geologic framework and history, modern geologic processes, and factors influencing the present day landscape for each park area. Optional field trips. 3 hours.
105. **Geology of Energy Resources.** Geology of fossil and nuclear fuels, geothermal energy, wind and water power, and exotic energy sources. History of energy production and use. Future supplies and predictions of availability. Politics and environmental effect on energy supply, extraction, and consumption. 3 hours.
107. **General Geology, I.** Introduces Earth phenomena and processes. Includes minerals and rocks, continental drift, plate tectonics, rock deformation, igneous and sedimentary processes, geologic time, landscape evolution, internal structure and composition of the earth, groundwater, seismology and earthquakes, and formation of natural resources. Emphasizes the chemical and physical aspects of the Earth, and the basis for geological inference. Field trip required for geology majors, optional for others. Intended for science and science-oriented students. 4 hours. Credit may not be received for both Geology 107 and Geology 100.
108. **General Geology, II.** Approaches to understanding the dynamic history of the Earth since its formation by analysis of sedimentary rock systems, evolution and life history, plate tectonic changes through time, and age determination methods. Laboratory work focuses on identification of sedimentary rocks, reconstructing sedimentary environments, fossil identification, and a field trip report. Field trip required. Primarily intended for science and science-oriented students. Prerequisite: Geology 107 or consent of instructor. 4 hours.
110. **Planet Earth — Lab/Field.** Introduces practical techniques for identification of rocks and minerals, interpretation of geologic and topographic maps, recognition of fossils, appreciation of geologic features and landforms in the field. Two field trips are required. 1 hour.

Co-registration with Geology 100 is recommended. Credit may not be received for both Geology 110 and Geology 101-102, 104, 107-108.

111. **The Dynamic Earth (Honors).** Study of the geological history and evolution of the earth, the formation of mountains and ocean basins, the making of continents and earth environments and resources. A four day field trip will be open to students. Course in the campus Honors Program. Credit may not be received for both Geology 111 and Geology 101 or 107. 4 hours.
115. **Regional Field Study.** Field observations in a region of diverse geology. One- to two-week field trip. Credit is given only on completion of a satisfactory written report. Prerequisite: Any one of Geology 101, 102, 107, or 250; or consent of instructor. 2 hours.
143. **History of Life.** The evolution of life from its beginning, illustrating changing faunas and floras through time; the invasion of land and of the skies; the effects of a changing atmosphere, changing climates, and continental drift. Emphasis on dinosaur evolution, ecology, and extinction; also other vertebrates, including mammal-like reptiles, mammals, and the emergence of humans, as well as plants and invertebrates. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Geology for Engineers.** Physical geology with an emphasis on those aspects of the natural environment which are of importance to the engineer. Prerequisite: Theoretical and Applied Mechanics 150 or 152; sophomore standing in the College of Engineering. 3 hours.
290. **Individual Study.** Research and individual study in geology. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member. 1 to 4 hours. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
291. **Individual Honors Study.** Research and individual study in geology for honors credit. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member and of departmental honors advisor. 1 to 4 hours. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
292. **Senior Thesis.** Research in geology, with thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member. 2 to 8 hours. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Research in geology with honors thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member and of departmental honors advisor. 2 to 8 hours. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
301. **Geomorphology.** History, origin, and characteristics of land forms produced by fluvial, glacial, wind, and wave erosion or by a combination of these acting upon the major kinds of geologic materials and structures. Lectures, laboratory, and field trips. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
304. **Soil Geomorphology.** Same as Geography 304. See Geography 304.
306. **Fluvial Geomorphology.** Same as Geography 306. See Geography 306.
307. **Periglacial Geomorphology.** Same as Geography 307. See Geography 307.
311. **Structural Geology and Tectonics.** Introduction to principles of rock deformation, stress, and strain; description and interpretation of geologic structures; study of methods for structural analysis; outline of geotectonic processes; three hours of lecture and a three-hour lab per week. Required four day field trip. Prerequisite: Geology 107 or consent of instructor. 4 units or 1 hour.
315. **Field Geology.** Field mapping or study in a selected area of a specific geologic problem; involves preparation of a geologic map and/or report. Prerequisite: Geology 108 or equivalent; consent of instructor. 2 to 8 hours, or $\frac{1}{2}$ to 2 units.
317. **Field Geology in the Rocky Mountains.** Field course conducted in the Rocky Mountains; introduction to field techniques, geologic mapping, and field training in stratigraphy, petrology, structure, and geomorphology. Offered in summer session only. Prerequisite: 8 hours of 300-level credit in geology, including Geology 340 or 332; or consent of instructor. 8 hours or 2 units.
320. **Introduction to Paleontology.** Surveys the major groups of fossil forming invertebrates, vertebrates and plants, their modes of preservation, and basics of taxonomy; also their use in the study of functional morphology, ecology, evolution, and biogeography. Prerequisite:

Geology 108, or Ecology, Ethology, and Evolution 320, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

325. **Paleobotany.** Same as Plant Biology 325. See Plant Biology 325.
332. **Mineralogy and Mineral Optics.** Introduction to: crystallography; crystal optics; structures, compositions, properties, stabilities and geological occurrences of minerals; and mineral identification. Prerequisite: Geology 108 and Chemistry 102. 4 hours and 1 unit.
336. **Petrology and Petrography.** Study of the minerals, compositions, textures, structures, classifications, and origins of igneous, sedimentary, and metamorphic rocks; lectures emphasize rock forming processes (petrology), and laboratories emphasize description and classification (petrography). Prerequisite: Geology 332. 4 hours or 1 unit.
340. **Sedimentology and Stratigraphy.** Introduces dynamics of sedimentation, geology of sedimentary basins, the distribution of geologic processes through time, definition and correlation of stratigraphic units, principles of paleogeography, stratigraphy and tectonics. Prerequisites: Geology 102 or 108, or consent of instructor. 4 hours or 1 unit.
344. **Stratigraphic Geology.** Advanced practices in definition and correlation of stratigraphic units, paleogeography and stratigraphic tectonics; time criteria and their application in stratigraphy; advanced practice in subsurface stratigraphy; regional field exercises; usage in geologic mapping, mineral fuels exploration, hydrogeology, and engineering geology exemplified. Prerequisites: Geology 340 or consent of instructor. 4 hours or 1 unit.
346. **Advanced Sedimentary Systems.** Advanced survey of processes of sediment transport and bedform evolution in open channel, coastal and marine geological settings; fluvial, eolian, coastal, deltaic, shelf, turbidite, and submarine fan depositional systems; current status of basin systems focussing on basin formation, basin fills, basin maturation and integrative basin analysis. Prerequisite: Senior or graduate standing; Geology 311 and 340; concurrent registration in Geology 350 and 360 desirable. 3 hours or $\frac{3}{4}$ unit.
350. **Introduction to Geophysics.** Introduction to basic concepts related to the physics of the earth's interior; includes formation and composition, gravity and shape, seismology, heat flow and internal temperatures, magnetism, rheology, and plate tectonics. Prerequisite: Mathematics 242 and Physics 107. 4 hours or 1 unit.
351. **Geophysical Prospecting.** Same as Mining Engineering 351. Principles of geophysics and their application to mining processes. Prerequisite: Senior standing in engineering or geology, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
352. **Physics of the Earth.** Survey of the physical and chemical principles used to delineate the physical state and evolution of the Earth including its internal structure, composition, and mineralogy. Topics include seismology, gravity, magnetics, heat flow, geophysical exploration, high-pressure mineralogy, and composition of the mantle and core. Students in geophysics, engineering, or physics should enroll in 350. Prerequisites: Geology 107, Physics 102, Geology 332, co-registration or credit in Geology 311, or permission of instructor. 3 hours or $\frac{3}{4}$ unit.
355. **Introductory Groundwater Hydrogeology.** An introduction to fluid flow and transport in the subsurface; topics include the geology of groundwater, regional groundwater flow, petroleum migration, formation of economic ores, and water-rock interaction. Prerequisite: Mathematics 120 or 135. 4 hours or 1 unit.
356. **Introduction to Plate Tectonics Analysis.** Introduction to the analytic methods employed in plate tectonics analysis; topics include methods of locating seismic events, construction of earthquake focal mechanisms, determination of paleomagnetic poles, calculation of plate kinematics, and of reconstruction plate motions; measurements of heat flow and in-situ stress, and calculation of basin subsidence curves. Prerequisites: Mathematics 242, Physics 106, and Geology 107 or consent of instructor. 4 hours or 1 unit.
357. **Glacial Geology.** Consideration of glacial processes, materials and landscapes, stratigraphic analysis of glacial deposits and the mid-continent Pleistocene glacial succession; field trip and required field work. Prerequisite: Geology 107 or consent of instructor. 4 hours or 1 unit.
358. **Seismology.** Quantitative treatment, at the advanced undergraduate level, of the theoretical and observational aspects of seismology, and application to: understanding the nature of planetary interiors, earthquakes, natural and man-made explosions, and tectonics; prospecting for natural resources; and earthquake engineering. Includes equations of motion, Helmholtz potentials, polarization, matching of boundary conditions, Thompson-Haskell formulation,

- Rayleigh and Love waves, dispersion and higher modes, travel time inversion, origin and mechanism of earthquakes, effects of earthquakes on ground motion, and synthetic seismograms. Prerequisite: Mathematics 346 or equivalent; or consent of instructor. 4 hours or 1 unit.
360. **Geochemistry.** Fundamental chemical and physical concepts applied to geological processes; topics include: origin, distribution, and geochemical behavior of elements; chemical evolution of the Earth; geochemistry of natural waters and sedimentary rocks; isotope geochemistry, crystal chemistry, trace element geochemistry and organic geochemistry. Prerequisite: Geology 101 or 107; Chemistry 102; Mathematics 120 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
370. **Oceanography.** An investigation of the principal factors that control the origin and physiography of ocean basins; the composition and distribution of marine sediments; the composition, biological productivity, and dynamics of seawater. Prerequisite: Geology 101 or 107, and Chemistry 101, and Mathematics 120; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
397. **Special Topics in Geology.** Seminar or lectures in subjects not covered by regular course offerings; for advanced undergraduates and graduate students. See *Timetable* for current offerings. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
401. **Physical Geochemistry, I.** Introduction to geochemistry providing the background needed for more advanced courses in geochemistry, petrology, and mineralogy; topics, with geochemical examples, include classical thermodynamics, statistical thermodynamics, reaction kinetics, aqueous geochemistry, solid-state chemistry, and the theory of phase transformations. Prerequisite: Chemistry 101, 102 and Mathematics 242; or equivalent, or consent of instructor. 1 unit.
402. **Physical Geochemistry, II.** Introduction to geochemistry providing the background needed for more advanced courses in geochemistry, petrology, and mineralogy. Topics, with geochemical examples, includes classical thermodynamics, statistical thermodynamics, reaction kinetics, aqueous geochemistry, solid-state chemistry, and the theory of phase transformations. Prerequisite: Geology 401 or consent of instructor. 1 unit.
403. **Physical Systems in Landform Analysis.** Same as Geography 403. See Geography 403.
415. **Advanced Field Geology.** Field mapping or study in a selected region. Requires preparation of a geological map and/or report. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
420. **Paleoecology.** Interpretation of life habit of fossil organisms from skeletal morphology and associated depositional features; reconstruction of marine ecosystem relationships from the study of assemblages of fossils. Prerequisite: Geology 320 or equivalent. 1 unit.
421. **Topics in Paleontology.** Selected topics in macro- and micropaleontology. Intensive study of a selected invertebrate or algal group; special problems in the taxonomy, evolution, skeletal diagenesis, ecology, biogeography, and biostratigraphy of selected fossil organisms. Prerequisite: Geology 320, Ecology, Ethology, and Evolution 320, or consent of instructor. 1 unit. May be repeated.
422. **Advanced Stratigraphic Geology.** Application of stratigraphic principles and techniques to solution of a selected geologic problem or problems. Selected problem may be in the area of regional stratigraphy, historical inference, or applied geology. Prerequisite: Consent of instructor. 1 unit.
431. **Structural Mineralogy.** Crystal chemistry of minerals and survey of current knowledge about the structures and properties of selected minerals and mineral groups. Prerequisite: Consent of instructor. 1 unit.
432. **Sedimentary Geochemistry.** Equilibrium assemblages among the principal organic and inorganic sedimentary solids and their associated liquids during weathering, deposition, and diagenesis; kinetics and mechanism of phase changes; and transport processes during diagenesis. Prerequisite: Geology 360 or equivalent, or consent of instructor; some background in physical chemistry desirable. 1 unit.
433. **Isotope Geology.** Introduction to the theoretical basis for isotopic fractionation in nature; survey of isotopic variations in natural materials; and application of isotopic variations to problems of geological and environmental significance. Prerequisite: Consent of instructor. 1 unit.
434. **Theoretical Petrology.** Use of thermodynamic and kinetic arguments in the solution of basic petrological problems. Prerequisite: Consent of instructor. 1 unit.
435. **Igneous and Metamorphic Petrology.** Application of chemistry and physics to the study of crystalline rocks, with emphasis on the integration of theory with field and laboratory obser-

- uations; topics selected on the basis of student interest and training. Prerequisite: Geology 336. 1 unit. May be repeated.
437. **Basin Analysis and Sedimentary Geology.** Examines contemporary aspects of tectonics and sedimentation, cratonic sequences, seismic stratigraphy, geologic history of sea level, isotope chronostratigraphy, anoxic sedimentation, pelagic deposition, transgressive-regressive sequences, rates of sediment accumulation, sediment yield, maturation of organic sediments, global sedimentary cycles, basin classification, basin geodynamics, and examples of basin analysis. Prerequisite: Geology 311, 340, 352, and 360; or equivalent; or consent of instructor. Consent of instructor required for students from other departments. 1 unit.
438. **Sedimentary Petrography.** Microscopic study of sedimentary rocks in thin section with emphasis on detailed classification and genetic interpretation of carbonates. Prerequisite: Geology 336 or consent of instructor. 1 unit.
439. **Carbonate Sedimentology.** Study of genesis and diagenesis of carbonate sediments covering: carbonate deposition, coordination of ultrastructural-petrographic properties and elemental-isotopic composition, nature and environments of diagenetic changes, and temporal trends in carbonates. Prerequisite: Geology 320 and 336, or equivalent; or consent of instructor. 1 unit.
450. **Principles of Engineering Geology.** Study of the effects that lithology, weathering, joints, faults, and ground water have upon engineering projects; the description and origin of geologic factors and their significance in the design, construction, and performance of civil engineering undertakings. Field trip or term paper required. Prerequisite: Geology 250 or equivalent, or consent of instructor. 1 unit.
451. **Practice of Engineering Geology.** Review of modern geotechnical exploration techniques (borings, downhole logging, surface geophysics, and remote sensing) and study of case histories illustrating the influence of significant geologic features on exploration design, construction, and performance of civil engineering projects. Field trip or term paper required. Prerequisite: Geology 450 and Civil Engineering 383, or consent of instructor. 1 unit.
452. **Geodynamics.** Dynamical characteristics of the solid earth; mathematical theories that describe large scale deformation, both on the surface and within the interior of the Earth; theoretical predictions compared with observations to delineate: the internal properties of the earth, driving mechanism of plate tectonics, and the origin of various geological processes such as volcanism, mountain building, and basin formation. Prerequisite: Mathematics 285, Physics 107, Geology 350 or permission of instructor. 1 unit.
454. **Geophysical Inverse Problems.** Emphasizes implementations of geophysical inverse theory in complex systems of incomplete, noisy measurements. Includes solutions based on vector norms, generalized inverse, maximum likelihood solution, various travel time inversions, reflectivity, migration, tau-p inversion, moment tensors, and the inversion of geochemical data. Prerequisite: Mathematics 315 or equivalent and Geology 350 or Geology 358, or consent of instructor. 1 unit.
455. **Hydrogeology.** Geology of the occurrence, storage, movement, and quality of water in the rocks of the earth's crust. Prerequisite: Consent of instructor. 1 unit.
457. **Quaternary Geology.** Consideration of the Quaternary Period, its definition, stratigraphic and fossil records, and correlations; introduces climatic considerations. Prerequisite: Geology 357 or consent of instructor. 1 unit.
461. **Mineralogy of Clays.** Same as Ceramic Engineering 461. Composition of various types of clays; the structure and properties of the clay minerals; and the origin and mode of occurrence of the clay minerals and clay materials. Field trip required. Prerequisite: Geology 336 or equivalent; consent of instructor. 1 unit.
462. **Petrology of Clay Minerals.** Same as Ceramic Engineering 462. Origin and occurrence of clay minerals in natural and synthetic systems such as the weathering, sedimentary, burial diagenetic, and hydrothermal environments; quantitative X-ray diffraction analysis of mineral assemblages from each environment; advanced analytical techniques such as nuclear magnetic resonance and transmission electron microscope analysis of clay minerals. Prerequisite: Geology 461. 1 unit.
468. **Microbeam Analysis.** Covers the theory and practice of scanning electron microscopy (SEM) and quantitative electron microprobe analysis with emphasis on geological applications; laboratory work utilizes both the SEM and an automated microprobe equipped with wave-length

dispersive and energy dispersive spectrometers, and also covers specimen preparation. Prerequisite: Consent of instructor and endorsement of research advisor. $\frac{1}{2}$ unit. May be repeated as topics vary; students may register for two different topics in the same semester. May be repeated to a maximum of 1 unit.

477. **Recent Sedimentary Environments.** Survey of sedimentary processes, physical sedimentary parameters, and sedimentary mineralogy in fluvial, lake, dune, beach, barrier island, bar, deltaic, tidal flat, lagoonal, bay, marsh, continental shelf, continental margin, submarine canyon, and deep ocean floor environments; sedimentological aspects of predicting occurrences of oil, natural gas, coal, uranium, and metalliferous deposits in ancient analogs of these environments; and sedimentological aspects of land usage, and conservation and preservation of man's environment. Prerequisite: Geology 340 or consent of instructor. 1 unit.
488. **Advanced Structural Geology.** Analysis of geologic deformation based upon the principles of mechanics and utilizing research data from laboratory and field investigations; methods in structural analysis. Prerequisite: Geology 311 or consent of instructor. 1 unit.
489. **Geotectonics.** Nature and distribution of major earth structures and geological and geophysical evidence bearing on their origin. Prerequisite: Geology 311 or consent of instructor. 1 unit.
493. **Advanced Studies in Geology.** Work may be taken in the following fields: (a) general geology; (b) engineering geology; (c) geomorphology and glacial geology; (d) clay mineralogy; (e) ground-water geology; (f) micropaleontology; (g) mineral deposits; (h) mineralogy and crystallography; (i) paleontology; (j) geochemistry; (k) geophysics; (l) petrography and petrology; (m) sedimentology; (n) stratigraphy; (o) oceanography; (p) submarine geology; (q) structural geology and geotectonics; (r) mathematical geology; (s) sedimentary petrography; (t) petroleum geology; (u) coal geology; (v) isotope geology and geochronology; (w) electron beam analysis; (x) vulcanology; (y) environmental geology; and (z) planetology. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** Individual research under supervision of members of the faculty in their respective fields. 0 to 4 units.

GERMANIC LANGUAGES AND LITERATURES

(Including German, Germanic, and Scandinavian)

Head of Department: James M. McGlathery

Department Office: 3072 Foreign Languages Building, 707 South Mathews, Urbana

German

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one four-hour course at the same semester level (e.g., 104 or 114). Approval to do so must be obtained from the department.

101. **Elementary Course.** Oral practice, reading, and grammar for beginners. 4 hours.
102. **Elementary Course.** Continuation of German 101. Prerequisite: One semester of college German or equivalent. 4 hours.
103. **Intermediate Course.** Continuation of German 102. Prerequisite: Two semesters of college German or equivalent. 4 hours.
104. **Intermediate Course.** Continuation of German 103. Prerequisite: Three semesters of college German or equivalent. 4 hours.
113. **Intermediate Speaking.** Practice in speaking idiomatic German; emphasis on spontaneous expression. Prerequisite: Two semesters of college German or equivalent. 4 hours.
114. **Intermediate Speaking.** Continuation of German 113. Prerequisite: Three semesters of college German or equivalent. 4 hours.
153. **Practice in Conversation.** Emphasis on learning to converse in German in an everyday manner. Prerequisite: Two semesters of college German or equivalent. 2 hours.

161. **German Masterpieces in Translation I: The Middle Ages Through Classicism.** Introduces major works of German literature in English translation from the beginnings through the eighteenth century. Texts and lectures in English; not open to students concentrating in German. 3 hours.
162. **German Masterpieces in Translation II: Romanticism to the Present.** Introduces major works of German literature in English translation from the nineteenth and twentieth centuries. Texts, discussions, and lectures in English; not open to students concentrating in German. 3 hours.
189. **Living German — German Living.** Practice in speaking German for students living in the German House. Prerequisite: Elementary speaking knowledge of German. 1 hour. May be repeated to a maximum of 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **German Literature in Translation.** Same as Comparative Literature 224. Introduction to German literature for students with no knowledge of German. 3 hours. May be repeated as topics vary.
211. **Conversation and Writing.** Prerequisite: German 104 or equivalent, or consent of instructor. 3 hours.
212. **Conversation and Writing.** Continuation of German 211. Prerequisite: German 211 or equivalent, or consent of instructor. 3 hours.
220. **German for Business.** Introduces German business language as used in basic operations in retail/wholesale, export/import, banking transactions. Prerequisite: German 211 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
221. **German for Economics.** German language as used in professional contexts involving economic matters: texts and documents relating to forms of enterprises and their financing, to macroeconomic structures of domestic and foreign trade, and to reports on the economies of German-speaking countries. Prerequisite: German 220 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
225. **German-Speaking Europe Today.** Examines contemporary civilization and culture in the German-speaking countries of Europe, including reference to historical, political, and economic developments. Not open to German concentrators or German teacher trainees. 3 hours.
231. **Introduction to German Literature, I.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Eichendorff, Buechner, Wedekind, Schnitzler, T. Mann, Borchert, Frisch, and Boell. Prerequisite: Two years of college German or equivalent. 3 hours.
232. **Introduction to German Literature, II.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period, such as Storm, Keller, Hauptmann, Kaiser, Kafka, Brecht, and Duerrenmatt. Prerequisite: German 231 or equivalent. 3 hours.
270. **Parateaching.** Same as French, Latin, Russian, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
280. **Teachers' Course.** Introduction into the problems of the teaching of German and a study of textbooks. Prerequisite: Senior standing or consent of instructor. 4 hours.
293. **Honors Senior Thesis.** Intended primarily for candidates for honors in German, but open to other seniors. Prerequisite: Senior standing; consent of instructor. 2 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
296. **Special Topics in German Literature.** Same as Comparative Literature 228. Introductory study in such topics as individual authors, selected literary movements or periods, modes of inquiry in literary study, minor genres, subgenres, extraliterary influences, etc. Prerequisite: Reading fluency in German beyond the fourth-semester college level. 3 hours.
299. **Study Abroad.** Lectures, seminars, and practical work in German language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: German 211 or equivalent; 3.75 overall average; 4.0 average in German courses. 0 to 17 hours. May be repeated to a maximum of 34 hours per academic year.

301. **Advanced Conversation, Composition, and Syntax.** Intensive study of advanced problems of grammar, syntax, and style. Prerequisite: German 211 and 212, or equivalent. 3 hours or $\frac{1}{2}$ unit.
302. **Advanced Conversation.** Practice in free conversation with a native speaker. Prerequisite: German 301 or equivalent. 1 hour or 0 units.
303. **Translation in Theory and Practice.** Theory and practice of translating technical, commercial, scientific, and literary texts from German into English and vice versa. Prerequisite: German 301 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **German Literature 750-1450.** Literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 750 to 1450. Prerequisite: German 232 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **German Literature 1450-1770.** A literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 1450 to 1770. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
320. **History of German Civilization.** Selected topical, historical, and pictorial analysis of Germany's culture and civilization. Prerequisite: German 232 or equivalent. 4 hours or $\frac{3}{4}$ unit.
330. **Modern German Poetry.** Same as Comparative Literature 323. A poetical and metrical survey of modern German lyric verse. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
331. **The German NOVELLE.** A study of the development of the German NOVELLE as a genre, together with reading and discussion of *Novellen* from Goethe to Grass. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
332. **German Drama.** German drama from the classical to the modern period; selected works of representative playwrights, such as Lessing, Goethe, Schiller, Kleist, Grillparzer, Hebbel, Buechner, Hauptmann, Kaiser, Brecht, Frisch, Weiss, and Mueller. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
335. **Literature and Culture of the German Democratic Republic.** History, politics, and literature of the German Democratic Republic. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
341. **Martin Luther.** Same as Religious Studies 341. Special attention to Luther as an artist, and to his importance for the development of German language and literature; attention also paid to the historical and intellectual trends of the fifteenth and sixteenth centuries as well as to the significance of Luther in modern psychological and sociological thought. Prerequisite: A reading knowledge of German. 3 hours or $\frac{3}{4}$ unit.
342. **Goethe.** Introduction to Goethe's life and works. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
343. **Goethe's FAUST.** Intensive study of Goethe's FAUST, Parts I and II, with an examination of the theme's evolution in literature. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, Italian, Portuguese, and Spanish 360. See English as an International Language 360.
365. **Structure of the German Language, I (Phonology and Morphology).** Introductory survey of the phonological and morphological structure of the German language. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit.
366. **Structure of the German Language, II (Syntax).** Introduction to German syntax; theory and practical applications. Prerequisite: German 365 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, Italian, Portuguese, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
387. **Introduction to Myth and Folklore.** Same as Comparative Literature, English, Slavic, and Speech Communication 387. See English 387.
390. **The German Cinema.** History and criticism of the German film from its beginnings through Expressionism and the New Objectivity of the 1920s, the Third Reich and the period of decline, to the young German film of the 1960s; weekly film screenings, lectures, and discussions. Knowledge of German useful but not required. 3 hours or $\frac{3}{4}$ unit.

396. **Special Topics in German Studies.** Intensive study of restricted topics in German language, literature and culture. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit. May be repeated as topics vary up to a maximum of 9 hours or 2 $\frac{1}{4}$ units.
400. **Beginning German for Graduate Students.** Introduction to the reading of German texts in the sciences and the humanities. 4 hours. No graduate credit.
401. **Readings in German for Graduate Students.** Designed for graduate students preparing for the German reading requirements for the Ph.D. Prerequisite: German 400 or equivalent. 4 hours. No graduate credit.
410. **Introduction to Graduate Study.** Bibliography and methodology of the study of the Germanic languages and literatures, with particular regard to German literature and Germanic linguistics; introduction to scholarship in general and the German profession in particular, including the modes and methods of scholarly endeavor. 1 unit.
415. **Middle High German.** Prerequisite: German 365. 1 unit.
420. **History of the German Language.** The internal and external history of German from pre-historic times to the present. Prerequisite: German 365 or equivalent. 1 unit.
430. **Old High German.** Grammar and interpretation of the oldest literary documents. Prerequisite: German 365. 1 unit.
440. **Middle High German Literature.** Prerequisite: German 415 or equivalent. 1 unit.
441. **German Romanticism.** Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
442. **Nineteenth-Century German Realism.** German realism as manifested in the literature between romanticism and naturalism, with emphasis on so-called poetic realism. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
444. **The Eighteenth Century before Goethe.** The Enlightenment and the development of the classical ideal; emphasizes the work of Gottsched, Lessing, Wieland, Klopstock, and Herder. Prerequisite: German 312 or equivalent. 1 unit.
451. **Naturalism, Symbolism, and Expressionism.** Same as Comparative Literature 441. Comparative analysis of German literature from the 1880s to the 1920s within the European context. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
452. **German Literature from the Twenties to the Present.** Trends, problems, and personalities in recent German literature, including exile literature and literature of the Third Reich. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
460. **Seminar in Older German Literature.** Topics range from the earliest known literature to the Enlightenment. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
461. **Seminar in Modern German Literature.** Same as Comparative Literature 482. Topics range from the Enlightenment to the present. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
463. **College Teaching of Foreign Languages.** Same as French, Russian, Spanish, Italian, Portuguese, and English as an International Language 463. See French 463.
480. **Teaching German in College.** Introduction to the problems of teaching German in college. $\frac{1}{2}$ unit.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, Russian, Spanish, Portuguese, and English as an International Language 481. See French 481.
493. **Research in Special Topics.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units.

Germanic

367. **Introduction to Germanic Linguistics.** Same as Linguistics 367. Comparative and historical survey of the Germanic languages. Prerequisite: Completion of the foreign language requirement in the College of Liberal Arts and Sciences, or equivalent; some knowledge of German desirable. 3 hours or $\frac{3}{4}$ unit.
426. **Gothic.** Synchronic and diachronic study of the Gothic language and its relationship to other Germanic and Indo-European languages; extensive reading of extant texts. Prerequisite: Germanic 367 or consent of instructor. 1 unit.

462. **Seminar in Germanic Linguistics.** Varying topics dealing with problems in diachronic and synchronic Germanic linguistics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated as topics vary.
465. **Comparative Germanic.** Reconstruction of the phonological and morphological systems of Proto-Germanic and their development into the Germanic languages and dialects. Prerequisite: Germanic 426 or consent of instructor. 1 unit.
467. **Runic Inscriptions.** Detailed analysis of inscriptions in the "older" Germanic futhark, the Anglo-Frisian futhorc, and the Scandinavian "younger" futharks; their relationships and the correlation between phonological and orthographic developments. Prerequisite: Germanic 465 or consent of instructor. 1 unit.

Scandinavian

101. **Elementary Scandinavian, I.** The first of four semesters leading to a reading knowledge of Danish, Norwegian, or Swedish, and to an oral command of one of these languages; linguistic structure, reading, and oral practice. 4 hours.
102. **Elementary Scandinavian, II.** Continuation of Scandinavian 101. Oral practice and reading of simple texts. Prerequisite: Scandinavian 101. 4 hours.
103. **Intermediate Scandinavian, I.** Readings in Danish and Norwegian, or in Swedish; structure of Swedish, or of Danish and Norwegian. Prerequisite: Scandinavian 102 or equivalent. 4 hours.
104. **Intermediate Scandinavian, II.** Continuation of Scandinavian 103. Readings in classical and modern Danish, Norwegian, and Swedish texts. Prerequisite: Scandinavian 103. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Comparative Literature 215. Works by Jacobsen, Strindberg, Vesaas, Myrdal, and Nobel Prize winners Ham-sun, Undset, Lagerkvist, and Johnson; readings and discussion in English. 3 hours.
251. **Germanic Mythology.** Same as Religious Studies 251. Studies pre-Christian beliefs of the Germanic peoples as reflected primarily in medieval Icelandic prose and poetry (in translation). 3 hours.
252. **Icelandic Sagas in Translation.** Same as Comparative Literature 252. Studies Old Norse-Icelandic literature: kings' sagas, family sagas, mythical-heroic sagas, and romances. Texts and lectures in English. 3 hours.
293. **Honors Senior Thesis.** Prerequisite: Senior standing; consent of instructor. 1 to 2 hours. (Counts for advanced hours in LAS.)
361. **Ibsen in Translation.** Same as Comparative Literature 326. Dramas in English translation; selected works of Ibsen's Scandinavian contemporaries. 3 hours or 1 unit.
362. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Comparative Literature 327. Major dramas and prose works of August Strindberg; selected plays by Kaj Munk, Kjeld Abell, Nordahl Grieg, and Par Lagerkvist. 3 hours or 1 unit.
390. **The Films of Ingmar Bergman.** Focuses on Bergman's major films of the late 1950s and 1960s; involves reading screenplays and extensive criticism in addition to viewing the films; and includes important artistic influences on Bergman as well as his own significance as a major twentieth-century artist. Knowledge of Swedish unnecessary. 3 hours or ¾ unit.
396. **Special Topics in Scandinavian Studies.** Individual study in selected topics, such as individual authors, literary movements, periods, genres, or themes, and Scandinavian culture. Prerequisite: Consent of instructor. 2 to 4 hours, or ½ to 1 unit. May be repeated.
405. **Old Norse-Icelandic, I.** Grammar and selected readings. 1 unit. Offered in alternate years.
406. **Old Norse-Icelandic, II.** Readings; selections from the Elder Edda and the sagas. Prerequisite: Scandinavian 405. 1 unit. Offered in alternate years.

GRAPHIC DESIGN

(See Art and Design)

HEALTH AND SAFETY STUDIES

Head of Department: R. W. Armstrong

Department Office: 121 Huff Hall, 1206 South Fourth, Champaign

100. **Contemporary Health.** Examines concepts of health and health promotion in contemporary society with emphasis on health and safety of individuals. Topics include: mental health and stress; exercise, nutrition and weight control; disease; sexuality; aging; environmental health; drugs, tobacco, and alcohol; and consumer health. 3 hours.
101. **Introduction to Public Health.** Introduction to the nation's public health system; includes an overview of historical roots and organizational structure, basic research tools, concepts and scope of varied public health programs, topical treatment of major contemporary health and safety problems. 3 hours.
111. **Professional Seminar.** Orientation to department; current views and issues in health and safety fields; career opportunities, and other related topics. 0 hours.
140. **Health Advocate, I.** Provides an overview of current college student health issues and concerns, knowledge of the University of Illinois health care delivery system and an understanding of medical self care; develops skills in communication and referral techniques enabling students to be advocates for members of their living units. 2 hours.
141. **Health Advocate, II.** Provides direct experiences in peer education and basic community health program planning including needs assessment and evaluation. Students plan and implement one campus-wide health promotion activity. Includes CPR certification. Prerequisite: Health and Safety Studies 140. 2 hours.
143. **Drug Use and Abuse.** Introduction to the biological, psychological, pharmacological, and legal aspects of drug use and abuse; surveys community and university resources concerned with drug use and abuse; emphasizes personal and social actions for responsible drug use. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Mental Health.** Introduction to the science of mental health and illness including personality development, the genesis and manifestations of mental illness, and the maintenance of mental health; taught by a psychiatrist with emphasis on the preventive and medical aspects of mental health. 2 hours.
204. **Foundations of Health Behavior.** Examines the application of the social and behavioral sciences to health and health behavior; analyzes psychological, social psychological, and sociological approaches to health behavior. Topics include the development of health attitudes and behaviors, perceptions of health and illness, methods of changing health behavior and patient-provider interaction. Prerequisite: Health and Safety Studies 100. 3 hours.
206. **Human Sexuality.** Emphasizes the behavioral aspects of human sexuality. Topics include: birth control; prenatal care, pregnancy and childbirth; sex roles; premarital sex; lifestyles; marriage and divorce. 2 hours.
210. **Health Program Development.** Presents the elements of program development and planning as they pertain to various health settings including health care facilities, community agencies, and the school community; places special emphasis on student skills in developing example program plans pertinent to the student's area of interest. Prerequisite: Health and Safety Studies 100 and 101. 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Psychology, and Rehabilitation 214. See Human Development and Family Studies 214.
225. **Sexuality Program Development.** Examines theory and practice in the planning, implementation, and evaluation of sex education and sexuality programs in various settings; current topics and issues; students complete an individual planning project. Prerequisite: Health and Safety Studies 100 and 210. 2 hours.

240. **Health Promotion Practicum.** Preparation and presentation of lifestyle workshops to campus community groups. Practica selected from one or more of the following topics: nutrition, fitness, chemical education, sexuality, or stress management. Prerequisite: Junior standing, or consent of instructor. 3 hours. May be repeated once for credit.
243. **Drug Education Planning.** Development of curricula and education program strategies for management of drug use and abuse; evaluation of current school and community responses to drug use and abuse; pharmacological, psychosocial and legal aspects of drugs including tobacco, alcohol, medications, and illicit drugs. Prerequisite: Credit or concurrent registration in Health and Safety Studies 210. 2 hours.
266. **Tomorrow's Environment.** Same as Environmental Studies 236. See Environmental Studies 236.
274. **Introduction to Epidemiology.** Provides an overview of the basic concepts, principles, and methods of epidemiology; emphasis on the application of epidemiology to health education, health services administration and planning, health policy, and environmental health. Prerequisite: Health and Safety Studies 100 and 101, or consent of instructor. 2 hours.
285. **Health and Safety Studies Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in Health and Safety Studies with work experience in actual field situations. Students work for 12 weeks in University-approved health agencies for a minimum of 480 hours. Prerequisite: Completion of Health and Safety Studies 300-level courses in field of concentration; Senior standing in Health and Safety Studies and consent of instructor. 8 hours.
290. **Honors Seminar.** Same as Kinesiology 290 and Leisure Studies 260. See Kinesiology 290.
293. **Special Projects.** Special projects in research and independent investigation in any phase of health, kinesiology, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser and instructor, and approval of the head of department. 2 or 3 hours. May be repeated for a total of 4 or 6 hours.
303. **Delivery of Health Care: Problems and Perspectives.** Same as Social Work 303. See Social Work 303.
310. **Public Health Practice.** Theory and practice of public health promotion as they relate to educational approaches in solving community health problems. Prerequisite: Health and Safety Studies 210, or consent of instructor. 4 hours or 1 unit.
312. **Health and Safety Education in the Elementary School.** Overview of the school health program to acquaint the teacher with modern concepts of health and safety education in the elementary school; consideration of the role of the classroom teacher in understanding and meeting the health needs of children; and focus on the legal requirements for Illinois schools, major health and safety problems of elementary children, the teacher's role in the school health program, and methods and materials in teaching modern health and safety education. Prerequisite: Junior standing. 3 hours or ½ unit.
313. **Curriculum Development in Nutrition Education.** Same as Vocational and Technical Education 353. See Vocational and Technical Education 353.
321. **Health Data Analysis.** Introduces health data analysis, sources and uses of health data, collection techniques and classification procedures, commonly used health indices, techniques of rate adjustment, graphic presentation of data as they relate to the planning, conducting, and evaluating of public and school health education programs. Prerequisite: Educational Psychology 390 or equivalent. 3 hours or 1 unit.
329. **Research and Evaluation in Health and Safety Studies.** Study of the research literature, research designs and program evaluation models employed in health and safety studies. Devotes special emphasis to developing student skills in analyzing research, assessing health behavior change and problem identification for thesis research. 2 hours or ½ or 1 unit.
356. **The Organization of Health Care.** Same as Sociology 339. Examines types and performance of health care organizations (e.g., doctors' offices, clinics, hospitals, and nursing homes), networks of health services, evaluation of health care, and social policy issues relating to organizations in the U.S. health care system. Prerequisite: 6 hours of anthropology, sociology, health and safety studies, or psychology. 3 hours, or ½ or 1 unit.
357. **Health Planning.** Analysis of theory, principles and practices of health planning processes. Includes application of health planning as it relates to health systems agencies and the health

- care delivery system. Prerequisite: Health and Safety Studies 303, or consent of instructor. 2 hours, or $\frac{1}{2}$ or 1 unit.
358. **Health Administration.** Examines management principles relative to health care institutions; emphasizing goal setting, decision making, system analysis, organizational structure, conflict resolution, and leadership theories. Prerequisite: Senior or graduate standing, or consent of instructor. 3 hours or 1 unit.
369. **Environmental Health.** Appreciation of the concepts and mechanisms used to reduce or prevent environmental problems that may lead to infectious or environmentally-induced diseases; presents topics from a public health perspective which include water supply management, waste water treatment and disposal, radiation protection, pest control, and solid waste management. Prerequisite: Health and Safety Studies 274 or equivalent. 2 hours, or $\frac{1}{2}$ or 1 unit.
371. **Epidemiology and the Media.** Same as Veterinary Pathobiology 371. See Veterinary Pathobiology 371.
374. **Principles of Epidemiology.** Same as Environmental Studies, Medical Sciences, and Veterinary Pathobiology 374. The epidemiology and natural history of infectious and noninfectious diseases, including integrated vector control and host resistance; mental health and public health. Prerequisite: Microbiology 326, Veterinary Pathobiology 332, or equivalent, or consent of instructor. 4 hours or 1 unit.
375. **Geographical Epidemiology.** Same as Geography 372. Patterns of health and disease in place and time; time-space analysis and mapping; interrelations between health and population, behavior, and environment; sociocultural aspects; investigative examples from mid-latitude continental, oceanic, and tropical settings. Prerequisite: Health and Safety Studies 374, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
385. **Health and Safety Studies Advanced Internship.** Observation, study, and practical work in student's area of specialization under supervision in professional field situations; student works for a minimum of 12 weeks in a University-approved agency or site. Prerequisite: Health and Safety Studies 329, 374 and 410; or graduate standing in Health and Safety Studies; or consent of the department. 4 hours or 1 unit.
394. **Special Topics.** Lecture-discussion course in topics of current interest; see *Timetable* for specific subjects. Prerequisite: Consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
401. **Issues in Health Education.** Analyzes current developments, trends, and controversies in health education from an historical perspective, with emphasis on developing student competencies for issue analysis; assesses the effect of philosophical, scientific, political, and legislative initiatives on professional practice; and examines issues affecting the health educator in various work settings, including occupational health and safety, patient care, public health, school health, and higher education. $\frac{1}{2}$ or 1 unit.
410. **Problems in Public Health Practice.** Basic facts and principles of public health at the local, state, and national levels, including the relationships among public health departments, voluntary health agencies, and the school health program. $\frac{1}{2}$ or 1 unit.
427. **Statistical Techniques in Epidemiological Research.** Same as Environmental Studies 427, Medical Sciences 463, and Veterinary Pathobiology 426. Description and application of quantitative issues and statistical techniques prominent in the analysis of classification data arising from epidemiologic cohort or case-control aetiological studies; studies of preventive public health; and therapeutic clinical interventions. Confounding factors and methods of adjustment including standardization, stratified and matched analyses, and multiple logistic regression modelling are emphasized. Practice using available computing software for implementation is stressed. Prerequisites: Health and Safety Studies 374 and minimum of two statistics courses covering multiple regression and correlation. 1 unit.
440. **Theories of Health Behavior.** Examines the philosophical and behavioral science foundations of health science; principles of the determinants of human behavior and relationships to health. Students develop a frame of reference for understanding, predicting, and facilitating change in human behavior. Prerequisite: Health and Safety Studies 310 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
441. **Intervention Strategies in Health Science.** Advanced seminar for critical review of intervention strategies as studied from theoretical and practical perspectives; recent developments

in the medical, surgical, community, school, and environmental arenas. Prerequisite: Health and Safety Studies 310 and 440, or consent of instructor. $\frac{1}{2}$ or 1 unit.

450. **Health Policy in the United States.** Comprehensive analysis of the policy process in health care in the United States; systematic and critical review of health policy development, implementation, and evaluation; impact of government at all levels and the role of providers, industry, labor, and consumer in health policy. Prerequisite: Admission to graduate program in Health and Safety Studies or the MBA program; Health and Safety Studies 329; or consent of instructor. 1 unit.
451. **Public Health Policy.** Examines the historical mandates of public health and the formulation, substance, and implementation of public health policy at state and local levels of government; students select case studies to evaluate the performance of the public health sector in achieving its goals through health policy. Prerequisite: Health and Safety Studies 450 or consent of instructor. 1 unit.
476. **Epidemiology of Infectious Diseases.** Same as Veterinary Pathobiology 416. See Veterinary Pathobiology 416.
477. **Principles and Methods of Veterinary Epidemiology.** Same as Veterinary Pathobiology 417. See Veterinary Pathobiology 417.
479. **Seminar in Epidemiology.** Discussion of advanced topics in epidemiologic methods and research. Prepares students for thesis or dissertation research through study of selected literature and the completion of a research paper. Prerequisite: Health and Safety Studies 374 or equivalent. 1 unit.
490. **Seminar for Advanced Students.** Critical evaluation of research studies in health and safety studies, emphasizing research methods and experiment design and analysis; review of statistical techniques in factorial and correlational studies; and student reports of thesis literature reviews and research procedures. Prerequisite: Master's thesis. $\frac{1}{2}$ unit. May be repeated to a maximum of 1 unit.
493. **Special Projects.** Independent research on special projects. Prerequisite: Educational Psychology 390, Kinesiology 495, and Health and Safety Studies 440 or equivalent. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 2 units.
494. **Special Topics in Health and Safety Studies.** Lectures on topics of current interest. $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Preparation of theses in health and safety studies. 0 to 4 units.

HISTORY

Chair of Department: Geoffrey Parker

Department Office: 309 Gregory Hall, 810 South Wright, Urbana

111. **Western Civilization from Antiquity to 1660.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society before 1660; includes the Greek and Roman world, the German migrations, the rise of cities and the commercial revolution, medieval art, universities, and heresies, the Renaissance and Reformation, the Puritan Revolution, and the beginnings of the modern world. 4 hours.
112. **Western Civilization from 1660 to the Present.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society since 1660; includes the rise of modern science, the French and Industrial revolutions, the Romantic movement, the growth of nationalism and socialism, imperialism, urbanization, the Russian Revolution, Nazi Germany, the world wars, and the West and the underdeveloped world. 4 hours.
131. **History of England to 1688.** Survey of the political and constitutional, social and economic, religious and cultural, and imperial history of the British people from the beginning of English history through the revolution of 1688. 4 hours.
132. **History of England, 1688 to the Present.** Survey of the political and constitutional, social and economic, diplomatic and imperial, religious and cultural history of the British people from 1688 to the present. 4 hours.

147. **Religion and Science.** Same as Religious Studies and Sociology 102. See Religious Studies 102.
151. **History of the United States to 1877.** Colonial foundations, movement for independence, and early years of the republic. 4 hours. Students may not receive credit for both History 151 and either History 260 and 261.
152. **History of the United States, 1877 to the Present.** The evolution of an industrial, urbanized, and pluralistic society, grappling with domestic and global problems. 4 hours. Students may not receive credit for both History 152 and 262.
168. **Indian Civilization and Society.** Same as Anthropology 168. See Anthropology 168.
170. **East Asian Civilizations: China, Japan, Korea.** Surveys the three major East Asian civilizations from ancient and classical times, through the period of Western influence, political revolution, and modernization, to the contemporary age and the emergence of East Asian superpowers. 3 hours.
172. **Southeast Asian Civilizations.** Same as Anthropology and Asian Studies 186. See Anthropology 186.
173. **Islamic History and Civilization in the Near and Middle East to 1700.** Development of Islamic beliefs, institutions, and culture in the nuclear Islamic region (the present area of the Arab countries and Israel, Iran, and Turkey) from Mohammed to the age of European expansion. 4 hours.
174. **Islamic History and Civilization in the Near and Middle East Since 1700.** Islamic civilization since the age of European expansion; imperialism, Westernization, nationalism, and modernization. Arab countries, Israel, Iran, and Turkey are covered. 4 hours.
175. **Latin America from Conquest to Independence.** Survey of Latin American history from the discovery of America to 1824. 3 hours. Credit is not given for both History 175 and 275.
176. **Modern and Contemporary Latin America.** History of the Latin American republics from their independence to the present; emphasis on Argentina, Brazil, Chile, Colombia, Cuba, and Mexico. 3 hours. Credit is not be given for both History 176 and 275.
181. **The Ancient World.** Ancient empires and Greece. 3 hours.
182. **The Ancient World.** Rome. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Through research, reports, and discussion in a selected field of historical study, the seminar provides a thorough understanding of the problems of that field and of the methods of history as a discipline. Prerequisite: James Scholar standing or other designation as a superior student; consent of instructor. 3 to 4 hours. May be repeated to a maximum of 6 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **The Age of Localism: The Early Middle Ages.** The failure of imperial Rome and the rise of the Church; the organization of European society on a local basis through manorialism and feudalism. 3 hours.
204. **The Revival of Europe: The High and Later Middle Ages.** The revival of the economy; the expansion of Europe; and the rise of national states. 3 hours.
211. **The Contemporary World: Political, Ideological, and International Forces.** Interpretation of the contemporary world covering the legacy of imperialism, militarism, and world politics, the revolt of the masses, the totalitarian state, nationalism, internationalism, and such related topics. 3 hours.
212. **The Contemporary World: Economic, Social, and Cultural Aspects.** Interpretation of the contemporary world covering the economics of global power, ideological and social forces, the individual and the modern mind, the collective society, the personality in history, and such related topics. 3 hours.
213. **The Third World in Contemporary History.** Surveys the years from the close of the nineteenth century to the present, specifically the developments in Africa, Asia, Latin America, and the Middle East that led to the emergence of the "Third World." 3 hours.
215. **History of North and West Africa.** Survey of major themes and events in the history of North and West Africa from prehistoric times and the peopling of Africa through the advent of Islam; North and West African empires and states in the medieval period; the arrival

and departure of European colonial powers; and the re-emergence of independent African states. 3 hours.

216. **History of East and Southern Africa.** Survey of major themes and events from the Bantu migrations and the rise of Aksum through the development of states and empires, Islam, the expansion of trade, European colonial rule, nationalism, and the persistence of white domination in the south. 3 hours.
219. **Survey of Russian History from Early Times to the Present.** Main themes and problems of Russian history from earliest times to the present. 3 hours.
222. **Traditional China.** Historical background to the modern age, tracing the Chinese state and empire from the earliest times until 1644 A.D. Basic political, social, and economic patterns; cultural, intellectual, and technological achievements; and China's impact on Asia and the world. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as Religious Studies 224. Examination of China's principal philosophical, religious, and political schools of thought — such as Confucianism, Taoism, Zen Buddhism, and Maoism — as ways of understanding one of the world's major civilizations; the period of the classical philosophers, the glory years of empire, and the troubled era of western contact receive approximately equal attention. 3 hours.
230. **Modern Business History.** Historical development of business enterprise from the early modern era to the present in broad international perspective; social and cultural values in business activity; business, government, and social responsibility; and theories of entrepreneurial behavior and detailed case studies of great business leaders. Prerequisite: Sophomore standing. 3 hours.
237. **Contemporary Western Europe.** Same as Economics 237. An interdisciplinary approach to contemporary Western Europe; cultural, historical, economic, political, and social topics; and postwar issues, including economic recovery, position of Western Europe between the United States and the Soviet Union, economic and political integration, and current policy problems. Prerequisite: Sophomore standing. 3 hours.
247. **Science in Western Civilization, I.** The intellectual and social history of science from antiquity through the Enlightenment; special emphasis on the scientific revolution of the seventeenth century. 3 hours.
248. **Science in Western Civilization, II.** Topics in the intellectual and social history of modern science, 1789 to the present. 3 hours.
249. **History of Medicine.** Rise and development of medicine in the West since the sixteenth century; interrelations of physiology, pathology, and social demands with the theory and practice of medicine; patterns of professionalization; social role of the physician; conflict among ideas of medicine as an art, a science, and a social service; and problems of mental illness, medical ethics, and nontraditional forms of practice. Prerequisite: One year of college biology or chemistry, one year of college history, or consent of instructor. 3 hours.
253. **Afro-American History to 1877.** Same as Afro-American Studies 253. History of Africans in the Americas, surveying the African slave trade, slavery in the European colonies of the Americas, early United States slavery, and the Afro-American in the Civil War and Reconstruction. 3 hours.
254. **Afro-American History Since 1877.** Same as Afro-American Studies 254. History of Afro-Americans in the age of white supremacy; the rise of modern protest organizations; the era of integration; and the black power movement. 3 hours.
255. **New England, 1620-1789.** The founding of the New England colonies and their development through the period of the American Revolution. 3 hours.
260. **Colonial Beginnings and Early United States History to 1815.** Social, economic, and political survey of the region and its relation to the evolving Atlantic community. Credit is not given for both History 260 and 151. 3 hours.
261. **The United States in the Nineteenth Century.** History of the United States from 1815 to 1900. 3 hours. Credit is not given for both History 261 and 151.
262. **The United States in the Twentieth Century.** One major emphasis on foreign policy, including the emergence of the United States as a great power after 1898; a second emphasis on the Progressive movement and recurrent attempts at the reform of American society; and racial and urban problems and the conservation of natural resources included. 3 hours. Credit is not given for both History 262 and 152.

265. **Europe and the Romantic Revolution, 1770-1850.** Examines Romanticism as a basic psychological orientation that received its first elaborate cultural development and historical definition in the period indicated; treats various aspects of human activity, such as love, heroism, nature worship, morbidity, social idealism, and nationalism from the standpoint of the Romantic Movement. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
267. **History of Korea.** Same as Asian Studies 267. See Asian Studies 267.
268. **Religious Rebellions and Messianic Movements in History.** Same as Religious Studies 268. Comparative study of revolutionary religious movements from ancient times to the present. 3 hours.
272. **History of Women in Europe, 1700 to the Present.** Same as Women's Studies 272. Focuses on the history of women in all social classes in Europe from pre-industrial times to the present; covers changes in attitudes towards women, female employment patterns, household roles and family lives, and women's political and social movements. 3 hours.
273. **The History of American Women: Colonial Period to the Present.** Same as Women's Studies 273. Focuses on the changing legal, political, economic, and social status of women in the United States and the complex factors affecting change; includes a consideration of family life; and combines chronological and topical approaches. 3 hours.
274. **United States and World Crisis, 1917 to Present.** History of American foreign relations since World War I. 3 hours.
281. **War, Military Institutions, and Society to 1815.** Land and naval warfare from prehistory to Napoleon; discusses traditional topics such as technology, tactics, and strategy at length and demonstrates how military institutions are integrated with society as a whole. 3 hours.
282. **War, Military Institutions, and Society Since 1815.** Land and naval warfare since Napoleon; technology, tactics, strategy, administration, and military institutions in themselves and as they relate to western and nonwestern societies; and conventional nuclear warfare. 3 hours.
285. **Premodern Japanese History.** Same as Asian Studies 285. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the earliest times to the sixteenth century. 3 hours.
286. **Modern Japanese History.** Same as Asian Studies 286. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the mid-sixteenth century to the mid-twentieth century. 3 hours.
289. **Comparative Muslim Societies.** Same as Anthropology 289 and Religious Studies 289. See Religious Studies 289.
290. **Individual Study.** Readings in selected fields in consultation with the instructor. Prerequisite: Junior or senior of high standing; written consent of the honors adviser. 2 to 4 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Two-semester research project. Prerequisite: History concentrator with senior standing and 4.5 grade point average; written consent of supervising professor and honors adviser. May be taken by honors students in partial fulfillment of department honors requirements. 3 hours. Must be repeated for a total of 6 hours. (Counts for advanced hours in LAS.)
296. **Special Topics.** Topics are given on an experimental one-time-only basis. 3 hours.
298. **Colloquium in History.** Prerequisite: Junior standing; 14 hours in history, or, with consent of instructor, 14 hours in the social sciences and/or humanities. 3 hours. May be repeated as topics vary to a maximum of 6 hours. (Counts for advanced hours in LAS.)
301. **European Working-Class History: 1750 to the Present.** Same as Labor and Industrial Relations 301 and Sociology 301. Comparative study of the rise of the working class in European countries; formation, culture, and daily life; stratification within the working class; workers in organized labor and revolutionary movements. Prerequisite: One year of college history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
302. **Evolution of American Cities.** Same as Urban Planning 302. See Urban Planning 302.
303. **The Near and Middle East in the Twentieth Century.** Great power diplomacy, imperialism, nationalism, and problems of modernization studied through coverage of Arab states and Israel, Turkey, and Iran. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
304. **Medieval Civilization.** Same as Religious Studies 304. The architectural, artistic, philosophical, political, and religious components of medieval culture, thought, and patterns of behavior;

- includes monasticism and society and the individual. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
305. **The Age of the Renaissance.** Same as Religious Studies 305. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
306. **The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as Religious Studies 306. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
307. **Islam and the Near and Middle East from Mohammed to 1258.** Same as Religious Studies 307. The Koran and the Prophet; rule from the Atlantic Ocean to India; Arab and Persian Muslims; caliphate and sultanate; law, theology, mysticism, and heresies; Crusades; trade and commerce; and intellectual and cultural achievements. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
308. **The Europeanization of the Near East, 1768-1914.** Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
309. **Development of Modern Europe; Absolutism and Colonial Expansion, 1648-1789.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
310. **Europe in the Age of the French Revolution and Napoleon.** Comparative survey of Western countries in the age of democratic upheavals; America, England, and Prussia as well as France; the rise of Napoleon and the response of Europe; and the fate of innovation and reform in the immediate aftermath of the Napoleonic Wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
311. **European History from 1815 to 1871.** A synthesis of politics, economics, and culture; revolutions, reaction, liberalism, conservatism, socialism, nationalism, romanticism, and realism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
312. **European History from 1871 to 1918.** A synthesis of politics, economics, and culture; new state systems, long depression, imperialism, racism, nationalism, imperialism, symbolism, fin de siècle, socialism, and World War I. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
313. **European History from 1918 to 1939.** Survey of European society from 1918 to 1939, with emphasis on the impact of World War I, the Russian Revolution, fascism, and the intellectual trends of the twenties and thirties. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
314. **European History from 1939 to the Present.** Survey of European society since 1939, with emphasis on the impact of World War II, the cold War, the establishment of the welfare state, and social developments. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
316. **The Industrial Revolution in Europe, 1780-1900.** Comparative analytic study of industrial development in England, France, Germany, and Russia; social, cultural, and demographic consequences of rapid economic change. 3 hours, or $\frac{1}{2}$ or 1 unit.
318. **European International Affairs, 1815-1914.** The history of European international affairs from the Vienna Congress to the First World War, with the main focus on political developments, but with considerable attention also paid to the influence of domestic politics and social and economic changes on foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
319. **European International Affairs, 1914 to the Present.** The history of European international affairs from the First World War to the present day, concentrating on political developments, especially the two world wars, but including the impact of domestic politics, ideological struggle, and socio-economic change upon foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
320. **Russia from the Earliest Times to Peter the Great.** Political, economic, cultural, and social development of Russia during the Kievan and Muscovite periods. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
321. **History of Imperial Russia.** Development of Russia as a modern Western state; evolution of political institutions, economic development, growth of the revolutionary movement, with attention paid to the formation of social groups; intelligentsia, peasantry, working class; from 1700 to 1905. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

325. Southern Africa: Race and Power. Same as African Studies 325 and Political Science 333. See African Studies 325.
326. Intellectual and Cultural History of Russia. Survey of major themes in the development of Russian culture and thought, with emphasis on the nineteenth and twentieth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
327. Revolutionary Russia, 1904-1939. Russia and its empire from the Russo-Japanese War and the Revolution of 1905 through World War I, the Revolutions of 1917, the early years of the Soviet system, the rise of Stalin, and the Great Purge. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
328. Soviet Russia since 1939. The multinational Soviet state from the Hitler-Stalin Pact through World War II, the postwar Stalin era, the emergence and dominance of Khrushchev, and the Brezhnev era to the present day. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
329. Southeastern Europe, 1700-1918. The political, economic, and cultural development of the Rumanians, South Slavs, Greeks, and Albanians; the impact of Ottoman rule; the rise of nationalism and the formation of national states; and the Orthodox Church. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
330. Eastern Europe, 1919 to the Present. The political, economic, and cultural history of Poland, Czechoslovakia, Hungary, Rumania, Yugoslavia, Bulgaria, Greece, and Albania; particular emphasis upon the post-World War II era. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
331. Medieval Economic and Social History. Includes the decline of Roman society, the age of localism, the revival of commerce and urbanism, medieval capitalism, and economic decline and social turmoil. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
332. Medieval England. Economic, intellectual, religious, and social developments as reflected in the art and architecture of medieval England from the time of the German invasions to about the fifteenth century. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
333. England under the Tudors and Stuarts, 1485-1660. Politics, religion, and society in the era of the Protestant Reformation and the Civil War. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
335. History and Culture of Venice. Examines Venice from its origins at the time of the Roman Empire until the present. Includes economic, political, and social history; humanism; philosophy; art; architecture; literature; music; and popular culture. Fully illustrated with slides. 3 hours or 1 unit.
336. France, 1815-1900. The development of France, with special attention to questions of social history. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
337. American Working Class History, 1780 to the Present. Same as Labor and Industrial Relations 337. Focuses on working class formation, culture, ideas, and organization; examines daily experience of work and community life; special emphasis on race, ethnicity, and gender in the process of class formation; labor relations and the changing patterns of working class protest and accommodation. Prerequisite: One year of college level history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
338. History of Biology. Same as Biology 338. Development of biological thought from antiquity to the present, emphasizing evolutionary theory and physiology in the nineteenth century and genetics in the twentieth century. Prerequisite: One year of college biology or history, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
339. Scientific Thought, I. Same as Philosophy 317 and Sociology 305. See Philosophy 317.
340. Scientific Thought, II. Same as Philosophy 318 and Sociology 306. See Philosophy 318.
341. Modern Britain: the Victorian Era, 1815-1900. History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
342. Modern Britain Since 1900. History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.

343. **The Turks and the Ottoman Empire, 1100-1566.** Turkish migrations; the Crusades; Genghis Khan and the Mongols; Seljuks of Rum; Ottoman expansion; Islamic mysticism and law; society and economy; and international trade routes in the Black Sea and eastern Mediterranean. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
344. **The Ottoman Empire, 1566-1924.** Economy; society; law, and government; the Ottomans and Mediterranean society; Ottoman culture and Islamic tradition; minorities; trade, diplomacy and capitulations; decline and dismemberment; and traditional and westernizing attempts at revival. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Thought and Society in Modern Europe, 1789-Present.** Same as Sociology 303. Examines the reciprocal relationship between thought and society in Western Europe from the French Revolution to the present. Prerequisite: Sociology 200 or one year of college history; or consent of instructor. 3 hours or 1 unit.
346. **Thought and Society in Early Modern Europe, 1513-1789.** Same as Sociology 304. Examines the reciprocal relationship between thought and society in western Europe from the Italian Renaissance to the French Revolution. Prerequisite: Sociology 200, or one year of college history; or consent of instructor. 3 hours or 1 unit.
347. **History of Roman Law and Legal Tradition.** Examines Roman law and legal tradition in the context of historical, political, and social developments; origins of law in primitive and ancient classical societies; survey's development of precedent, codification, and preservation of Roman law, and the impact of Roman law on western legal traditions. Prerequisite: One year of college history, political science, or classical civilization; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
349. **War and Society in Early Modern Europe, 1450-1815.** Technology, tactics, operations, and strategy of warfare from the Renaissance through the Napoleonic Era; the impact of war and military institutions upon economics, society, and government; topics vary. Prerequisite: History 281, 282, 306, 309, or 310, or consent of instructor. 3 hours or 1 unit.
352. **Colonial Beginnings of American Life and Institutions.** Study of the seventeenth- and eighteenth-century colonies to 1763. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
354. **The Era of the American Revolution, 1763-89.** Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **Federalists, Jeffersonians, and the Era of Good Feeling.** United States history from 1789 to 1828, with emphasis on the conflict between nationalism and sectional interests. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
356. **America in the Age of Jackson.** Political, social, and cultural study of the United States from the 1820s to the 1850s, including the humanitarian reform movements, manifest destiny, and the Mexican War. 3 hours, or $\frac{1}{2}$ or 1 unit.
359. **Civil War and Reconstruction.** The United States between 1850 and 1877, with emphasis on the causes of the war, wartime problems of the North and South, and efforts to create a new Union after the war. 3 hours, or $\frac{1}{2}$ or 1 unit.
360. **History of the United States, 1877-1909.** Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
362. **History of the United States since 1932.** Discusses the New Deal, the Cold War, Franklin D. Roosevelt and subsequent presidents, the structure of American imperialism, and America's role in world politics. Prerequisite: One year of college history, political science, or economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
363. **Social History of Industrial America to 1918.** The impact of industrialization, immigration, and urbanization on American society to the end of World War I. Prerequisite: One year of college history. 3 hours, or $\frac{1}{2}$ or 1 unit.
364. **Social History of Industrial America Since World War I.** Study of the impact of industrial technology, business enterprise, immigration, and urbanization on American society. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
366. **The History of Illinois in the Twentieth Century.** The development of a modern American state in the twentieth century with emphasis upon its political life, economic growth, social and intellectual problems, and contribution to the nation. Includes Chicago's expanding role

in the history of Illinois. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

367. **The Trans-Mississippi West.** The West in American history since the Louisiana Purchase; western stereotypes, order and violence, racial minorities, the urban sector, natural resources, and environmental policy. 3 hours, or $\frac{1}{2}$ or 1 unit.
368. **The South in American History.** Same as Afro-American Studies 368. Exploration of the history of the American South identifying and explaining differences between the South and the rest of the nation; examines the correlates of economic change in the realms of politics, social structure, and cultural values. Race relations provides a central theme of the course. 3 hours, or $\frac{1}{2}$ or 1 unit.
369. **Constitutional Development of the United States to 1865.** Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
370. **Constitutional Development of the United States Since 1865.** Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
371. **American Intellectual and Cultural History to 1865.** Same as Religious Studies 381. Examines the role of religious, scientific, political, social, educational, and artistic thought and institutions in shaping a distinctive American culture, emphasizing Puritanism, the Enlightenment, and the Romantic movement. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
372. **American Intellectual and Cultural History since 1859.** Same as Religious Studies 382. Treats the leading intellectual and cultural influences in shaping modern and contemporary America, emphasizing the impact of Darwinism and naturalistic thought, science and technology, the American university, divisions in religious thought (Modernism, Fundamentalism, Neo-Orthodoxy), the Counterculture, and the New Conservatism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
373. **History of American Foreign Relations to 1917.** 3 hours, or $\frac{1}{2}$ or 1 unit.
374. **Imperialism, 1870 to the Present.** Deals thematically with controversial issues concerning imperialism in the past century; includes various theories on the origins of imperialism, the diverse character of European empires before 1914, the impact of the world wars on empire, and American and Soviet "imperialism" since World War II. Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
375. **Andean Countries of South America, 1532 to the Present.** The history of Colombia, Ecuador, Peru, Bolivia, and Chile; emphasizes common problems and diverse responses, from the conquest in the sixteenth century to the struggles for development in the twentieth. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
377. **History of Modern Brazil, 1808 to the Present.** Problems of a neocolonial society; themes include family structure, slavery, imperialism, modernization, and the crisis of traditional institutions. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
378. **History of Mexico, 1519 to the Present.** The development of Mexico from the conquest to the postrevolutionary present. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
379. **Slavery and Race Relations in Latin America.** Same as Afro-American Studies 379. Selected topics on Indians and Spaniards, whites and blacks, emphasizing Mexico, the Caribbean, and Brazil. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
381. **Ancient Greek States.** History of the Greek states from the earliest times to 334 B.C. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
382. **Alexander and His Successors.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
383. **History of the Roman Republic to 44 B.C.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **The Roman Empire.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **African Independence and Underdevelopment: 1945 to the Present.** Same as Political Science 332. Historical investigation of African political economies based on selected case studies; includes development of the colonial economy, economic bases of African nationalism, and

- postindependence underdevelopment and attempts to escape from it. Prerequisite: One year of college history or enrollment in the African Studies program. 3 hours, or $\frac{1}{2}$ or 1 unit.
387. **History of Central America.** Major themes of Central American history since conquest: the Colonial regime, ethnic diversity, the independence movement, fragmentation in the nineteenth century, export economies and imperialism, 1880-1932, social movements and populism in the twentieth century, revolution and intervention since the 1950's. Prerequisite: One year of college history or consent of the instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
388. **India from Colony to Nation.** Mughal Empire and British Raj, Indian national awakening, and struggle for independence under Ghandi and Nehru. 3 hours, or $\frac{1}{2}$ or 1 unit.
390. **China Under the Ch'ing Dynasty.** The period of Manchu domination in China (1644-1912); emphasis on Chinese reactions to Western influences during the nineteenth century. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
391. **History of Blacks in Urban America.** A survey of historic conditions of Afro-Americans in nineteenth and twentieth century cities; an examination of Black life, slave and free, in antebellum cities, migration patterns, the origins of the ghetto, ethnic conflicts, socio-economic patterns of urban Blacks, community institutions, political participation, urban policy issues, and social and demographic effects of urbanization. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
393. **Social-Economic History of Modern China.** Disintegration of traditional social and economic systems during the nineteenth and twentieth centuries, and the political effects of that disintegration; examines changes in the agricultural economy, changing rural elites, urbanization, and emergence of new social classes. It is recommended that students take History 390 and 394 before enrollment in History 393. 3 hours, or $\frac{1}{2}$ or 1 unit.
394. **Twentieth-Century China.** Chinese state and society in revolutionary transition; emphasis on the Nationalist and Communist revolutions and their results. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
396. **Politics and Society in Twentieth-Century Germany.** Political upheavals of twentieth-century Germany; topics include the First World War's impact on German society, the war's revolutionary aftermath, the political struggles and cultural achievements of the Weimar Republic, the rise of Hitler, the Third Reich, the Holocaust, the Second World War, and the divided postwar Germanies; novels and films complement readings. Prerequisite: History 112. 3 hours or 1 unit.
397. **History of Spain and Portugal.** Iberian history from pre-Roman times to the present with emphasis on the modern period. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
398. **The Habsburg Monarchy, 1526-1792.** A history of the Habsburg Monarchy from the union of Austria, Bohemia, and Hungary to the end of the period of reform. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
399. **The Habsburg Monarchy, 1792-1918.** Social, cultural, economic, and political development; evolution of the central institutions of the monarchy and the monarchy's place in the European state system; and internal history of the constituent peoples of the monarchy: Germans, Magyars, Czechs, Slovaks, Poles, Slovenes, Croats, Serbs, Ruthenians, and Rumanians. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
411. **Seminar in Ancient History: Greece.** 1 unit.
413. **Seminar in Ancient History: Rome.** 1 unit.
415. **Seminar in Medieval History.** 1 unit.
417. **Seminar in European History, 1350-1648.** 1 unit.
419. **Seminar in European History, 1648 to 1815.** 1 unit.
421. **Seminar in European History Since 1815.** 1 unit.
423. **Seminar in English History to 1688.** 1 unit.
425. **Seminar in English and British Empire History Since 1688.** 1 unit.
427. **Seminar in Russian History.** 1 unit.
448. **Seminar in African History.** Prerequisite: History 215, 216, and one upper-level African history course. 1 unit.
451. **Seminar in Early American History to 1789.** 1 unit.
453. **Seminar in American History Since 1789.** 1 unit.
461. **Seminar in Latin American History.** 1 unit.

- 471. Seminar in the History of Science. 1 unit.
- 472. Seminar in History of Medicine: Selected Topics from Antiquity to the Present. 1 unit.
- 473. Seminar in Military History. Prerequisite: Consent of instructor. 1 unit.
- 475. Problems in Ancient History. 1 unit.
- 476. Problems in Medieval History. 1 unit.
- 477. Problems in Early Modern European History. 1 unit.
- 478. Problems in European History since 1815. 1 unit.
- 479. Problems in English History before 1688. 1 unit.
- 480. Problems in English History since 1688. 1 unit.
- 481. Problems in Russian History. 1 unit.
- 482. Problems in Military History. Prerequisite: Graduate Standing. 1 unit.
- 483. Problems in Chinese History. 1 unit.
- 484. Problems in European History, 1350-1648. 1 unit.
- 486. Problems in American History to 1830. 1 unit.
- 487. Problems in American History since 1815. 1 unit.
- 488. Problems in Latin American History. 1 unit.
- 489. Problems in African History. 1 unit.
- 490. History and Social Theory. Introduces recent historical work drawing upon theories and concepts from the social sciences; considers fields of inquiry which include family history, demographic history, labor history, prosopographical and entrepreneurial studies, local and regional studies, and others. 1 unit.
- 491. Quantitative Techniques for Historians. Focuses on the use of quantitative techniques in historical research, exploring problems in research design, data management and computer techniques, and the evaluation of statistics used by historians. Prerequisite: Sociology 385 or consent of instructor. 1 unit.
- 492. Problems in Comparative History. Intensive comparative examinations of particular issues in the histories of multiple countries, cultures or periods; emphasizes methodology, the discipline of comparative history, and the nature of historiography in a cross-cultural and interdisciplinary context. Prerequisite: Consent of instructor. 1 unit.
- 495. Individual Research Project. Directed research in special fields; may be taken in lieu of seminars in fields in which seminars are seldom offered. 1 unit.
- 496. History of Historiography. Introduction to the great historians from early times to the present. 1 unit.
- 497. Reading Course. Directed readings in special fields. Primarily, but not exclusively, for students with a master's degree or equivalent, who are preparing for the preliminary examination in history and who need instruction in areas not provided by current course offerings. Prerequisite: Consent of instructor. 1 unit.
- 498. Problems in the Teaching of College History. Prerequisite: Candidate for Ph.D. degree in history. ½ unit.
- 499. Thesis Research. Individual direction in research and guidance in writing theses for advanced degrees. 0 to 4 units.

HISTORY OF ART

(See Art and Design)

HORTICULTURE

Acting Head of Department: William L. George

Department Office: 1005 Plant Sciences Laboratory, 1201 South Dornier, Urbana

100. **Introduction to Horticulture.** Basic principles of plant growth and development as they apply to the production, marketing, and utilization of fruits, vegetables, and ornamental plants. 3 hours.
125. **Survey of Landscape Horticulture.** Consumer analysis of horticultural elements and non-plant items utilized in the development of residential, commercial, and community landscapes; includes analysis of objectives, site, plants, installation, and maintenance; and considers selection and development of specialty gardens and interior landscapes in order to develop analytical skills in evaluating needs, materials, and services available. Not open to students in ornamental horticulture curriculum. 3 hours.
131. **Introduction to Floral Design.** Introduces the art of arranging flowers, foliages, and accessories according to the principles of design. Lecture and lab; fee required. 2 hours. Credit not given for students in ornamental horticulture.
190. **Home Vegetable Gardening.** Principles and practices of producing vegetables in the home garden by traditional and organic methods; lecture and laboratory. 3 hours. Credit is not given to horticulture majors. All other students: may not receive credit for both Horticulture 190 or 242.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Identification and Use of Woody Ornamental Plants, I.** Systematic approach to the identification, ornamental characters, culture, propagation, production, and use of woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
202. **Identification and Use of Woody Ornamental Plants, II.** Systematic approach to the identification, ornamental characters, culture, propagation, production and use of woody ornamental conifers, broadleaf evergreens, vines, ground covers and woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 and Horticulture 201, or consent of instructor. 3 hours.
210. **Home Grounds Planning and Design.** Practice of developing home grounds emphasizing planting design; analysis of and practical solutions for typical site problems; and evaluating garden structures as elements in home grounds planning and design. Prerequisite: Horticulture 202; limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agriculture occupations for secondary teachers curriculum. 4 hours.
211. **Home Grounds Development and Construction.** Continuation of Horticulture 210, with emphasis on development of home grounds and construction methods and techniques. Prerequisite: Horticulture 210; limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agriculture occupations for secondary teachers curriculum. 3 hours.
212. **Landscape Contracting.** Interpretation of the landscape architect's plans and specifications; estimating quantities of materials; and computing costs and procedures for bidding and executing landscape construction. Prerequisite: Horticulture 211. 3 hours. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only.
220. **Plant and Animal Genetics.** Same as Agronomy 220 and Animal Science 220. See Agronomy 220.
221. **Plant Propagation.** Examines theory and methods employed in propagation of plants, emphasizing anatomical, physiological, and ecological principles involved in sexual propagation (seeds) and asexual propagation (division, cuttings, budding, grafting, tissue culture, etc.). Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
222. **Greenhouse Management.** Survey of topics relating to greenhouse structures (design, location, construction) and their operation (management, heating and cooling systems, cultural practices, and cost accounting). Several field trips to local greenhouses will be made. Prerequisite: Horticulture 100 or consent of instructor. 3 hours.

223. Floricultural Crops Production. I. Commercial production of major cut-flower crops in the greenhouse and field. Prerequisite: Horticulture 222. 3 hours.
224. Floricultural Crops Production. II. Commercial production of pot plants and minor greenhouse and field-grown cut flowers. Prerequisite: Horticulture 223. 3 hours.
226. Bedding Plant Production, Use, and Identification. Examines the commercial production, use, and identification of herbaceous, frost-tender ornamental plants, largely flowering annuals, grown for outdoor bedding purposes. Includes field trip. Prerequisite: Plant Biology 100. 3 hours.
227. Indoor Plant Culture, Use and Identification. Culture, use, and identification of indoor plants in relation to their application in interior situations; discusses the influence of water, fertilizer, soil type, light (natural and artificial), relative humidity, storage and shipping. Students design and maintain an interior plant area; lecture and lab. A field trip is required. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
230. Herbaceous Perennials: Identification and Use. Identification of herbaceous perennials; cultural requirements and uses in the landscape; discussion of perennial border design for continuous flowering. Prerequisite: Plant Biology 100. 3 hours.
231. Floral Design. I. Applies principles of design to the composition and decorative use of flowers, foliage, and accessories. 3 hours. Registration limited to horticulture majors, students in ornamental horticulture curriculum, or students in agricultural occupations for secondary teachers curriculum only.
232. Flower Shop Management and Floral Design. II. Introduces flower shop management; includes the location, establishment, and financing of a new or existing shop and basic skills in management, pricing, buying, delivery, and display. Covers advanced floral design skills. Prerequisite: Horticulture 231. 3 hours.
233. Floriculture for the Home. Fundamentals of home gardening and the effective use of ornamentals as a part of the home environment; subjects include the selection, culture, and use of garden annuals, biennials, perennials, bulbs, and house plants; garden tools and equipment; soil preparation; plant propagation; principles of design and planting methods; garden maintenance; use of fertilizers; pest control; training and pruning; lawn care; hybridizing; growing structures; and care of cut flowers. Not open to students in the ornamental horticulture curriculum. 3 hours.
234. Landscape Plants Production. Emphasizes woody ornamental plant production, nursery operation, and nursery business management techniques; compares both traditional and computer-aided management tools; examines industry scope and diversity through nursery visits, presentations by nursery operators, and student-directed interviews; presentations throughout the state. Field trip required; see *Timetable* for approximate cost. 3 hours. Offered in alternate years.
236. Turfgrass Management. Examines principles and practices used in management of turfgrasses in areas of general and specific use of value to students interested in one or more aspects of turfgrass utilization. Prerequisite: Plant Biology 100. 3 hours.
242. Commercial Vegetable Production. Commercial vegetable production with emphasis on cultural considerations and harvest and handling of selected vegetable crops. Integrates principles of plant growth into vegetable production schemes; covers vegetable classification, growing practices and handling in the context of current commercial production systems. Prerequisite: Horticulture 100 and Soils 161. 3 hours.
250. Horticulture Internship. A supervised off-campus learning experience of at least 300 hours in a horticulture related enterprise. Prerequisite: Junior status; good academic standing; major in ornamental horticulture, horticulture, or agricultural science with horticulture emphasis; completion of a 200- or 300-level course appropriate to the internship activities; and consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
251. Arboriculture. Evaluates criteria for ornamental woody plant selection, cultivation, valuation, and maintenance; links the technical skills and practices for commercial arborists to an understanding of woody plant physiology and anatomy; emphasizes marketing and promotion of horticultural expertise. 3 hours. Offered in alternate years.
261. Small Fruit and Viticulture Science. Technological application of biological principles to the culture of strawberry, grape, blueberry, raspberry, blackberry, currant, gooseberry, and miscellaneous small fruits. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours.

262. **Tree Fruit Science.** Examines biological principles, cultural methods and practices involved in the growth and production of the apple, pear, peach, cherry, plum, apricot, almond, and miscellaneous citrus and nut crops. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours. Offered in alternate years.
300. **Special Problems.** Supervised research on individual problems in any phase of horticulture; includes anatomy, breeding, physiology, ecology, or general culture of fruit, vegetable, or ornamental plants. Prerequisite: Not open to students on probation; written consent of the instructor and authorized departmental approval required prior to advanced enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade point average of 4.0 and may be taken in conjunction with other courses in the department subject to approval of the instructor. 1 to 5 hours, or $\frac{1}{2}$ to 2 units.
307. **International Food Crops.** Survey of the botany, physiology, breeding, production practices, and pest management of the major international food crops. Tropical and subtropical crops are emphasized and aspects of agriculture in developing countries are discussed. Prerequisite: Agronomy 121, Horticulture 100, or Plant Biology 100. 3 hours or $\frac{3}{4}$ units. Offered in alternate years.
320. **Horticultural Plant Breeding.** Methodology, objectives, and constraints of breeding for improved cultivars of flowers, woody ornamentals, turfgrasses, fruits and vegetables. Emphasis on breeding objectives and methods unique to horticultural commodities such as color, appearance, flavor and shelf-life, nutritional value and other characteristics that determine product quality. Prerequisite: Horticulture 220. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
321. **Floricultural Physiology.** Studies the physiology and metabolism of floricultural crops during their development from seeds through flowering. Lectures and discussion. Prerequisite: Agronomy 101, Plant Biology 100, or consent of instructor. 4 hours or 1 unit.
322. **Plant Nutrition.** Studies the mechanisms of and factors affecting the absorption, transport, distribution, and functions of the essential elements required by higher plants. Lectures and discussions. Prerequisite: Soils 101; Plant Biology 234 or 330. 4 hours or 1 unit. Offered in alternate years.
323. **Principles of Plant Breeding.** Same as Agronomy 323. See Agronomy 323.
333. **Plant Physiology Laboratory.** Same as Agronomy 333 and Plant Biology 333. See Plant Biology 333.
336. **Perennial Grass Ecosystems.** Same as Agronomy 336. Different levels of ecological organization in perennial grass ecosystems. Provides advanced study for students in turfgrass and forage management. Cultural programs are derived from an understanding of interrelationships between different components of the ecosystem, including man and animals. Term paper required. Field trips; see *Timetable* for approximate cost. Prerequisite: Horticulture 236 or Agronomy 322. 4 hours or 1 unit.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science, and Forestry 340. See Agronomy 340.
345. **Growth and Development of Horticultural Crops.** Factors affecting growth, development, and quality of horticultural crops, such as photoperiodism, growth regulators, carbon dioxide levels, etc. Lecture and discussion. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
398. **Postharvest Physiology of Horticultural Crops.** Physiology, biochemistry, and anatomy of fruits and vegetables during development, maturation, and ripening in situ and in storage. Prerequisite: Plant Biology 100 and Chemistry 102 or 103, or equivalent. 4 hours or 1 unit. Offered in alternate years.
424. **Plant Biochemistry.** Same as Agronomy and Plant Biology 424. See Agronomy 424.
425. **Membrane Transport and Mineral Nutrition in Plants.** Same as Agronomy and Plant Biology 425. See Agronomy 425.
431. **Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Plant Pathology 431. See Biology 431.
432. **Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Plant Pathology 432. See Biology 432.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Plant Pathology 433. See Biology 433.

436. **Plant Gene Regulation.** Same as Agronomy and Forestry 446. See Agronomy 446.
437. **Gene Expression During Seed Development.** Same as Agronomy and Forestry 447. See Agronomy 447.
447. **Horticulture Seminar.** Discussion of current research and literature pertaining to problems of horticulture and related fields. Prerequisite: Graduate standing in horticulture or related fields. $\frac{1}{4}$ unit.
488. **Plant Pigments.** Same as Plant Biology 488. A comprehensive presentation of the nature, function, distribution, biosynthesis, degradation, separation, and spectroscopic properties of pyrrole, carotenoid, quinone, and anthocyanin pigments. Prerequisite: Plant Biology 330 or consent of instructor. 1 unit. Offered in alternate years.
490. **Research Methods in Horticulture.** Lectures, discussions, demonstrations, and laboratory exercises dealing with methods and apparatus used in horticultural research. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 1 unit.
492. **Special Topics in Horticulture.** Readings and discussion in selected phases of horticulture including such topics as genetics, physiology, anatomy, morphology, and ecology of horticultural crops. $\frac{1}{2}$ to 2 units.
494. **Professional Orientation in Horticulture.** The philosophy and components of graduate education, with development of the principles useful in teaching, research, and extension in horticulture. Prerequisite: Graduate standing in horticulture. $\frac{1}{4}$ unit.
499. **Thesis Research.** Research on problems in floriculture, ornamentals, plant breeding, pomology, turfgrass, or vegetable crops. Prerequisite: Graduate standing in horticulture. 0 to 4 units (summer session 0 to 2 units).

HUMAN DEVELOPMENT AND FAMILY STUDIES

Head of Division: Judy DeLoache

Department Office: 206 Child Development Laboratory, 1105 West Nevada, Urbana

105. **Introduction to Human Development.** Systematic overview of the psychological, biological, familial, and cultural factors related to human growth and development throughout the life cycle. 3 hours.
106. **Observation and Assessment of Human Development.** Studies human behavior in laboratory and natural settings, with emphasis on the developing child; includes observation and assessment of cognitive, social, affective, and motor development. Prerequisite: Human Development and Family Studies 105, or consent of instructor. 3 hours.
110. **Introduction to Family Ecology.** Overview of family development, including courtship, marriage, parenting, the aging family, and family crisis; emphasizes the application of research findings to individual decision-making. 3 hours.
143. **Biological Bases of Human Behavior.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 143. See Anthropology 143.
145. **Introduction to Women's Studies in the Social Sciences.** Same as Sociology 145 and Women's Studies 112. See Women's Studies 112.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Development of Curriculum for Infants and Preschoolers.** Introduces development of curriculum for children from birth to age five; integrates child development theory and principles with programming for young children in preschool and childcare settings. Prerequisite: Human Development and Family Studies 105, or consent of instructor. 3 or 4 hours. Developmental Child Care students only register for 3 hours and do not enroll in the laboratory; all other students must register for 4 hours credit.
203. **Infancy and Early Development.** Reviews development during the first two years of life, including cognitive, social, and biological aspects of early development; lab involves first-hand observation of infants to supplement and extend lecture material. Prerequisite: Human Development and Family Studies 105 or Psychology 216, or consent of instructor. 4 hours.

204. **Motor Development in Childhood.** Same as Kinesiology 262. See Kinesiology 262.
205. **Children with Special Needs.** Same as Sociology 205. See Sociology 205.
210. **Comparative Family Organization.** Same as Anthropology 210. A cross-cultural examination of the family in relation to its environment, the family as an environment, and the family structure as it changes over time; evaluates findings in anthropology, sociology, and psychology; examines current issues in American family life. Prerequisite: Junior standing or consent of instructor. 3 hours.
211. **Social Context of Human Sexuality.** Surveys current research on social aspects of human sexuality from cross-cultural, social, familial, and life-span development perspectives. 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Leisure Studies, Psychology, and Rehabilitation 214. A multi-disciplinary introduction to the study of aging; the social, psychological and physiological context of changing roles in later life; public and private policies that affect older people and their families. Prerequisite: Human Development and Family Studies 105, or 3 hours of social science. 3 hours.
215. **Courtship and Marriage.** Development of cross-sex and same-sex relationships that lead to marriage or intimate living over the life cycle; the dissolution of such relationships; emphasizes the effects of social and cultural environments on intimate relationships. 3 hours. Students may not receive credit for both Human Development and Family Studies 215 and Sociology 321.
220. **Organization and Administration of Child Development Programs.** Examines principles and practices of organization and administration of programs and community services for young children and their families with special focus on leadership; emphasizes daily planning and operation of programs and services, and internal and external factors influencing program management and effectiveness. Prerequisite: Human Development and Family Studies 202, or consent of instructor. 3 hours.
242. **Family Violence.** Same as Sociology 242. See Sociology 242.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
301. **Issues in Socialization and Development.** Presents and uses theories of socialization to evaluate and analyze current issues and socialization practices; delineates historical and philosophical trends in socialization, and discusses the implications of these trends for generating social policy affecting the developing individual. Prerequisite: Human Development and Family Studies 202 and 203 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Sex Roles.** Same as Sociology 302 and Women's Studies 302. See Sociology 302.
303. **Hospitalized Children and Their Families.** Examines the developmental needs of children in hospitals and their families; delineates the role of the Child Life Specialist and familiarizes students with hospital procedures and personnel. Clinical placement includes direct experience with hospitalized children and their families. Prerequisite: Human Development and Family Studies 202, 205, and 319, and consent of instructor. 3 or 4 hours, or 1 unit.
304. **Gerontology.** An interdisciplinary approach to the study of aging and the aged from developmental, behavioral, and social perspectives. Prerequisite: Senior standing. 3 hours or 1 unit.
305. **Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Elementary and Early Childhood Education 305. See Foods and Nutrition 305.
310. **Contemporary American Family.** Examination of the variety of forms families assume in the United States; families are compared in the areas of kinship, family organization, patterns of interpersonal relationships, socialization, values, and integration with the larger society. Prerequisite: Human Development and Family Studies 210 or consent of instructor, and 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
315. **Critical Transitions in Families.** A life-span development approach to the study of normative changes and non-normative events and their impact on marriage and family relationships; gives attention to variations in the socio-economic contexts of family transitions, and to methods for reducing the negative effects of such transitions. Prerequisite: Six hours of Human Development and Family Studies courses, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

316. **Adolescent Development.** Examines paths of experience and individual development within the family, the peer group, and other domains through this socially-defined stage of life. Prerequisite: Six hours of Human Development and Family Studies courses, or equivalent social science courses. 3 hours, or $\frac{3}{4}$ or 1 unit.
319. **Day Care Practicum.** Same as Psychology 319. See Psychology 319.
330. **The Family in International Settings.** Examines the impact of technological change on the family in developing nations, compared with the Western World; includes coverage of the effects of various development approaches and projects on family roles, form, and resource access, and the effects of family characteristics on the success of development projects. Prerequisite: Human Development and Family Studies 210, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
349. **Music in Early Childhood.** Same as Music 349. See Music 349.
350. **Practicum in Human Development and Family Studies.** A supervised on or off-campus learning experience related to human development or family ecology, supervised in cooperation with an appropriate agency or institution. Prerequisite: Human Development and Family Ecology major; junior standing. Not available to students on probation. 4 to 12 hours, or 1 to 3 units. (Only 1 unit of the course may be applied to the total required for a graduate degree in Human Resources and Family Studies, Option 2. At the undergraduate level, only 4 hours may be applied to the total HDFS courses required.)
354. **Growth and Physical Development of Children.** Same as Kinesiology 354. See Kinesiology 354.
370. **Family Conflict Management.** Examines processes of conflict management in family and community disputes; emphasizes negotiation and mediation as modes of dispute settlement. Prerequisite: Human Development and Family Studies 210 or 310; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
388. **Special Topics in Human Development and Family Studies.** Prerequisite: Senior standing and consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours, or 2 units.
390. **Human Development: Theory and Methodology.** Discussion and evaluation of theories of human development and critical examination of current research; examples from current literature illustrating research methods and the differing theoretical orientations shaping research directions in human development. 4 hours or 1 unit.
410. **Family Interaction.** Observation and qualitative analysis of the family as a system; how family organization emerges, is maintained, and changes through social interaction. Prerequisite: Human Development and Family Studies 310 or equivalent. 1 unit.
418. **Seminar in Human Development.** An overview of theories and research in human development; focuses on major issues regarding development, differing conceptualizations of those issues, and relevant research. Prerequisite: Consent of instructor. 1 unit.
419. **Seminar in Family Research and Theory.** Presents an advanced, multidisciplinary approach to current theories and research in the areas of marriage and the family. Prerequisite: Human Development and Family Studies 310, or consent of instructor. 1 unit.
420. **Contemporary Topics in Human Development.** An in-depth analysis of a current issue in human development with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Studies or a related area, and consent of instructor; courses in statistics and Human Development and Family Studies 390 or equivalent. 1 unit.
421. **Contemporary Topics in Family Studies.** An in-depth analysis of a current issue in family studies with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Ecology or a related area, and consent of instructor; courses in statistics and Human Development and Family Studies 390 or equivalent. 1 unit.
457. **Sensorimotor Development.** Same as Kinesiology 457. See Kinesiology 457.
470. **Family Mediation: Theory and Techniques.** Applies mediation theory and techniques to decisions faced by families in conflict, e.g., divorce; emphasizes the development of professional conflict management skills to assist individuals and families in their ability to resolve disputes. Prerequisite: Human Development and Family Studies 370 or equivalent. 1 unit.
493. **Advanced Studies in Human Development and Family Studies.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required

for a master's degree by students who do not write a thesis. For non-thesis students only. $\frac{1}{2}$ or 1 unit.

495. **Seminar in Human Development and Family Studies.** Discussion and evaluation of current literature on selected topics in human development and family studies. Prerequisite: Graduate standing in Human Development and Family Studies or consent of instructor. $\frac{1}{4}$ to 1 unit.
498. **Special Problems in Human Development and Family Studies.** Research or independent study on a special problem that is not part of thesis work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Original research designed and conducted under faculty supervision. 0 to 4 units.

HUMAN RESOURCES AND FAMILY STUDIES, SCHOOL OF

(Please refer to individual alphabetical listings: Consumer Sciences, Foods and Nutrition, and Human Development and Family Studies. For Family and Consumer Economics, Interior Design, and Textiles and Apparel, see listings under Consumer Sciences.)

Director of School: Sharon Y. Nickols

School Office: 260 Bevier Hall, 905 South Goodwin, Urbana

HUMAN RESOURCES AND FAMILY STUDIES

Director of School: Sharon Y. Nickols

School Office: 260 Bevier Hall, 905 South Goodwin, Urbana

100. **Contemporary Issues in Human Resources and Family Studies.** Introduces and analyzes contemporary issues and trends in human resources and family studies; examines the integrative nature of Human Resources and Family Studies and life planning theories, models and research; includes orientation to the School of Human Resources and Family Studies. Required of, and limited to, freshmen in the School of Human Resources and Family Studies. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
268. **Cooperative Extension.** Same as Agriculture 268. See Agriculture 268.
269. **Cooperative Extension: Summer Experience.** Same as Agriculture 269. See Agriculture 269.
280. **Leadership Development.** Same as Agriculture Communications 280. See Agriculture Communications 280.
298. **International Experience.** Same as Agriculture 298. See Agriculture 298.
369. **Educational Programs in Cooperative Extension.** Same as Agriculture 369. See Agriculture 369.
390. **Seminar in Human Resources and Family Studies.** Discussion of selected topics in human resources and family studies; review of related literature. Prerequisite: Completion of 12 hours in Human Resources and Family Studies, or consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated for credit to a maximum of 4 hours or 1 unit.

HUMANITIES

(Please refer to individual alphabetical listings: Classics, Comparative Literature, English, French, Germanic Languages and Literatures, History, Humanities, Linguistics, Philosophy, Religious Studies, Slavic Languages and Literatures, Spanish, Italian, and Portuguese, and Speech Communication.)

School Office: 112 English Building, 608 South Wright, Urbana

HUMANITIES

Dean of College: Larry R. Faulkner

College Office: 294 Lincoln Hall, 702 South Wright, Urbana

131. **Introduction to Renaissance Civilization.** A study of major historical, intellectual, and artistic achievements of the period; organized around a series of topics, each focusing on a society, movement, or historical event as reflected in literature, art, and the history of ideas. 3 hours.
141. **Introduction to American Civilization, I.** An introduction to the multidisciplinary study of major aspects, events, and periods of the American experience; includes a series of topics, each focusing on one society, movement, or historical event as reflected in literature, art, history, and politics. 3 hours.
142. **Introduction to American Civilization, II.** Continuation of Humanities 141. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
261. **Survey of World Cinema, I: The Beginnings through the Coming of Sound.** Survey of the development of equipment, techniques, and themes of the cinema from its origins through the coming of sound; lectures, discussions, and showings of selected films. 3 hours.
262. **Survey of World Cinema, II: The Thirties to the Present.** Survey of the development of equipment, techniques, and themes of the cinema from the coming of sound to the present; lectures, discussions, and showings of selected films. 3 hours.
279. **Introduction to Foreign Language Education.** Same as French, German, Latin, Russian, and Spanish 279. Introduction to the theory and methodology of second language teaching, including the history of foreign language education, contemporary practices and perspectives, and current research in second language acquisition. Includes 16 hours of observation in local schools. Prerequisite: Sophomore standing and enrollment in a teacher education curriculum, or consent of instructor. 3 hours.
285. **The Jewish Experience in Film.** Selected topics focusing on various aspects of Judaism and Jewish culture as it has been portrayed in world cinema along with an examination of the contributions of selected Jewish artists to the cinema. Prerequisite: One college course in literature or cinema studies. 3 hours.
290. **Individual Study.** Supervised reading and research on interdisciplinary humanities topics chosen by the student in consultation with a faculty member. Prerequisite: Consent of humanities advisor (an approved Learning Agreement must be submitted to 294 Lincoln Hall not later than the second week of the semester or the first week of the summer session). 2 to 4 hours. May be repeated to a maximum of 8 hours.
292. **Senior Thesis.** Individual research for concentrators in humanities leading to the completion of a thesis. Prerequisite: Senior standing, a declared option in humanities major, and consent of advisor. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
295. **Special Topics: Interdisciplinary.** Interdisciplinary topics in the humanities; topics vary, but are normally related to one of the options in the humanities major. 3 hours. May be repeated as topics vary; students may register for two different topics in the same semester.

297. **Special Topics: Junior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities major. Prerequisite: Junior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to 294 Lincoln Hall not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
298. **Special Topics: Senior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities major. Prerequisite: Senior standing and consent of humanities advisor (tutorial students must submit an approved Learning Agreement to 294 Lincoln Hall not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours.
361. **Film Theory and Criticism.** Study of major aesthetic and critical theories about film; study of theory and practice of film criticism. Prerequisite: One cinema studies course at the 200 or 300 level and one college course in literature, or consent of instructor. 3 hours or 1 unit.
366. **Japanese Cinema.** Same as Asian Studies 366. Examines the influence of Japan's traditional aesthetics on its cinema and surveys its major film movements, genres, and directors. Prerequisite: Two college level courses in cinema studies or Asian Studies, or graduate standing. 3 hours or 1 unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. Theory and practice of computer-assisted instruction, with special emphasis on problems and techniques of foreign-language instruction. General principles; survey of existent and probable future CAI systems; and practical experience with lesson design and programming on the PLATO system. Linguistics majors are advised to complete Linguistics 306 before registering for this course. Prerequisite: Two years college language or equivalent, and consent of instructor. 4 hours or 1 unit.
395. **Special Advanced Topics: Interdisciplinary.** Offers interdisciplinary topics in the humanities; topics vary, but normally relate to the interdisciplinary areas of study within the humanities major or to the special humanities facilities (e.g., the Language Learning Laboratory). Prerequisite: Prerequisites will vary according to topic. See *Timetable*. 3 hours or 1 unit. May be repeated as topic varies to a maximum of 6 hours or 2 units.

INDUSTRIAL DESIGN

(See Art and Design)

INDUSTRIAL ENGINEERING

(See Mechanical and Industrial Engineering)

INTERIOR DESIGN

(See Consumer Sciences)

JOURNALISM

Head of Department: Steven J. Helle

Department Office: 120A Gregory Hall, 810 South Wright, Urbana

114. **Agricultural Communications Media and Methods.** Same as Agricultural Communications 114. See Agricultural Communications 114.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
204. **Typography.** Studies type lore and design; type dimensions; printer's arithmetic and copyfitting; platemaking; printing processes; shop organization; and terminology. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours. News-editorial majors do not receive credit for this course.
214. **Agricultural Communications Strategy.** Same as Agricultural Communications 214. See Agricultural Communications 214.
217. **History of Communications.** Same as Communications 217. Nature and development of communication systems; history of communication media; history of journalism, advertising, and broadcasting; and communications in the modern world. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
218. **Communications and Public Opinion.** Same as Communications 218. Theory of public opinion and of communications; relation of communication systems to public opinion, social systems, and the political order. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
220. **Communications and Popular Culture.** Same as Communications 220. See Communications 220.
223. **Photojournalism.** A basic photography course designed to give students a proficiency in picture taking and processing and to acquaint them with picture editing and other illustrative problems. For current fees, see *Timetable*; cameras provided by the college. Prerequisite: Registration in the College of Communications or consent of instructor. 3 hours.
231. **Mass Communication in a Democratic Society.** Same as Communications 231. Studies the philosophical bases of the functions and the responsibilities of mass communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
241. **Law and Communications.** Same as Communications 241. Historical background of the nature and meaning of the law as it relates to journalism and contemporary problems of freedom of expression. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
251. **Social Aspects of Mass Communications.** Same as Communications 251 and Sociology 251. Media structures related to cultural content and functions; problems of life and society as treated in mass-produced communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
291. **Special Problems.** Special projects, research, and independent reading in journalism for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of head of department. 1 to 3 hours.
293. **Journalism Seminar.** Seminar based on summer internship experience; offered only in the fall for students who participated in a spring pre-internship orientation class and then completed an approved summer internship. Prerequisite: Journalism 350; open only to undergraduate journalism majors who have taken a non-credit internship orientation. 0 to 2 hours.
326. **Magazine Article Writing.** Preparation of feature stories and articles; techniques of marketing, market analysis, and publishing articles written in the course. Prerequisite: Journalism 350; registration in the College of Communications or consent of the college. 3 hours or $\frac{1}{2}$ unit.
330. **Magazine Editing.** Basic principles of editing for consumer, business, trade, and company magazines; communications theory, market analysis, editorial process, design process, production process, and distribution process as they relate to magazine publishing. Prerequisite: Credit or concurrent registration in Journalism 326 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
340. **News Publication Management.** An introduction to the administration and management of print media news organizations. Prerequisite: Journalism 350 or Advertising 391; and consent of the department. 3 hours or $\frac{1}{2}$ unit.

350. **Reporting, I.** Fundamentals of journalistic writing; reporting news of public affairs. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
360. **Graphic Arts.** Rational and aesthetic standards of visual communications; principles and techniques of making visual statements; and uses of visual technology in wedding verbal and nonverbal languages. For current fees, see *Timetable*. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
362. **Broadcast News Production.** Introduces radio and TV news production designed to acquaint students with techniques, principles, and equipment used in the studio and in the field; emphasizes planning, producing, and directing individual news and public affairs programs and news stories, and serving on production teams. Prerequisite: Enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
370. **News Editing.** Newspaper editing and headline writing; the makeup and design of newspaper pages. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
372. **Broadcast News Writing and Gathering.** Gathering, writing, and editing news for radio and television; critical analysis of broadcast news practices, past and present; ethics of broadcast journalism; audio and visual communication principles as applied to news dissemination; editing and writing to film, tape and graphics. Individual and team projects. Prerequisite: Journalism 350 and 362; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
380. **Reporting, II.** The interviewing, analytical, and writing techniques of reporting complex news stories with clarity and depth. Prerequisite: Journalism 350 and 360; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
382. **Broadcast News Editing.** Principles of editing audio tape, video tape, and scripts with audiovisual materials; editing story units for broadcast; assembling news and public affairs programs; broadcast news editing ethics, research, and criticism. Prerequisite: Journalism 372; enrollment as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
390. **Advanced Reporting.** Advanced reporting projects in specialized fields; recommended for news-editorial seniors. Prerequisite: Journalism 350 and 380. 3 hours or 1 unit.
392. **Broadcast Journalism Practicum.** Individual and team produced advanced enterprise projects in specialized fields. Subject matter to be coordinated with Journalism 390. Prerequisite: Journalism 382; enrollment as a major in the Department of Journalism or consent of department. 3 hours or 1 unit.
400. **Issues in Journalism.** Seminar on issues of contemporary importance in journalism. Prerequisite: Consent of department. ½ unit.
468. **The Political Economy of Communications.** Same as Communications 468. Analyzes the structure, policy, and behavior of such media of communication as newspapers, magazines, books, postal service, telegraph, telephone, broadcasting, and film; special emphasis on their relationships to political order and the economy. Prerequisite: Consent of College of Communications. 1 unit.
470. **Communications and Popular Culture.** Same as Communications 470. Problems of cultural analysis related to the media of communications; social implications of communications research. Prerequisite: Consent of College of Communications. 1 unit.
471. **Proseminar in Communications, I.** Same as Communications 471. General discussion of the mass media of communications, their role as social institutions, and their control and support; content, audience, and effect of the mass media. Prerequisite: Consent of College of Communications. 1 unit.
472. **Proseminar in Communications, II.** Same as Communications 472. General discussion of the problem of communications, including the individual as a communicating system, symbolic processes, analysis of messages, psycholinguistics, and language as social behavior. Prerequisite: Consent of College of Communications. 1 unit.
473. **History and Theory of Freedom of the Press.** Same as Communications 473. Development of the Anglo-American press system and the idea of freedom of the press; contemporary mass media and their implications for freedom and democracy. Prerequisite: Consent of College of Communications. 1 unit.

474. **Communications Systems.** Same as Communications 474. Analyzes the structure and development of communications systems; examination of the role of communication in social change, political movements, and formal organizations. Prerequisite: Consent of College of Communications. 1 unit.
480. **Journalism Masters' Proseminar.** Introduction to scholarship and research in journalism and mass communication examining theoretical approaches to the meanings, uses, and effects of mass media in society; discussion of media freedom and accountability; humanistic and social scientific contributions to understanding mass communication. Prerequisite: Graduate standing in journalism or consent of instructor. 1 unit.
490. **Special Topics in Journalism.** Prerequisite: Consent of head of department. $\frac{1}{2}$ or 1 unit.
492. **Research Methods in Communications.** Same as Communications 492. See Communications 492.
499. **Thesis Research.** Prerequisite: Graduate standing in journalism. 1 to 2 units.

KINESIOLOGY

Acting Head of Department: Glyn C. Roberts

Department Office: 117 Freer Hall, 906 South Goodwin, Urbana

100. **Developmental Activities.** Skills and knowledge essential for leisure-time activities which are classified as developmental activities. Prerequisites for each developmental activity are given below. More than one activity (Sections A through H) may be taken in the same term. 1 to 2 hours.
- Section A: Conditioning and Weight Control.** Activities and understanding which contribute to the development and/or maintenance of physical fitness and a well-proportioned body. 1 to 2 hours. May be repeated once for credit if taken in successive semesters; credit not to exceed a total of 2 hours.
- Section B: Personal Defense.** Skills and understanding essential for defense against an aggressor, with emphasis on avoiding attack. 1 hour.
- Section C: Weight Training.** Skills and knowledge essential for use of weights for conditioning the body. 1 hour. May be repeated once for credit if taken in successive semesters.
- Section D: Physical Fitness.** Activities and understanding which contribute to the development and maintenance of physical fitness according to social and hygienic standards. 1 hour. May be repeated once for credit if taken in successive semesters.
- Section H: Hatha Yoga.** Introduction to Hatha Yoga, which is concerned with the physical well-being of the entire organism; includes a graduated program of postures (asanas), stretching movements, and muscular relaxation and breathing exercises. 1 hour.
- Section I: Outdoor Adventures.** Introductory skills and knowledge for development of life time activities in basic backpacking, basic river canoeing, and mountaineering techniques (balance climbing and rappelling). Includes participation in one field trip during the semester. Prerequisite: Kinesiology 106A and 107A; or consent of instructor. 1 hour.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.
101. **Dance Activities.** Skills and knowledge essential for leisure-time activities which are classified as dance activities. Prerequisites for each dance activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour.
- Section A: Ballroom Dance, I.** Introductory skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, cha-cha, and selected fad dances. 1 hour.
- Section B: Ballroom Dance, II.** Intermediate skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, and cha-cha as well as tango, samba, and paso doble. Prerequisite: Kinesiology 101A or consent of instructor. 1 hour.

Section C: International Ballroom Dance. Skills and understanding essential for international ballroom dance steps; emphasis on tango, cha-cha, Viennese waltz, samba, rumba, quick-step, paso doble, mambo, and merengue. Prerequisite: Kinesiology 101B or consent of instructor. 1 hour.

Section D: American Square Dance. Introductory skills and understanding essential for square dancing; opportunities for conducting and calling dances. 1 hour.

Section E: International Folk Dance. Introductory skills, knowledge, and conditioning essential for exploring cultural characteristics via the folk dance idiom. 1 hour.

Section F: Modern Dance. I. Introductory skills, knowledge, and conditioning essential for free and creative dance. 1 hour.

Section G: Modern Dance. II. Intermediate level technique, improvisation, and composition for both men and women; multimedia approaches to dance and dance criticism. Prerequisite: Kinesiology 101F or consent of instructor. 1 hour.

Section H: Afro-American Dance Forms. Beginning skills and knowledge and, under the repeat option, refined and more complex skills and heightened kinesthetic awareness essential for development of cultural characteristics via dance of West African, West Indian, Latin American, and contemporary Black American sources. 1 hour. May be repeated to a maximum of 3 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

102. **Individual and Dual Activities.** Skills and knowledge essential for leisure-time activities which are classified as individual and dual activities. Prerequisites for each individual or dual activity are given below. More than one activity (Sections A through I) may be taken in the same term. 1 hour.

Section A: Tennis. I. Introductory skills, knowledge, and conditioning essential for court play. 1 hour.

Section B: Tennis. II. Intermediate skills, knowledge, and attitudes for effective court play. Prerequisite: Kinesiology 102A or consent of instructor. 1 hour.

Section C: Golf. I. Introductory skills and understanding essential for course play, with emphasis on irons. For current fees, see *Timetable*. 1 hour.

Section D: Golf. II. Intermediate skills and understanding essential for use of irons and woods; analysis of course play. For current fees, see *Timetable*. Prerequisite: Kinesiology 102C or consent of instructor. 1 hour.

Section E: Bowling. I. Introductory skills and understanding essential for bowling. For current fees, see *Timetable*. 1 hour.

Section F: Bowling. II. Intermediate skills and understanding essential for bowling. For current fees, see *Timetable*. Prerequisite: Kinesiology 102E or consent of instructor. 1 hour.

Section G: Equitation and Horsemanship. I. Fundamentals of riding, including walk, trot, and canter; flatsaddle and bareback riding; use of reins and tack; saddling and unsaddling; and basic grooming. For current fees, see *Timetable*. 1 hour.

Section H: Equitation and Horsemanship. II. Intermediate riding skills, including individual control of walk, trot, and canter; smooth transfer of gaits; bareback riding in all three gaits; diagonals, figure eights, and serpentine; and tack maintenance. For current fees, see *Timetable*. Prerequisite: Kinesiology 102G or consent of instructor. 1 hour.

Section I: Foil Fencing. Introductory skills, knowledge, and conditioning essential for foil fencing. 1 hour.

Section J: Target Archery. Introductory skills, knowledge, and conditioning essential for target shooting. 1 hour.

Section K: Track and Field. Introductory skills, knowledge, and conditioning essential for various track and field events. 1 hour. May be repeated once for credit.

Section M: Pocket Billiards. An introduction to the fundamentals of pocket billiards play; grip, stance, bridge, strategy, variation of shots, how to impart English on the cue ball, basic position play, and an 8-ball tournament; and rules of various billiard games. For current fees, see *Timetable*. 1 hour.

Section N: Basic Marksmanship. Introductory skills, knowledge, and safety measures for basic marksmanship techniques with small bore weapons. 1 hour.

Section O: Competitive Marksmanship. Development of advanced competitive shooting skills; includes match weapons, description use, match procedures and match techniques. Prerequisite: Kinesiology 102N. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

103. **Indoor Court Activities.** Skills and knowledge essential for leisure-time activities which are classified as indoor court activities. Prerequisites for each indoor court activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.
- Section A: Racquetball, I.** Introductory skills, knowledge, and strategies essential for racquetball. 1 hour.

Section B: Racquetball, II. Intermediate skills, knowledge, and strategies essential for racquetball. Prerequisite: Kinesiology 103A or consent of instructor. 1 hour.

Section C: Badminton. Introductory skills, knowledge, and conditioning essential for badminton. 1 hour.

Section D: Handball. Introductory skills, knowledge, and conditioning essential for four-wall handball. 1 hour.

Section E: Squash Racquets. Introductory skills, knowledge, and conditioning essential for squash racquets. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

104. **Skating Activities.** Skills and knowledge essential for leisure-time activities which are classified as skating activities. Prerequisites for each skating activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.

Section A: Figure Skating, I. Introductory skills, knowledge, and conditioning essential for figure skating. For current fees, see *Timetable*. 1 hour.

Section B: Figure Skating, II. Intermediate skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the United States Figure Skating Association's preliminary tests. For current fees, see *Timetable*. Prerequisite: Kinesiology 104A or consent of instructor. 1 hour.

Section C: Figure Skating, III. Advanced skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the first eight tests of the United States Figure Skating Association. For current fees, see *Timetable*. Prerequisite: Kinesiology 104B or consent of instructor. 1 hour.

Section E: Ice Dance. Introduction to set patterns of ice dance; emphasizes ice dance skills designed to build control in footwork and balance when skating with a partner. For current fees, see *Timetable*. Prerequisite: Kinesiology 104B or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

106. **Swimming Activities.** Skills and knowledge essential for leisure-time activities which are classified as swimming activities. Prerequisites for each swimming activity are given below. More than one activity (Sections A, B) may be taken in the same term if these activities are offered on an 8-week basis. 1 hour.

Section A: Swimming, I. Introductory skills, knowledge, and conditioning essential for swimming. Open only to nonswimmers and those with no deep water experience. 1 hour. May be repeated once for credit.

Section B: Swimming, II. Intermediate skills, knowledge, and conditioning essential for swimming. Open only to swimmers who can execute a minimum of one of the five basic strokes in deep water, perform a standing dive, and tread in deep water. Prerequisite: Kinesiology 106A or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 107. Aquatic Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as aquatic sport activities. Prerequisites for each aquatic sport activity are given below. More than one activity (Sections A through G) may be taken in the same term. 1 hour.
- Section A: Canoeing.** Introductory skills and knowledge essential for handling a canoe with safety. Prerequisite: Kinesiology 106B or consent of instructor; the ability to jump or dive into deep water while clothed and maintain a survival position for 10 minutes. 1 hour.
- Section B: Competitive Swimming.** Skills, knowledge, and conditioning essential for strokes, starts, and turns; emphasis on training for competitive participation as well as meet organization. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour.
- Section C: Springboard Diving.** Introductory skills, knowledge, and conditioning essential for springboard diving. Prerequisite: Kinesiology 106B or consent of instructor. 1 unit. May be repeated once for credit.
- Section D: Synchronized Swimming.** Introductory skills, knowledge, and conditioning essential for creating aquatic compositions. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.
- 109. Team Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as team sport activities. Prerequisites for each team sport activity are given below. More than one activity (Sections A through L) may be taken in the same term. 1 hour.
- Section A: Volleyball, I.** Introductory skills, knowledge, and conditioning essential for power volleyball. 1 hour.
- Section B: Volleyball, II.** Intermediate skills, knowledge, and conditioning essential for power volleyball. Prerequisite: Kinesiology 109A or consent of instructor. 1 hour.
- Section C: Basketball.** Introductory skills, knowledge, and conditioning essential for basketball. 1 hour.
- Section F: Baseball.** Introductory skills, knowledge, and conditioning for baseball. 1 hour.
- Section H: Soccer.** Introductory skills, knowledge, and conditioning essential for soccer. 1 hour.
- Section I: Rugby Football.** Introductory skills, knowledge, and conditioning essential for offensive and defensive strategies of the game. 1 hour.
- Section J: Field Hockey.** Introductory skills, knowledge, and conditioning essential for field hockey. 1 hour.
- Section K: Lacrosse.** Introductory skills, knowledge, and conditioning essential for lacrosse. 1 hour.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.
- 110. Gymnastic Activities.** Skills and knowledge essential for leisure-time activities which are classified as gymnastic activities. Prerequisites for each gymnastic activity are given below. More than one activity (Sections A through E) may be taken in the same term. 1 hour.
- Section A: Apparatus, I.** Introductory skills, knowledge, and conditioning relative to participation on heavy apparatus. 1 hour.
- Section B: Apparatus, II.** Intermediate skills, knowledge, and conditioning relative to participation on heavy apparatus. Prerequisite: Kinesiology 110A or consent of instructor. 1 hour.
- Section C: Tumbling.** Introductory skills, knowledge, and conditioning for tumbling and free exercise. 1 hour. May be repeated once for credit.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.
- 120. Injuries in Sport.** Emphasizes injury mechanisms, means of injury prevention, and emergency care applied to various types of sport injuries; laboratory sessions emphasize preventive and therapeutic taping and emergency first aid. 2 hours.
- 121. Survey of Sports Medicine.** Introduction to sports medicine for non-kinesiology majors; includes discussion of training, conditioning, and preparation for sports, injury aspects of sports, and rehabilitation. 3 hours.

130. **Analysis and Performance of Basic Movement Skills.** Development of an understanding of basic movement skills; emphasizes performance and qualitative analysis of personal movement skills; and studies developmental aspects of typical and atypical movement skills in a variety of settings. 2 hours.
131. **Movement Skills: Fitness.** Development of and participation in a physical fitness program including physical fitness assessment. 1 hour.
132. **Movement Skills: Swimming.** Development of an understanding of basic swimming skills; emphasizes performance and qualitative analysis of personal aquatic skills, developmental aspects of aquatic skills, and analysis of atypical movement patterns in an aquatic environment. Prerequisite: Kinesiology 130, and ability to execute a minimum of one of five basic strokes in deep water, perform a standing dive, and tread in deep water. 1 hour.
133. **Movement Skills: Dance.** Development of an understanding of basic dance steps, positions and sequences; emphasizes performance and qualitative analysis of personal dance skills, developmental aspects of dance and rhythm, and analysis of atypical movement patterns in a dance setting. Prerequisite: Kinesiology 130. 1 hour.
134. **Movement Skills: Gymnastics.** Development of an understanding of basic gymnastic movements and sequences; emphasizes performance and qualitative analysis of personal gymnastic skills, developmental aspects of gymnastic skills, and analysis of atypical movement patterns in a gymnastic setting. Prerequisite: Kinesiology 130. 1 hour.
135. **Movement Skills: Field Activities.** Development of an understanding of basic field activity skills; emphasizes performance, as well as an appreciation of commonalities, in specific activities including soccer, speedball, speedaway, field hockey and flag football. Prerequisite: Kinesiology 130. 1 hour.
136. **Movement Skills: Racquet Activities.** Development of an understanding of basic racquet activity skills; emphasizes performance, as well as appreciation of commonalities in specific racquet activities such as tennis, badminton, squash or racquetball. Prerequisite: Kinesiology 130. 1 hour.
140. **Social Scientific Bases of Sport.** Introduction to the social scientific aspects of human movement including sport; particular emphasis on concepts derived from the social sciences (including psychology) that are appropriate to human movement. 3 hours.
141. **Sports in Greece and Rome.** Same as Classical Civilization 150. See Classical Civilization 150.
142. **Contemporary Issues in Sport.** Examines current issues in sport relative to competition, economics, race, sex, youth, educational institutions, deviant behavior, religion, psychology, and the media. 3 hours.
150. **Bioscientific Foundations of Human Movement.** Integrates anatomical and physiological aspects of human movement; emphasizes how the body moves, physiological responses to exercise stress, physical conditioning and physical fitness. 3 hours.
160. **Physical Education as a Profession.** The nature and scope of physical education as a profession; emphasis on orientation to the profession as well as understanding necessary for selecting an area of specialization within physical education. 2 hours.
161. **Principles of Motor Skill Acquisition.** Studies the basic principles of learning motor skills and their application in physical activities. Prerequisite: Kinesiology 130, or consent of instructor. 3 hours.
166. **Scuba Diving.** Introductory skills, knowledge, and conditioning essential for scuba diving. Includes only the pool and classroom sessions, not the open water dives required for certification; therefore, successful completion of this course does not result in certification. For current fees, see *Timetable*. Prerequisite: Kinesiology 106B or equivalent with consent of instructor; medical certification required to use scuba apparatus. 2 hours.
169. **Water Safety Instructor Training.** American Red Cross Instructor training for the teaching of swimming and life saving. Prerequisite: American Red Cross Swimmer and Advanced Life Saving certificates (current), and consent of instructor. 2 hours.
171. **Introduction to Sports Officiating.** Introduction to the fundamentals of sports officiating; a lecture course designed to foster the development of a sound knowledge of rules and an understanding of the mechanics involved in officiating selected sports. Content focuses upon those sports in season according to student demand and available faculty expertise; specific sports are announced in the *Timetable*. Each section is offered for eight weeks. 1 hour. May be repeated as specific activity varies.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.
220. Fundamentals of Athletic Training. Discusses the role of the athletic trainer; legalities, facilities, advanced emergency procedures, and injury prevention; emphasizes the understanding of the process of injury and healing as a basis for prevention and treatment of injuries. Laboratory sessions stress special taping, emergency procedures and equipment. Prerequisite: Physiology 103, Cell and Structural Biology 234, Kinesiology 120, or consent of instructor. 2 hours.
222. Bases for Prescription of Therapeutic Exercises. Functional anatomy and injury constraints as a bases for prescription of therapeutic exercises for musculoskeletal conditions; laboratory sessions stress clinical evaluation of muscle and joint function and familiarization with therapeutic exercises. Prerequisite: Physiology 103 and Cell and Structural Biology 234. 3 hours.
230. Coaching Strategies: Basketball. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management and performance analysis related to coaching basketball. 2 hours.
231. Coaching Strategies: Tackle Football. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tackle football. 2 hours.
232. Coaching Strategies: Baseball Softball. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching baseball, softball. 2 hours.
233. Coaching Strategies: Track and Field Cross Country. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching track and field/cross country. 2 hours.
234. Coaching Strategies: Volleyball. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching volleyball. 2 hours.
235. Coaching Strategies: Gymnastics. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching gymnastics. 2 hours.
236. Coaching Strategies: Swimming/Diving. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching swimming/diving. 2 hours.
237. Coaching Strategies: Tennis Badminton. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tennis/badminton. 2 hours.
238. Coaching Strategies: Soccer. Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching soccer. 2 hours.
244. Anthropology of Play. Same as Anthropology 244. The study of human play with emphasis on origin, diffusion, spontaneity, emergence, and diversity; includes functions of play in selected culture groups. Prerequisite: A course in anthropology. 3 hours.
247. Introduction to Sport Psychology. An analysis of the competitive sport process, with study of how personality and situational variables affect motivation, anxiety, and aggression in sport. Attention is given to the psychological skills needed by coaches and athletes for successful and enjoyable sports participation. 3 hours.
249. Sport and Modern Society. Same as Sociology 249. The sociological analysis of sport in modern societies with regard to social class, politics, community, education, and collective behavior. 3 hours.
251. Analysis of Physical Fitness Programs. Introduction to the physiological adaptations of the body during physical conditioning; analysis and development of physical fitness programs for individuals and groups. Prerequisite: Kinesiology 150 or consent of instructor. 2 hours.
255. Biomechanical Analysis of Human Movement. Studies the biological and mechanical principles of human motor performance; analyzes selected movement skills in depth. Prerequisite: Physiology 103, Cell and Structural Biology 234, Mathematics 112, or consent of instructor. 3 hours.

262. **Motor Development in Childhood.** Same as Human Development and Family Ecology 204. Studies the selection of specific movement experiences for the elicitation and maintenance of developmental sequences in children and youths based on physical growth and motor development; observational experiences provided with children in a variety of settings. Prerequisite: Kinesiology 150 or Human Development and Family Ecology 105. 3 hours.
263. **Physical Education Curriculum.** The identification, selection, and organization of movement knowledges and experiences into curricula for children and youth; emphasizes the decision-making process in curriculum development. Prerequisite: Junior standing. 3 hours.
267. **Adapted Physical Education.** Organization, administration, and conduct of physical education programs for the most prevalent types of medical conditions found in school settings; emphasis on analyzing motoric needs and prescribing programs of motor activity for special populations, including individuals with mental retardation and learning disabilities. Prerequisite: Kinesiology 150 and 161, or consent of instructor. 3 hours.
269. **Physical Education for Children.** Theory and practice of physical education in pre-elementary and elementary schools; for non-kinesiology majors. 3 hours.
273. **Instructional Strategies in Physical Education.** Analyzes the teaching-learning process, emphasizing the identification of instructional strategies specific to the development of skilled performance in movement activities. Prerequisite: Kinesiology 161. 3 hours.
280. **Principles of Evaluation and Assessment.** An introduction to the methods and techniques of evaluation and assessment of human performance in physical education and sport. Prerequisite: Kinesiology 160; Mathematics 111 or 112, or equivalent score on the Mathematics Placement Test. 3 hours.
285. **Supervised Experiences in Kinesiological Research.** Supervised laboratory experiences in physical education research; individual work under the supervision of members of the faculty in their respective fields. The student assists with data collection, processing, and analysis for research in progress. Prerequisite: Kinesiology 160 or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
286. **Supervised Experience in the Common School.** Supervised practice in observing, assisting, and teaching children in preelementary school, elementary school, junior high school, and senior high school; emphasis on understanding motor behavior, teacher-learner behavior, and interrelatedness with other aspects of the learning environment. Prerequisite: Kinesiology 161 or equivalent. 3 hours. May be repeated to a maximum of 6 hours.
287. **Supervised Experiences in the Agency Setting.** Supervised practical experience in leadership roles in nonschool agency settings; emphasis on observing, planning, and conducting physical activity programs for children and/or adults in preschool, recreation, or other social agencies. 3 hours. May be repeated for a maximum of 6 hours.
288. **Supervised Experiences in Athletic Training.** Supervised practicum in the athletic training setting; places emphasis on evaluation of student progress in clinical experiences. Prerequisite: Sophomore standing, and selection into the National Athletic Trainers Association approved athletic training certification program. 1 hour. May be repeated for a maximum of 6 hours.
290. **Honors Seminar.** Same as Health and Safety Studies 290 and Leisure Studies 260. Lectures and discussion dealing with issues in kinesiology, dance, health education, recreation education, and related fields. Prerequisite: James Scholar standing or grade-point average of 4.0. 2 hours. May be repeated for a maximum of 6 hours.
291. **Special Problems.** Special projects in research and independent investigation in any phase of health, kinesiology, physical education, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty advisor, instructor, and head of department. 2 or 3 hours. May be repeated for a maximum of 4 to 6 hours.
305. **Principles of Ergonomics.** Same as Industrial Engineering and Physiology 305. See Industrial Engineering 305.
320. **Advanced Assessment of Athletic Injuries.** Analyzes injury patterns and mechanisms for the various joints and body segments; emphasizes the nature of the injuries, clinical evaluation and therapeutic principles, the physiology of the healing process, and functional anatomy. Prerequisite: Kinesiology 220, or consent of instructor. 3 hours or 1 unit.

321. **Therapeutic Modalities in Athletic Training.** Emphasizes instrumentation and application of therapeutic modalities in laboratory settings: therapeutic heat, electrotherapy, traction, massage, and hydrotherapy. Prerequisite: Credit or concurrent registration in Kinesiology 320, or consent of instructor; Physics 140 is recommended. 2 hours or $\frac{1}{2}$ unit.
322. **Neurophysiological Bases of Therapeutic Exercise.** Examines neurological mechanisms underlying exercise performance with application to therapeutic programs. Prerequisite: Physiology 103 or Cell and Structural Biology 234, or equivalent. 4 hours or 1 unit.
341. **Games in Culture.** Examines game phenomena as cultural action systems with special emphasis on the biosocial behavior expressed in varying societies; topics include game components, cultural contexts, ecological strategies, enculturation, acculturation, symbolism, change process, and maladaptive behavior. Prerequisite: Kinesiology 244 or consent of instructor. 3 hours or 1 unit.
346. **Sociology of Sport.** Same as Sociology 346. Sociological analysis of sport as a socio-cultural system which progresses from the micro to the macro level; focuses on theoretical and conceptual issues in sociology of sport. Prerequisite: Kinesiology 249 and 3 additional hours of sociology, or consent of instructor. 3 hours or 1 unit.
347. **Social Psychology of Sport.** Same as Psychology 349. Outlines the social psychological parameters which influence behavior and performance in sport; emphasizes the impact of social influences upon the individual within the sport context, including such factors as achievement motivation, competition, anxiety, aggression, and personality. Prerequisite: Kinesiology 140; Kinesiology 247 or equivalent; Psychology 100, 103, or 105; Psychology 201; or consent of instructor. 4 hours or 1 unit.
352. **Physiology of Physical Activity.** Study of the immediate and long-term physiological effects of exercise upon the body; mechanisms of neuromuscular, cardiorespiratory, and metabolic control and adaptation relative to physical activity. Laboratory and lecture. Prerequisite: Kinesiology 150; Physiology 103 and Cell and Structural Biology 234; or equivalent. 3 hours or 1 unit.
354. **Growth and Physical Development of Children.** Same as Human Development and Family Ecology 354. A study of the growth and physical development of children through adolescence with emphasis on those systems and body composition changes related to motor performance and exercise stress. Prerequisite: Physiology 103 and Cell and Structural Biology 234; Kinesiology 280; or equivalent. 3 hours or 1 unit.
355. **Cinematography in Kinesiology.** Designed to develop an understanding of the mechanics of human motion as related to performance in sport activities through the mode of cinematography. Prerequisite: Kinesiology 255, or consent of instructor. 3 hours or 1 unit.
356. **Electromyographic Kinesiology.** Focuses upon the biological components of volitional and reflexive movement in humans; theory and technology of electromyography are utilized to describe and quantify the neuromuscular input to the mechanical output. Prerequisite: Physiology 103 and Cell and Structural Biology 234. 3 hours or 1 unit.
357. **Motor Learning.** Discussion and analysis of scientific principles related to the learning and performance of motor skills; review of related literature and research in motor learning. Prerequisite: Psychology 100 or consent of instructor. 4 hours or 1 unit.
385. **Clinical Experiences in Sports Medicine.** Clinical experiences in medical supervision of sports programs, in the areas of therapeutic exercises, fitness programming, and cardiac rehabilitation. Prerequisite: Consent of instructor. Prerequisites are determined on an individual basis in accordance with the clinical experiences to be undertaken. 2 to 8 hours, or $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 hours or 2 units.
394. **Special Topics in Kinesiology.** Lecture course on topics of current interest; specific topics announced in the *Timetable*. Prerequisite: To be determined for each subject and indicated in the *Timetable*. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
420. **Issues in Sports Medicine.** Addresses current issues in the medical aspects of sports; examples of these issues are epidemiology of injuries and treatment forms, use of sports equipment, questionable sports practices, and preventive techniques. Prerequisite: Kinesiology 352 and 320, or equivalent; or consent of instructor. 1 unit.
422. **Kinesiotherapy.** Analyzes pathomechanics underlying injury and orthopedic problems; also analyzes rehabilitation methods for orthopedic and neurological dysfunctions. Prerequisite: Kinesiology 322 or consent of instructor. 1 unit.

447. **Sport Psychology.** Analysis of psychological factors and principles with special reference to motor performance, learning motor skills, perception, and emotion in sports situations; review of literature; and independent projects. Prerequisite: Kinesiology 347 or consent of instructor. 1 unit.
449. **Seminar: Sociology of Sport.** Same as Sociology 449. Sociological analysis of sport with emphasis on sociological theory; places stress on problems of comparative analysis, concept formation, and theory construction within the area of the sociology of sport. Prerequisite: Kinesiology 346 and nine hours of sociology or anthropology; or consent of instructor. 1 unit.
451. **Scientific Basis of Physical Performance.** Contemporary trends in the study of human performance and exercise stress; analysis of the research literature, experimental strategies, and research instrumentation. Lecture-discussion and laboratory. Prerequisite: Kinesiology 352 or 354, or equivalent. 1 unit.
452. **Neuromuscular Aspects of Human Performance.** In-depth study of the neuromuscular aspects of human activity; focus on selected topics related to growth, physical development, exercise prescriptions, athletic conditioning, and fitness. Prerequisite: Kinesiology 451. 1 unit.
453. **Circulorespiratory Aspects of Physical Activity.** Aerobic performance responses to short-term, intermittent, and prolonged physical activity; special consideration given to endurance training methods and assessment techniques, ergogenic aids, and problems associated with growth, environmental influences, and competitive sport. Prerequisite: Kinesiology 451 or consent of instructor. 1 unit.
455. **Experimental Kinesiology.** Mechanical and neuromuscular approach to human movement; analysis and experimental research. Prerequisite: Kinesiology 355 and 356, or consent of instructor. 1 unit.
457. **Sensorimotor Development.** Same as Human Development and Family Ecology 457. Studies the development of spatially adapted movement behavior in man; emphasis on the nature of sensorimotor systems and development of perception; the role of proprioceptive feedback mechanisms and associated reflexes; and the neurogeometric principles basic to the study of man interpreting and acting on the environment. Prerequisite: Kinesiology 357 or equivalent. 1 unit.
461. **Administration of Physical Education and Sport.** Analysis of completed research relating to theory and practice of administration in physical education and sport; the development of policy statements and procedures manuals for the various educational levels; and experience in the use of the case plan of instruction as a teaching technique for the development of competence and knowledge relating to human relations and administration in this specialized field. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar.** Lectures, discussions, and critiques on kinesiology and related subjects by faculty members and visiting professional leaders; presentation and criticism of student theses. 0 credit.
493. **Independent Study.** Independent research on special projects; offered summers as a special group practicum. $\frac{1}{2}$ or 1 unit.
494. **Special Topics in Kinesiology.** Lecture course in topics of current interest; specific subject matter announced in the *Timetable*. $\frac{1}{2}$ or 1 unit. May be repeated.
495. **Research Methods in Kinesiology.** Review and appraisal of common research procedures; application of statistical procedures, library methods, evaluation procedures, and experimental methods. 1 unit.
499. **Thesis Research.** Preparation of theses in kinesiology. 0 to 4 units.

LABOR AND INDUSTRIAL RELATIONS

Director of Institute: W. Franke

Institute Office: 247 Labor and Industrial Relations Building, 504 East Armory, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
301. **European Working-Class History: 1750 to the Present.** Same as History 301 and Sociology 301. See History 301.

315. **The Economics of Poverty and Income Maintenance.** Same as Economics 315. See Economics 315.
318. **Industry and Society.** Same as Sociology 318. See Sociology 318.
337. **American Working Class History, 1780 to the Present.** Same as History 337. See History 337.
341. **Economics of Labor Markets.** Same as Economics 341. See Economics 341.
345. **Economics of Human Resources.** Same as Economics 345. See Economics 345.
347. **Labor Law, I.** Same as Law 357. See Law 357.
355. **Industrial Social Psychology.** Same as Psychology 355. See Psychology 355.
357. **Psychology of Industrial Relations.** Same as Psychology 357. See Psychology 357.
360. **Employee Benefit Plans.** Same as Finance 360. See Finance 360.
409. **Organizational Behavior.** Same as Business Administration 409. See Business Administration 409.
418. **Seminar in Industrial and Economic Sociology.** Same as Sociology 418. Industrialization, labor-management relations as group relations, the interrelations of industry and community, technology and controls in industry, problem of social economics and stratification in industry. 1 unit.
420. **Formation of Public Policy.** Same as Political Science 461. See Political Science 461.
422. **Government Regulation.** Focuses on government policies affecting collective bargaining and personnel practices; includes an introduction to theories of political science and public policy for an understanding of government regulation in the employment area. Prerequisite: Labor and Industrial Relations 347 or 491, or consent of instructor. 1 unit.
430. **Foundations of Industrial-Organizational Psychology.** Same as Psychology 430. See Psychology 430.
435. **Motivation and Morale in Industry.** Same as Psychology 435. See Psychology 435.
440. **Labor Economics.** Same as Economics 440. See Economics 440.
441. **Labor Economics.** Same as Economics 441. See Economics 441.
442. **Collective Bargaining.** Same as Economics 442. Examination of: social values and social science concepts to develop a framework for explaining the basis and shape of collective bargaining as it has been practiced in the United States; government and law, unions, and employers as part of the development of this framework; the environment of collective bargaining with respect to the role of economics and bargaining structure; the negotiating process as the interactive basis for union-management relations; conflict and conflict resolution as part of the negotiating process; wage and other effects of collective bargaining as bargaining outcomes; contemporary changes in union management relations. Case materials and exercises may be used to supplement course materials. Prerequisite: Consent of instructor. 1 unit. Graduate credit is not given for both Economics 343 and Labor and Industrial Relations 442.
443. **Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Law 361. Examination of the use of procedures to resolve employment disputes, especially between unions and employers; comparative analysis of grievance arbitration, interest arbitration, mediation, fact-finding, and combinations of these procedures; special emphasis given to the role of third party intervention. 3 hours or 1 unit. Hourly credit only applicable to Law 361.
444. **Problems and Policies in Human Resources.** Same as Economics 444. See Economics 444.
445. **Investment in Human Resources.** Same as Vocational and Technical Education 445. Activities that influence future monetary and psychic income by improving the resources in people; coverage of investments, including schooling, on-the-job and other training, migration, and the search for information on jobs and incomes; emphasis on human capital concepts, public human resources policy, and equal employment opportunity policy. Prerequisite: An introductory course in economics and in quantitative methods, as specified by the department. 1 unit.
447. **Labor Union Organization and Administration.** Same as Economics 447. Analysis of the structure, history, and government of the modern American trade union movement; survey of the environmental factors, objectives, and action programs with considerable emphasis on economic and internal institutional factors, including the roles of leaders, policy determination and execution, and governmental regulations; considerable emphasis also on the processes of union organizing and employer opposition. Prerequisite: Major in social science or consent of instructor. 1 unit.

448. **Problems of Personnel Management.** Same as Business Administration 411. See Business Administration 411.
451. **Labor Law and Public Policy.** Same as Law 360. Analyzes current major policy issues in labor law and administration through the concepts and techniques of the lawyer and the labor relations specialist. Prerequisite: For law students, Law 357 or consent of instructor; for Institute of Labor and Industrial Relations and other graduate students, one semester of labor and industrial relations course work or consent of instructor. 3 hours or 1 unit. Hourly credit only applicable to Law 360.
454. **Comparative Industrial Relations Systems.** Same as Law 356. Examines the history and structure of industrial relations systems in industrialized market economies; the organization and policies of unions and employers and of their international organizations; the role of national governments and international organizations in establishing industrial relations policies; comparative analysis of such topics as industrial conflict, industrial and economic democracy, and the relations between industrial relations and national economic policy. 3 hours or 1 unit. Hourly credit only applicable to Law 356.
455. **Labor in Less Developed Countries.** The role and place of LDCs in the world; colonialism, independence, and nation-building; economics, power, and stratification; development of labor markets and labor movements; economic, political, and social consequences of international trade, finance, and investment; international diffusion of technology and ideology; nation-states, multi-national corporations and world community; and UN, ILO, UNCTAD, UNIDO and other international and regional organizations and their impact on labor in LDCs. Prerequisite: Economics 101 or 109, or equivalent. 1 unit.
456. **Industrial Relations Theory, I.** An integrated analysis of the principles of labor relations through the study of the works of the major theorists and their critics. Prerequisite: Consent of instructor. 1 unit.
457. **Industrial Relations Theory, II.** Continuation of Labor and Industrial Relations 456. Focuses on contemporary research in industrial relations and related fields. Prerequisite: Labor and Industrial Relations 456. 1 unit.
458. **Faculty-Student Workshop.** Training and experience for Ph.D. students in the application of social science and industrial relations theory and research methodology to contemporary industrial relations problems through presentation and discussion of faculty and student research. Ph.D. students are required to make presentations and to participate in workshop discussions during the entire period of their campus residency. Prerequisite: Labor and Industrial Relations 456 and 457. 0 to 1 unit.
461. **Compensation Systems.** Compensation theory and practice. Topics include: the influences pay has on various outcomes such as job choice, motivation and performance; external and internal labor market analysis; job pricing through use of job analysis and job evaluation; merit and incentive pay systems; pay discrimination; executive compensation; and innovations in compensation practices. Case analyses and computer simulations may be used to supplement course materials. 1 unit.
462. **Human Resources Planning and Staffing.** Examines conceptual issues, policies, and practices relating to the attraction, selection, and development of human resources in both private and public organizations. 1 unit.
463. **Human Resource Information Systems and Computer Applications in Industrial Relations.** Design, implementation, and evaluation of human resource information systems (HRIS). Topics to be covered include fundamental database characteristics, information systems and management processes, systems analysis and needs assessment in Human Resources and Industrial Relations departments, implementing HRI systems, the use of HRI systems to solve organizational problems, information systems and labor relations. A series of cases and computer exercises which will play a major role in determining the course grade will be used. Regular seminars and some laboratory sessions will be scheduled throughout the semester. Prerequisite: Labor and Industrial Relations 491 and 493, or equivalent. 1 unit.
490. **Individual Topics.** A student in labor and industrial relations may register for this unit with the consent of the curriculum adviser and the adviser under whom the student will perform individual study or research. Such individual work may include special study in a subject matter for which no course is available or an individual research project, including on-the-job research in industry, which is not being undertaken for a thesis. 0 to 2 units.

491. **Industrial Relations Systems.** A general framework for the analysis of employment relationships. Topics include industrial relations theory, the American system of collective bargaining, intercountry system differences, and human resource management strategies and practices. Prerequisite: Graduate standing. 1 unit.
492. **Research Methods in Labor and Industrial Relations.** Systematic analysis of theories and procedures of the various social and physical sciences bearing on research in labor and industrial relations; primary emphasis on the process of integrating the approaches and techniques of the various social sciences with respect to the study of problems in labor and industrial relations as met in practice in management, the union, and government service, as well as in teaching and research in the field. Prerequisite: Major in social sciences or consent of instructor. 1 unit.
493. **Quantitative Methods in Labor and Industrial Relations.** Introduction to statistical concepts and methods in the social sciences and their application to industrial relations problems; familiarizes the student with modern methods of probability sampling, statistical inference, and multivariate analysis, and their application to current research problems in labor and industrial relations. Prerequisite: Any elementary statistics course. 1 unit.
494. **Tutorial Seminar.** Training and experience for Master's students in carrying out a problem solving project from formulation to written report in a chosen area of labor and industrial relations. Each student selects an individual topic with the approval and guidance of a faculty member. Prerequisite: Completion of no fewer than 6 units of Labor and Industrial Relations course work. 0 or 1 unit.
496. **The Evolution of Labor-Management Relations in America.** Historical analysis and interpretation of the development of the labor movement and labor-management relations at the plant, industry, and national levels. Prerequisite: Graduate standing in labor and industrial relations or consent of instructor. 1 unit.
497. **Collective Bargaining in Public Employment.** Same as Social Work 497, Administration, Higher, and Continuing Education 497, and Political Science 469. Development of employee organization, collective bargaining, and public policies in the public sector: federal, state, and local; analysis of contemporary bargaining relations, procedures, problems, and consequences; special emphasis on dispute resolution and on union impacts. 1 unit.
498. **Analysis of Organizations in Industrial Relations.** Intensive analysis of organizational behavior, with the main focus upon the theory of organizations as social institutions; concepts drawn from the various social sciences and applied to the principal organizations concerned with industrial relations; and examination of the internal dynamics of unions, managements, and government agencies, with special reference to decision-making processes, and their individual relations to the interactions among them. Prerequisite: Consent of instructor. 1 unit.
499. **Thesis Seminar.** For all students writing theses in labor and industrial relations at the A.M. and Ph.D. levels. 0 to 4 units.

LANDSCAPE ARCHITECTURE

Head of Department: Vincent J. Bellafiore

Department Office: 214 Mumford Hall, 1301 West Gregory, Urbana

101. **Introduction to Landscape Architecture.** A survey of the practice, profession, and philosophy of landscape architecture. 2 hours.
133. **Basic Landscape Design.** Introduction to the fundamentals of design, including studies in two- and three-dimensional abstract and applied problems, basic elements and procedures of design, and principles of landscape composition. Prerequisite: Credit or concurrent registration in Landscape Architecture 180, or consent of instructor. 5 hours.
134. **Site Design.** Principles and practices of site planning; orientation, circulation, and land use definitions and relationships applied to site scale problems; and application of site design process. Field trip required; see *Timetable* for current fees. Prerequisite: Landscape Architecture 133 or consent of instructor. 5 hours.

142. **Landform Design and Construction.** Introduction to the fundamentals of the earth's surface as a design element; limitations and uses of landforms; and methods of grading, surface drainage, and land surveying. Prerequisite: Mathematics 114 or 116. 3 hours.
150. **Landscape Surveys.** Principles and practices of identifying, analyzing, and recording landscape resources. Field trip required; see *Timetable* for current fees. Prerequisite: Geography 103 or consent of instructor. 3 hours.
170. **Psychological, Social, and Cultural Issues in Design of Outdoor Spaces.** To provide an understanding of how outdoor settings affect human behavior and how socially responsible design can result. Short exercises, field trips, and evaluation of open spaces will enable students to apply the above concepts. 3 hours.
180. **Visual Communications, I.** Basic principles and techniques of visual communication in landscape architectural rendering, including computer-based techniques. Prerequisite: Concurrent enrollment in Landscape Architecture 133. Open to Landscape Architecture majors only. 3 hours.
181. **Visual Communications, II.** Advanced principles and techniques of visual communication in landscape architectural rendering, including computer-based techniques. Prerequisite: Concurrent enrollment in Landscape Architecture 134; and Landscape Architecture 180 or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Senior Honors Course.** Independent guided study and research in a selected area of landscape architecture; for candidates for honors in landscape architecture. Prerequisite: Senior standing in landscape architecture, a university grade-point average of 4.0, and consent of head of department. 1 to 6 hours. May be repeated to a maximum of 9 hours.
214. **History of Landscape Architecture.** Analysis of the development of landscape architecture as a result of environmental and cultural influences. 3 hours.
226. **Principles of Park Design.** Introduces theories, principles, and applications of park site and system master planning and design; examines relationships between aesthetic and functional considerations, site features, park users, and administrators. 2 hours.
235. **Recreation and Community Design.** Development of design solutions at site and master plan scale relative to community urban and recreational problems; emphasizes development of analysis and design techniques. Field trip required; see *Timetable* for current fees. Prerequisite: Landscape Architecture 134 or consent of instructor. 5 hours.
236. **Design Workshops, I.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. Students select from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours.
243. **Site Engineering.** Principles of surveying and design of drainage, circulation, and utility systems. Prerequisite: Landscape Architecture 142 and Mathematics 114 or 116; or consent of instructor. 4 hours.
244. **Landscape Construction.** Construction methods, materials, and procedures related to the design of landscape structures; development of design details and cost estimating. Prerequisite: Landscape Architecture 243 or consent of instructor. 4 hours.
246. **Professional Practice.** The landscape architect as a professional practitioner; includes orientation to the concept of professionalism, forms of professional activity, and the skills needed to manage a practice. 1 hour.
252. **Plant Materials and Design.** Biogeography; identification of native species, evergreens, and exotics; uses of plants in the landscape; and planting design projects. Field trips required. Prerequisite: Horticulture 201 and 202. 3 hours.
253. **Planting Design.** Planting design philosophies; detailed and comprehensive design projects; management practices, technical documents; and plant identification. Field trips required. Prerequisite: Landscape Architecture 252. 3 hours.
290. **Special Problems.** Supervised independent study, research, or special project in a selected area related to landscape architecture. Prerequisite: Junior or senior standing; consent of instructor and head of department prior to advance enrollment and registration. 1 to 6 hours. May be repeated to a maximum of 9 hours.

299. **Off-Campus Study.** Provides campus credit for off-campus study. Prerequisite: Junior standing; prior review and approval of the student's written proposal by a faculty committee and the department head. 0 to 15 hours (summer session, 0 to 6 hours). Final determination of appropriate credit is made by a faculty review committee upon completion of the student's work. Maximum credit, 15 hours (summer session, 6 hours), all of which must be earned within one semester.
325. **Historical Geography of American Landscapes to 1880.** Same as Geography 325. See Geography 325.
326. **Historical Geography of American Landscapes Since 1880.** Same as Geography 326. See Geography 326.
327. **American Vernacular: The Cultural Landscape.** Same as Geography 327. See Geography 327.
337. **Regional Landscape Design.** Introduction to the process of physical planning, emphasizing land use policy and plan formulation; a regional case study is undertaken to develop analytical skills, to introduce the relationship between cultural and natural processes, and to explore the need for responsible political action. Prerequisite: Landscape Architecture 236 or consent of instructor. 5 hours or 1 ½ unit.
338. **Design Workshops, II.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. The student selects from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours, or ¾ to 1 ½ units.
341. **Land Resource Evaluation.** Same as Urban Planning 341. Examines concepts for the value of land, land resource problems and policy responses, methods for evaluating land resource development and policy alternatives, and case studies of land resource evaluation. Prerequisite: Graduate standing or consent of instructor. 4 hours or 1 unit.
350. **Land Use Ecology.** Ecological implications of alternative land use patterns; equipment, field techniques, and nomenclature in current use by environmental consultants; and elements of a baseline ecosystem study. Prerequisite: Consent of instructor. 3 or 4 hours, or ¾ or 1 unit.
370. **Design-Behavior Interaction.** Critical discussion of notions and theories pertaining to the reciprocal effects of landscape architectural design and human behavior. 3 hours or ¾ unit.
382. **Visual Communications, II.** Continuation of Landscape Architecture 181, emphasizing advanced techniques and further exploration of the media of visual communication. 3 hours or ¾ unit.
417. **Land and Society: History, Theories, and Problems.** Historical and cross-cultural investigation of the use, shaping, and perception of the land-based environment; case studies, critical problems and issues, and theories of social-environmental interaction. Prerequisite: Consent of instructor. 1 unit.
437. **Landscape Planning.** Small group design and planning studio emphasizing actual problems and clients; projects require fieldwork, analysis, problem-solving, design, and presentation to client. Prerequisite: Landscape Architecture 341 and 350, or consent of instructor. 1 ½ units.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Leisure Studies, Rural Sociology, and Urban and Regional Planning 440. See Environmental Studies 440.
442. **Spatial Design Methods.** Same as Urban Planning 442. Representations and solution procedures for problems involving the arrangement of land use activities in space; optimizing, approximate, and graphic methods, their applications, effectiveness, and efficiency; and experiments with computerized procedures. Prerequisite: Landscape Architecture 341 or consent of instructor. 1 unit.
450. **Environmental Impact Statements.** Requirements of the National Environmental Policy Act and Guidelines from the Council on Environmental Quality for preparing and writing environmental impact statements; includes interdisciplinary team efforts and impact assessment techniques. Prerequisite: Graduate or law school standing, or consent of instructor. 1 unit.
463. **Methods of Social and Behavioral Research in Designed Environments.** Same as Architecture 463. See Architecture 463.
464. **Conducting Social and Behavioral Research in Designed Environments.** Same as Architecture 464. Each student prepares and conducts research to obtain information about specific relationships between people and the designed environment. Prerequisite: Landscape Architec-

ture 370 or Architecture 323, and Architecture 463, or equivalent; and a course in introductory statistics. 1 unit.

- 465. **Design/Behavior Studio.** Same as Architecture 465. Development of site or project scale design emphasizing the integration of user needs and behavioral factors. Prerequisite: Landscape Architecture 464, or consent of instructor. 1 ½ units. May be repeated to a maximum of 3 units.
- 481. **Urban Design Studio, I.** Same as Architecture 481. See Architecture 481.
- 482. **Urban Design Studio, II.** Same as Architecture 482. See Architecture 482.
- 483. **Environmental Science and Planning Research.** Same as Urban and Regional Planning 483. See Urban and Regional Planning 483.
- 487. **Seminar.** Preparation, presentation, and discussion of research papers on current and future areas of landscape architectural application. Prerequisite: Consent of instructor. ½ to 1 unit.
- 490. **Special Problems.** Nature and scope of projects to be determined by consultation between student and faculty adviser; open to landscape architecture majors as well as those from other disciplines who wish to engage in interdisciplinary work. Prerequisite: Consent of instructor. ½ to 2 units.
- 498. **Master's Project.** Major independent or small-group project synthesizing knowledge from previous coursework. Prerequisite: Consent of instructor and program adviser. 0 to 2 units.
- 499. **Thesis Research.** Prerequisite: Graduate standing in landscape architecture. 0 to 2 units.

LANGUAGES

(For a list of the languages regularly offered, together with the units responsible for offering them, see APPENDIX A.)

LATIN AMERICAN AND CARIBBEAN STUDIES

Director of Center: Enrique Mayer

Center Office: Room 250, 1208 West California, Urbana

- 170. **Introduction to Latin America.** An interdisciplinary introduction to the ways of life of Latin American peoples, their origins and current expressions; discusses social, economic, and political problems, and domestic and international policies related to them in the context of other Third World societies. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. **Individual Study.** A major tutorial normally taken in the senior year. Students read the works on a reading list devised in consultation with a faculty tutor and write a term paper. Prerequisite: Latin American Studies 170; a declared field of concentration in Latin American Studies; consent of instructor. 1 to 5 hours. May be repeated as topic varies to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 295. **Special Topics.** A topical survey of social, economic, and political factors in Latin American life. Each semester a particular topic is considered. Prerequisite: A basic course in a social science discipline. 2 to 4 hours.
- 345. **Tutorials in Native Latin American Languages.** Upon the consent of the Director of the Center for Latin American Studies, tutorials are available in special native Latin American languages not regularly offered by the University. Tutorials at the elementary, intermediate, and advanced levels may be arranged. Students registering for unit credit for the first two semesters must first present satisfactory evidence of knowledge of the language at the elementary level, either in the form of credit earned at another institution or by passing a proficiency examination. Graduate credit is given only for work beyond the elementary level. Prerequisite: Consent of instructor. 2 to 4 hours, or ½ to 1 unit. May be repeated up to six semesters successively to a maximum of 16 hours or 4 units.

LAW

Dean of College: Roger W. Findley

College Office: 209 Law Building, 504 East Pennsylvania, Champaign

301. **Contracts-Sales, I.** Enforceability of promises including unjust enrichment and reliance, offer and acceptance, mistake, unfairness and overreaching, unconscionability, Statute of Frauds, interpretation of contract language, conditions, and third party beneficiaries. 4 hours or 1 unit.
302. **Contracts-Sales, II.** Introduction to the Uniform Commercial Code, its interpretation and application; performance of contracts including warranty obligations, breach, remedies for breach, impossibility and frustration of purpose, assignment and delegation, and third party rights in sold goods. Prerequisite: Law 301. 3 hours or 1 unit.
303. **Torts, I.** A basic course in civil wrongs, including intentional torts (such as assault and battery), negligence (duty, unreasonable risk analysis, actual and proximate cause), and strict liability. 3 hours or 1 unit.
304. **Torts, II.** A basic course in civil wrongs, including liability of owners and occupiers of land, libel and slander, unfair commercial practices, and products liability. Prerequisite: Law 303. 3 hours or 1 unit.
305. **Property, I.** With Law 306, the basic first-year course in property law, required of all students. Provides an overview of the law of land, with incidental coverage of personal property; includes the concept of property, acquisition of private property, recognized property interests, gratuitous transfer of property interests, commercial transfers (sale, lease), the use of property, and an introduction to environmental law. 3 hours or 1 unit.
306. **Property, II.** Continuation of Law 305. 3 hours or 1 unit.
307. **Criminal Law.** The sources and purposes of the criminal law; the meaning of criminal responsibility; and the characteristics of particular crimes. 3 hours or 1 unit.
308. **Criminal Procedure.** Problems in the administration of criminal justice with emphasis on right to counsel, arrest, search, interrogation, lineups, and the scope and administration of exclusionary rules. Prerequisite: Law 307. 3 hours or 1 unit.
309. **Civil Litigation, I.** The role and importance of procedure in litigation, including jurisdiction, pleadings and parties, pretrial motions and discovery, trial practice (except evidence), relationship between judge and jury, the effect of a decision in one case on subsequent litigation between the same or different parties (*res judicata*), verdicts and judgements, and appellate review. 3 hours or 1 unit.
310. **Civil Litigation, II.** Continuation of Law 309. Prerequisite: Law 309. 3 hours or 1 unit.
311. **Legal Writing and Research.** Emphasis on development and improvement of skills in legal writing, and training in legal bibliography. Assignments may include brief writing and preparation of legal memoranda and opinions. 3 hours or ½ unit.
312. **Moot Court.** Following Law 311, moot court is required in the second semester of the first year for further development of skills in legal research, analysis, and writing. Each student works in a team on the preparation of an appellate brief on a moot court case and then argues the case in appellate argument fashion before a panel of senior students and faculty. 2 hours. No graduate credit.
313. **Constitutional Law, I.** Basic principles of American constitutionalism, including the judicial function in constitutional cases; the implementation of the doctrines of federalism and separation of powers; the development and exercise of the powers of Congress and the states in the federal union; and the protection of civil rights and liberties. 4 hours or 1 unit (summer session, 3 hours or 1 unit).
314. **Administrative Law.** The functions of administrative tribunals in federal, state, and municipal government; the procedure before such administrative tribunals; and judicial relief from administrative decisions. 3 hours or 1 unit.
315. **Constitutional Law, II.** A detailed study of the history and application of the First Amendment to the Constitution of the United States; focuses on the decisions of the Supreme Court concerning the freedoms of assembly, press, speech, and religion as well as the implied right of association. Prerequisite: Law 313. 3 hours or 1 unit.

316. **Constitutional Litigation.** A study of the federal statutes that authorize civil suits against public officials and governmental entities responsible for the deprivation of constitutional rights; immunities and defenses; potential remedies; federalism issues. 2 to 3 hours, or ½ to 1 unit.
317. **Advanced Criminal Procedure.** Problems in the administration of criminal justice, with emphasis upon the commencement of formal proceedings (bail, decision to prosecute, grand jury, preliminary hearing, location of prosecution, scope of prosecution, speedy trial); the adversary system (pleas, discovery, jury trials, prejudicial publicity, ethical problems, double jeopardy); and post-conviction review (post-trial motions, appeals, habeas corpus, related post-conviction remedies). Prerequisite: Law 307, 308 and 313. 3 hours or 1 unit.
318. **Legislation.** Constitutional and statutory issues in legislative procedure, including issues relating to separation of power between Congress and the President; particular legislative-executive issues raised by the Illinois Constitution; and techniques of legislative drafting and the interpretation of statutes. 2 to 3 hours, or ½ to 1 unit.
319. **Environmental Law.** The regulatory aspects of environmental law. Environmental impact assessments; control of air pollution, water pollution, noise, and toxic substances; the roles of federal and state governments; and citizen participation in and judicial review of public decision-making and enforcement procedures. 3 hours or 1 unit.
320. **Natural Resources.** Legal problems associated with the use of certain land, water, and mineral resources, including energy sources; emphasizes public management and regulation. 2 or 3 hours, or ½ or 1 unit.
321. **Urban Government.** The law governing the structure, powers, and operation of local governments in urban and suburban areas with analysis of political, economic, and social implications. 3 hours or 1 unit.
322. **Land Use Planning.** Examination of the legal and administrative aspects of land development and regulation in an urban society, including the techniques and problems of planning; the tools of plan effectuation, such as zoning, subdivision regulation, renewal and redevelopment, and housing programs; and the allocation of decision-making among various levels of government. 2 to 3 hours, or ½ to 1 unit.
323. **American Indian Law.** A historical survey of congressional policy toward Indian affairs; studies relevant legislation delineating the relationship between tribes and the federal government; considers the unique jurisdictional problems that arise with conflicting claims of state, federal, and tribal sovereignty and regulatory authority; focus on individual rights and benefits conferred by federal law to American Indians, including Indian welfare laws, employment preference systems, and religious freedom legislation. 3 hours or 1 unit.
324. **Law and Medicine.** Examines legal, ethical, and social policy issues of selected recent revolutionary developments in health care provision; appropriate legal responses will be discussed and developed in the light of existing federal and state legislation, common law, and judicial intervention, constitutional mandates, economic/cost considerations, as well as analytical and evaluative commentary by physical and social scientists, lawyers, and politicians. 3 hours or 1 unit.
325. **Law, Science, and Medicine.** Explores the legal system's response to challenges of modern science and medicine; topics include regulation of genetic engineering and nuclear power, experimentation on humans and animals, control of communicable diseases, allocation of transplant organs, and the right to die. 2 or 3 hours, or ½ or 1 unit.
327. **Advanced Bankruptcy and Creditors' Rights.** Selected issues in bankruptcy and creditors' rights not covered in Law 339, with emphasis depending on current significance; examination of business reorganizations under Chapter 11 of the Bankruptcy Code, generally including jurisdictional issues and problems related to the filing of the case, the participants in the Chapter 11 process, operating a business under Chapter 11, and formulating and confirming a reorganization plan. Prerequisite: Law 339. 3 hours or 1 unit.
328. **Organizations, I.** Examines the basic state and federal legal consequences for individuals, organizations, and society of the formation, control, and financing of organizations; includes the agency and employment relationship, unincorporated associations, general partnerships, limited partnerships, close corporations, public corporations, and nonbusiness organizations. 3 hours or 1 unit.

- 329. Organizations, II.** Examines the impact of state and federal regulation and financial theory on the continuing financial policy decisions of business organizations, including distributions (by dividends and share purchases); going concern rights of debt and equity holders; insolvency and reorganization; tender offers; merger; and acquisitions. Prerequisite: Law 328. 2 hours or $\frac{1}{2}$ unit (summer session 3 hours or 1 unit).
- 330. Antitrust Law.** The limitations imposed by the Sherman Act, Clayton Act, and Federal Trade Commission Act on anticompetitive practices by business firms; emphasizes price fixing, monopolization, mergers, exclusive dealing, tying arrangements. 3 hours or 1 unit.
- 331. Business Planning.** Examination of planning situations wherein tax, corporations, corporate finance, securities regulation, and accounting materials are interrelated; organization of close corporations and public companies, corporate distributions and recapitalizations, sale of corporate businesses, corporate acquisitions and mergers, and corporate separations; and problems requiring written opinions and solutions. Prerequisite: Law 348 and 351. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Securities Regulation.** Problems arising under federal securities laws administered by the Securities and Exchange Commission, as well as "blue sky" or state securities laws; emphasis upon statutory and regulatory requirements imposed in connection with corporate financing. Prerequisite: Law 328 and 329. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 333. Advanced Corporate and Securities Law.** A problem method analysis of advanced substantive and procedural aspects of corporate and securities litigation, including advanced aspects and recent developments of SEC Rule 10b-5; problems involving takeovers, litigation possibilities; procedural and other aspects of shareholders' derivative suits; extra-territorial application of the federal securities laws. Prerequisite: Law 328 and 329. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 334. Government Regulation.** The legal and policy implications of government regulation. Course content varies from a survey of laws regulating various industries to a detailed focus on a specific industry. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 335. International Business Transactions.** Doing business abroad: export-import regulations, use of foreign commission merchants, licensing of patents and know-how, investment and exchange problems, establishing a foreign operation (including forms of business organization available abroad), and application of United States and foreign antitrust law to the business operation. 3 hours or 1 unit.
- 336. Regulation of Financial Institutions.** The framework of federal and state regulation of the structure and activities of financial institutions, with emphasis on banks and other depository institutions. Topics include relevant provisions of the National Bank Act, Federal Reserve Act, and Bank Holding Company Act as well as the regulatory policies of the Comptroller of the Currency and Federal Reserve Board. Consideration is given to the issues presented by "deregulation", including developments relating to branch banking, interstate banking, and brokerage and underwriting activities as well as regulation of international banking activities. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 337. Article 9 (Personal Property Security).** Study of secured transactions under Article 9 of the Uniform Commercial Code. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 338. Real Estate Finance.** Methods of financing land acquisition and residential and commercial development, including publicly owned and subsidized housing. 3 hours or 1 unit.
- 339. Creditors' Rights.** The legal regulation of the relationship among debtors and their creditors and among creditors of a particular debtor; pre- and post-judgment remedies of unsecured creditors; debtors' attempts to defeat creditors, including fraudulent conveyances; study of Bankruptcy Code chapters 7 (liquidation) and 13 (adjustment of debts by individuals), and an introduction to chapter 11 (reorganization). 3 hours or 1 unit.
- 340. Commercial Paper.** A study of problems involved in the use of checks and promissory notes with special emphasis on Articles 3 and 4 of the Uniform Commercial Code, including electronic funds transfers and letters of credit. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 341. Consumer Credit.** Existing patterns and proposed changes in consumer credit law; finance charge regulations, special licensing for merchandisers of consumer credit, disclosure of finance charges, door to door selling, home improvement financing, cutting off defenses, creditor

remedies problems including garnishment, wage assignments, and deficiency judgments, and administrative control of creditor practices. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).

342. **Copyright, Trademark, and Unfair Competition.** The regulation of competitive business behavior at common law and under federal and state statutes; trademarks, copyrights, trade secrets, protection of ideas, commercial disparagement, false advertising, and price discrimination. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
344. **Sports Law.** Examines specialized aspects of the sports industry; emphasis given to antitrust, labor, and tax issues as applied to professional sports, and antitrust and constitutional issues that have allowed courts to intervene in intercollegiate athletics. Does not consider recurring legal problems for which general principles of law are applicable. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Patent Law.** Historical development of protection of ideas, inventions, and discoveries; patentability; securing the patent; amendment and correction of patents; and infringement remedies, defenses, and procedures. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
346. **Advanced Antitrust Law.** Issues in antitrust law of particular current significance. The precise content varies, but typical areas of inquiry include federal regulatory antitrust exemptions, state action doctrine, patent licensing, extra-territorial application of domestic antitrust laws, and procedural issues in private enforcement. Prerequisite: Law 330. 3 hours or 1 unit.
347. **International Trade Policy.** An analysis of the regulation of trade between nations by international agreement (e.g., the GATT), by multinational organizations (e.g., the European Communities), and by individual countries; emphasizes U. S. import restraints, export controls, and related laws. 3 hours or 1 unit.
348. **Income Taxation.** The fundamental course in federal income taxation. Includes materials relating to income taxation of individuals and an introduction to taxation of corporations and shareholders. 3 hours or 1 unit.
349. **Corporate Taxation.** An in-depth study of federal income tax law related to taxation of corporations, shareholders, partnerships, and partners. Prerequisite: Law 348. 3 hours or 1 unit.
350. **Partnership Taxation.** Examines in detail the workings of subchapter K of the Internal Revenue Code of 1954, as amended, as well as other partnership tax provisions. Prerequisite: Law 348; Law 328, 329, and 349 are recommended. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
351. **Estate and Gift Taxation.** A comprehensive treatment of federal transfer (estate and gift) taxes. Prerequisite: Law 348. 3 hours or 1 unit.
353. **State and Local Taxation.** A survey which stresses the constitutional and statutory bases of state and local tax systems; considers the fiscal and economic policy aspects of the tax structure; and includes the power and purposes of taxation, the operation and administration of the general property tax, jurisdiction of the states to impose various types of taxes, and special problems relating to the operation of income, sales, and business excise taxes. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
354. **Taxation of International Transactions.** Survey of the problems in U.S. taxation of foreign persons and foreign income, with special emphasis upon foreign business transactions of U.S. corporations. Prerequisite: Law 351. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
356. **Comparative Industrial Relations Systems.** Same as Labor and Industrial Relations 454. See Labor and Industrial Relations 454.
357. **Labor Law, I.** Same as Labor and Industrial Relations 347. A study of the National Labor Relations Act as amended, the preact history of the labor movement, and the judiciary's response thereto, with emphasis on understanding the problems, experiments, and forces leading to the enactment; includes the negotiation and administration of the collective bargaining agreement, especially the grievance arbitration procedure, its operation and place in national labor policy; and explores the relationship of the individual and the union. Prerequisite: Graduate standing or completion of first year of law curriculum. 3 or 4 hours, or 1 unit.
358. **Employment Discrimination.** Problems arising under federal statutory prohibitions of discrimination in employment, with particular emphasis on evidentiary problems and the use of statistical proofs; defining relevant labor pools, using statistical analyses of data, and establishing proof of test validation. Prerequisite: All first year law courses. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit.)

359. **Collective Bargaining and Labor Arbitration.** Enforcement and administration of the collective bargaining agreement, including enforcement of labor contracts under Section 301 of the National Labor Relations Act and enforcement of the labor contract pursuant to its own grievance and arbitration procedure. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
360. **Labor Law and Public Policy.** Same as Labor and Industrial Relations 451. See Labor and Industrial Relations 451.
361. **Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Labor and Industrial Relations 443. See Labor and Industrial Relations 443.
362. **Public Sector Labor Law.** Treats the law of collective bargaining in public, largely state and municipal employment. Explores particular needs of public employment, in contrast with private employment, regarding approaches to: bargaining structure; scope of bargaining and enforceability of agreements; impasse and the resolution of disputes over terms and conditions of employment; and exclusivity of representation. Prerequisite: Law 357. 2 hours or $\frac{1}{2}$ unit.
363. **Family Law.** The creation and dissolution of the family, and legal relationships established by marriage, cohabitation and procreation. Covers the law of marriage, divorce, annulment, separation, unmarried cohabitation, illegitimacy, adoption and rights of child custody, parental property on divorce, inheritance, and related rights. Legal rules are placed into the social setting in which they operate, and emphasis is given to family policy as reflected in current developments in family law reform, including constitutional law. 3 hours or 1 unit.
364. **Decedent's Estates and Trusts.** Studies the means of transferring wealth, with primary emphasis on gratuitous transfers; the means available for making gratuitous transfers, including the validity and effect of testamentary instruments and trust deeds; and problems concerning the dispositive provisions of any type of instrument which transfers wealth. 3 hours or 1 unit.
365. **Future Interests.** Studies the validity and effect of gratuitous dispositions of assets in which enjoyment is postponed, restrained, or long continued; classification of future interests; construction; powers of appointment; rule against perpetuities and related restrictions. Prerequisite: Law 364. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
366. **Problems in Estate Planning.** Selected problems in the planning of estates which will serve to integrate the basic materials in property, trusts, wills, and income, estate, and gift taxation. Prerequisite: Law 348, 351, and 364. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
367. **Alternative Dispute Resolution.** An examination of the limitations, consequences, and costs, as well as the indispensability of some aspects of modern litigation; the possibilities, requirements, and legal problems of consensual and of court-annexed dispute resolution processes alternative to final judicial adjudication, including legal counseling, negotiation, mediation, arbitration, mini-trials, summary trials, summary jury trials, early neutral evaluation, private resolution providers, and settlement processes; current disputes used for illustration. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
368. **Mental Health Law.** Exploration of contemporary psychiatric theory, including diagnostic procedures, the etiology of psychopathology, and problems of treatment and prediction; legal issues and standards at the interface between mentally ill or incapacitated individuals and the institutional systems and processes designed to deal with such persons. 3 hours or 1 unit.
369. **American Legal History.** Studies selected topics in the development of law and legal institutions in the United States with particular emphasis on the history of the legal profession, legal education, and the role of lawyers and courts in U.S. society. Prerequisite: Some prior study of U.S. history, particularly social and intellectual, is helpful but not required. 3 hours or 1 unit.
370. **International Human Rights Law.** Studies established and developing legal rules and procedures governing the protection of international human rights, including Marxist and Third World, as well as Western, conceptions of those rights. 3 hours or 1 unit.
371. **Jurisprudence.** The place of law in society; the nature, goals, and methods of law; and the relation of law and social science. 3 hours or 1 unit.
372. **Development of Western Legal Institutions.** Explores the development of both public and private law institutions in Western Europe and Great Britain from the period of late Antiquity (the Roman Codifications) to the high Middle Ages. 3 hours or 1 unit.

373. **Current Legal Problems.** Intensive study of selected current legal problems; based upon recent court decisions, recent legislation, pending law reform proposals, or empirical studies; subject matter varies with each section; multiple sections and topics may be offered in a semester. Prerequisite: First year curriculum. 1 to 4 hours or $\frac{1}{4}$ to 1 unit.
374. **International Law.** The nature, sources, and subjects of international law and its place in the control of international society; includes an examination of the law of jurisdiction, territory, recognition and succession of states, rights and immunities of states in foreign courts, diplomatic immunities, treaties, protection of citizens abroad, settlement of international disputes, war and neutrality, the United Nations, and the International Court of Justice. 3 hours or 1 unit.
375. **Comparative Law.** An introduction to legal systems that differ significantly from ours through discussion of specific subjects, including legal education, legal professionals and fees, public law, commercial law, highlights of civil procedure, bases of jurisdiction, the relative roles of cases, statutes, and codes, and international business practices. The two major civil law code systems (French and German) are principal sources with contrasts between English and American common law also noted. 2 hours or $\frac{1}{2}$ unit.
376. **International Organizations of the United Nations.** Examines the legal and political problems arising from the establishment and operations of international organizations, covering the nature and implications of their legal personality, membership, decision-making processes and powers; emphasizes primarily the United Nations, related specialized agencies, and affiliated regional organizations in regard to the peaceful settlement of international disputes. 3 hours or 1 unit.
377. **Soviet Law.** Soviet conceptions of the role of law in theory and in practice; highlights of Soviet law, with comparison to the common law and civil law traditions; and study of Soviet court and legislative materials. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
378. **Common Market Law.** An intensive study of the European Common Market, particularly of its laws relating to trade barriers, establishment of companies, and antitrust; and United States legislation in the field of international trade. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
379. **Economic Analysis of Law.** An introduction to the systematic economic analysis of law, including property, contracts, torts, criminal law, and related topics. 3 hours or 1 unit.
380. **Advanced Torts.** Examines a variety of advanced tort topics, such as defamation, privacy, misrepresentation, special duties, prima facie tort, alternative compensation schemes, and proposals for tort reform. Prerequisite: First year of law school, or permission of the instructor and Associate Dean. 3 hours or 1 unit. May not receive credit for both Law 304 and 380.
381. **Evidence.** The law governing the proof of disputed issues of fact; function of the court and jury; competence and examination of witnesses; standards of relevancy; privileged communications; illegal evidence; hearsay rule; best evidence rule; presumptions; and judicial notice. 3 or 4 hours, or 1 unit.
382. **Trial Advocacy.** Examination of the problems of advocacy and tactics at the trial level. Students engage in all aspects of actual trial work, including witness preparation, opening and closing statements, direct and cross examination, and jury instructions; culminates in student conduct of a full jury trial in late spring; demonstrations are conducted by staff and visiting judges and practitioners. Prerequisite: Law 381. 2 hours or $\frac{1}{2}$ unit. Full year course; is repeated to a total of 4 hours or 1 unit.
383. **Fundamentals of Trial Practice.** Explores the theory and reality of trial practice, from developing a theory of the case through submission of jury instructions; topics include fact gathering, jury selection, opening statements, direct and cross-examination, exhibits, expert witnesses, and closing arguments. Prerequisite: Law 381 and concurrent registration in Law 382. 1 hour or $\frac{1}{2}$ unit.
384. **Insurance Law.** Covers principles generally applicable to insurance law and includes distinctive rules governing certain types of insurance coverage; objectives are to examine the nature of the insurance contract, marketing of insurance, principles of indemnity, individuals and entities protected by insurance rules, and risks that are shifted by insurance coverage. Prerequisite: First-year curriculum. 3 hours or 1 unit.
385. **Conflict of Laws.** The study of problems having relationship with two or more states or nations involving individual litigants or potential litigants; includes such matters as jurisdiction of courts, judgments, torts, workers' compensation, contracts, property, family rela-

- tionships, trusts and estates, business organizations, and governmental activities. 3 hours or 1 unit.
386. **Federal Courts.** Examination of the relationship of federal courts to other organs of federal government and to the states, including an analysis of cases dealing with congressional control over jurisdiction, federal review of state court decisions (including the relationship between state and federal substantive and procedural law), and application of law to fact; the scope of the federal question of jurisdiction in federal courts; abstention; federal injunctions of state criminal proceedings; and problems of justiciability, advisory opinions, and mootness. 3 hours or 1 unit.
387. **Products Liability.** Substantive theories of products liability: negligence, breach of warranty, strict liability, and tortious misrepresentation; procedural and remedial problems with, and defenses to, each substantive theory. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
388. **Complex Litigation.** Legal and practical issues in "complex" cases: problems of joinder in multi-party cases, consolidation of cases brought independently (including the activities of the Judicial Panel of Multidistrict Litigation), class actions, discovery issues including the assertion and waiver of evidentiary privileges and use of computers, consequences of active judicial "management" of litigation at the pretrial stage, settlement of complex cases, and res judicata problems. 3 hours or 1 unit.
389. **Computer Applications in the Law.** Provides the basic background necessary to make informed decisions on the use of computers in legal work; introduces the theoretical and practical aspects of document preparation, information retrieval, and communications. Prerequisite: Successful completion of first year of law school. 2 to 3 hours or $\frac{1}{2}$ to 1 unit (summer session 3 hours or 1 unit).
390. **Law of Professional Responsibility.** A problem course analyzing ethical issues that arise in the practice of law and considering the approaches to such issues taken by the American Bar Association's Code of Professional Responsibility, Model Rules of Professional Conduct, and Code of Judicial Conduct. 1 to 3 hours, or $\frac{1}{2}$ to 1 unit.
391. **Accounting Issues for Lawyers.** Examination of accounting principles as they affect the work of practicing lawyers, focusing particularly on accounting issues in corporate and securities law; includes an introduction to the mechanics of bookkeeping and proceeds to the interpretation of financial statements and the understanding of accounting conventions on income determination, inflation adjustments, and business acquisitions. Students with more than six hours of college accounting credit may not elect this course. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
392. **Lawyer as Negotiator.** Examines the negotiation process generally engaged in by legal practitioners; discusses specific negotiation situations of concern to lawyers, and considers the impact of social psychology upon the negotiation process. Reading materials include topics such as labor bargaining, personal injury settlements, nonverbal communication, visible manifestation of anxiety, and stress reaction; students engage in mock negotiations and write a paper on a related topic. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
393. **Legal Drafting and Law Office Practice.** A practical course on the drafting of legal documents; a study of the organization and management of a law office. 2 hours. No graduate credit.
394. **Legal Problems.** Preparation of comments on current legal developments for publication in the *University of Illinois Law Review* or the *Illinois Bar Journal*. 1 to 2 hours. May be repeated for a maximum of four semesters. No graduate credit.
395. **Moot Court Board.** Preparation of an appellate brief; presentation of an appellate oral argument; participation in intramural, state, national, or international moot court competition. 1 hour. No graduate credit. May be repeated to a maximum of 4 hours.
396. **Remedies.** A survey of legal and equitable remedies for the protection of personal and property rights. Procedural and substantive aspects of injunctions; restitution of unjust enrichment in the context of the receipt of unsolicited benefits, benefits derived from the commission of tortious acts, and the mistaken acquisition of benefits; alternative remedies arising from bargain transactions; and remedies for violations of civil rights. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
397. **Clinical Training.** Student field work in the offices of the Land of Lincoln Legal Assistance Foundation in Champaign and Danville, Champaign Human Relations Commission, local City Attorneys, State of Illinois Department of Mental Health, Champaign County State's

- Attorney, Champaign County Public Defender, Student Legal Service, and other public agencies. Students engage in legal and investigative work under the supervision of agency attorneys or other administrative personnel; this work may include conducting client interviews, doing legal research, preparing legal documents, and in some cases engaging in the trial of actual cases. 1 to 4 hours. May be repeated to a maximum of 4 hours. No graduate credit.
398. **Seminar.** Subjects vary from year to year; specific subject matter will be announced in the *Timetable*. 2 hours or $\frac{1}{2}$ unit. May be repeated.
399. **Research in Special Topics.** Individual research on a special problem selected in consultation with the instructor. 0 to 4 hours, or $\frac{1}{2}$ to 1 unit.
402. **Introduction to United States Law.** An intensive introduction to the American legal system for graduate law students with prior professional training in non-common law legal systems; stresses the functioning of basic U.S. legal institutions and the techniques of American legal research. 1 unit.
499. **Thesis Research.** 0 to 3 units.

LEISURE STUDIES

Acting Head of Department: Joseph J. Bannon

Department Office: 104 Huff Hall, 1206 South Fourth, Champaign

100. **Introduction to Leisure Studies.** Central issues in defining leisure and providing for its realization; historical, philosophical, sociological, psychological, and economic approaches to understanding leisure behavior, its meanings, social contexts, and personal and social resources. 3 hours.
110. **Foundations for Delivery of Leisure Services.** Introduces the leisure studies major to enabling legislation, fiscal concerns, standards for planning, problems of cities, and the relationship of professional organizations to recreation and park services. 2 hours.
130. **Introduction to Therapeutic Recreation.** A survey of the history, philosophy, concepts, and trends in therapeutic recreation; overviews types of populations served; describes settings and services; examines role of the therapeutic recreator in clinical and community settings. 2 hours.
140. **Principles of Outdoor Education and Camping.** Introduces various aspects of outdoor education and organized camping; theoretical perspectives, basic skills, and practice in developing program objectives and evaluations. 3 hours.
141. **Introduction to Outdoor Recreation.** Philosophy, policy, history, laws, regulations, and trends in the provision of all types of outdoor recreation opportunities; management and planning principles for the various organizational structures involved. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Leadership in Leisure Delivery Systems.** Introduces the student to the various theories of leadership applicable to situations that exist in the field of leisure studies; provides practice in various leadership settings and techniques for the evaluation of leadership performance. 3 hours.
210. **Theories and Methods of Supervision.** Concepts, principles, and objectives of supervision; the nature of the supervisory relationship; supervisory functions and processes; identification and application of methods and techniques; and organizational and operational patterns of supervision in recreation and park settings. Prerequisite: Leisure Studies 100 and 110, or consent of instructor. 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Psychology, and Rehabilitation 214. See Human Development and Family Studies 214.
215. **Recreation Program Development.** Theory and practice in recreation program development in the various recreation settings, including public, private, and commercial operations; core programming and programming dictated by the needs of the field, setting, or clientele; and program evaluation. Prerequisite: Leisure Studies 100 and 200, or consent of instructor. 3 hours.

230. **Clinical Aspects of Therapeutic Recreation.** A survey of basic concepts associated with the clinical application of therapeutic recreation services, including an investigation of illness and disabilities, basic medical and psychiatric terminology, adaptive devices and appliances, assistive techniques and record keeping and behavior, observation and recording. Prerequisite: Credit or concurrent registration in Leisure Studies 130. 4 hours.
231. **Leisure and the Aging.** In-depth study of concepts and theories of aging as related to recreation services; characteristics of the elderly, service delivery systems; activity adaptation; legislation; and issues and trends. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
232. **Principles of Therapeutic Recreation.** Practices and principles utilized in therapeutic recreation; includes professionalism, legislation, team approaches, activity analysis, client assessment and treatment plans. Prerequisite: Leisure Studies 230. 3 hours.
233. **Recreation for the Physically Disabled.** In-depth study of aspects of physical disability as related to therapeutic recreation services; includes characteristics and implications of disability, self-help skills, wheelchair activities, coaching techniques, services, accessibility, and legislation. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
234. **Recreation for the Mentally Ill and Emotionally Disturbed.** In-depth study of mental illness and emotional disturbance as related to therapeutic recreation services; characteristics and classification of mental illness, treatment standards, legislation, treatment approaches, and issues and trends. Prerequisite: Psychology 238 and Leisure Studies 230, or consent of instructor. 3 hours.
235. **Recreation for the Developmentally Disabled.** In-depth study of developmental disabilities as related to therapeutic recreation services; characteristics of various developmental disabilities, mainstreaming, normalization, activity selection and adaptation, instructional strategies, and behavioral management techniques. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
239. **Seminar in Therapeutic Recreation.** A seminar for senior therapeutic recreation majors to discuss and explore current issues, trends, and professional concerns in the field of therapeutic recreation. Prerequisite: Senior standing. 1 hour.
240. **Operation and Maintenance of Parks.** Basic understanding of park operations, facility design, construction, and maintenance practices; staff allocations, job analysis, contract administration, and organizational structures. Prerequisite: Leisure Studies 100, 110, and 141. 3 hours.
241. **Outdoor Recreation Consortium.** Intensive on-site study of programs and management of large multiple-use recreation areas; includes lectures, problem solving, and interaction with personnel from various responsible agencies. Prerequisite: Leisure Studies 141 and 240; Landscape Architecture 226, or consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
250. **Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, or related areas selected by the student. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser, instructor, and head of department. 2 to 3 hours. May be repeated to a maximum of 4 or 6 hours.
260. **Honors Seminar.** Same as Health and Safety Studies 290 and Kinesiology 290. See Kinesiology 290.
280. **Orientation to Practicum.** Prepares and places students in the Leisure Studies Practicum. Students must document completion of 320 hours of field work. Topics include placement requirements and policies, vitas, interviewing, letters of application, and the role and issues of professional practice. Prerequisite: Junior standing; Leisure Studies 100, 110, 130, and either 200 or 230. 0 hours.
284. **Leisure Studies Practicum.** Students are assigned to University-approved field training stations in an internship capacity for a minimum of forty hours per week for sixteen weeks. Both the agency and the University provide supervision. Prerequisite: Senior standing; Leisure Studies 280 and 310. 6 or 12 hours. Must be repeated to a maximum of 12 hours credit.
290. **Research in Leisure Studies.** Examines elementary principles of research methods, design, processing and analysis; use of completed leisure research; development of an ability to conduct, evaluate, and utilize research on leisure behavior. Prerequisite: Junior standing; Leisure Studies 100, or consent of instructor. 3 hours.

299. **Off-Campus Study.** Provides campus credit for foreign or domestic study completed off-campus. A student's proposal for study must have prior approval of the major department and the college office. Final determination of appropriate credit is made on the student's completion of the work. Prerequisite: Advanced standing and approval of major department and college. 0 to 16 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 32 hours.
301. **Forest Recreation.** Same as Forestry 301. See Forestry 301.
310. **Introduction to Administration.** Organization of public and private agency programs, leadership, facilities, and services; introduction to recreation administration. Prerequisite: Leisure Studies 210 and senior standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
315. **Play Theories and Their Implications.** Classical and modern theories of play; critical analysis of definitions, concepts, and assumptions and of extant research and research strategies; implications for programming and planning for play. Prerequisite: Leisure Studies 100 and Psychology 100, 103, or 105; or consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
331. **Facilitation Techniques and Leisure Education.** Examines knowledge, concepts, and models of leisure education in therapeutic recreation; applies specific instructional and counseling theories and techniques to the development and implementation of leisure education programs with different populations. Prerequisite: Leisure Studies 232 and junior standing, or consent of instructor. 3 hours or 1 unit.
332. **Program Design and Evaluation in Recreation.** Examines theory and techniques of program design and evaluation utilizing system approaches; includes needs assessment, agency accountability, and comprehensive programming strategies. Prerequisite: Leisure Studies 130 and senior standing, or consent of instructor. 3 hours or 1 unit.
340. **Outdoor Recreation Management.** Principles, practices, and problems involved in managing outdoor recreation areas; emphasizes management of both natural and cultural resources and visitor use patterns. Prerequisite: Landscape Architecture 226 and Leisure Studies 141; or consent of instructor. Leisure Studies 290 or another research methods course recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
341. **Outdoor Recreation Resource Planning.** Studies the outdoor recreational use of lands in the public domain and their planning, concepts, and processes related to planning resource based systems; multiple-use in planning; planning criteria for outdoor recreation facilities. Prerequisite: Leisure Studies 141, Landscape Architecture 226, and junior standing; or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
344. **Social Impact Assessment.** Same as Environmental Studies and Rural Sociology 344. See Environmental Studies 344.
361. **Sport Programming for the Physically Disabled.** Same as Rehabilitation Education 361. See Rehabilitation Education 361.
381. **Management Internship.** Work-study experience in the management aspects of leisure service delivery systems. Students are assigned to agencies in their special fields of study and are closely supervised by University faculty. Prerequisite: Leisure Studies 284 or graduate standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
401. **Foundations of Leisure Studies.** Basic philosophical, historical, and scientific foundations and developments in leisure and recreation; analyses of recreation values as related to other contemporary individual and community needs; and functions and settings of organized recreation, special problem areas, and current issues. Prerequisite: Leisure Studies 100 or equivalent. 1 unit.
402. **Leisure Systems Administration.** Strengthens the graduate student's knowledge of the public administration of recreation programs and services provided by municipal, county, state, and national departments and agencies as related to the general well-being of individuals, families, and communities. Prerequisite: Basic course in the organization of recreation or equivalent. 1 unit.
403. **Advanced Research Methods in Leisure.** Examines methods and techniques of conducting and evaluating leisure research; experimental and survey designs and procedures; data collection, reduction and analysis. Prerequisite: Leisure Studies 100 or equivalent; Leisure Studies 290 or equivalent; a course in introductory statistics. 1 unit.

404. **Seminar in Outdoor Recreation.** Philosophy, principles, and methods employed in outdoor recreation research today; also emphasizes pure versus applied research, utilization, and dissemination of research results. Prerequisite: Leisure Studies 141, 340 and 341, or equivalent; or consent of instructor. 1 unit.
412. **Personnel Administration for the Delivery of Leisure Services.** Examines principles, objectives, techniques, and problems in establishing a systematic approach to the recruitment, selection, and evaluation of personnel in public leisure service agencies with emphasis on innovative methods of personnel assessment and collective bargaining. Prerequisite: Leisure Studies 310 or consent of instructor. 1 unit.
430. **Advanced Seminar in Therapeutic Recreation.** In-depth investigation of contemporary professional issues related to the practice of therapeutic recreation in treatment and community agencies serving special populations. Prerequisite: Leisure Studies 332 or consent of instructor. 1 unit.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Landscape Architecture, Rural Sociology, and Urban and Regional Planning 440. See Environmental Studies 440.
445. **Sociology of Leisure.** Same as Sociology 445. Sociological theory and research methods as applied to the study of leisure; includes institutional and community contexts of leisure, leisure roles and socialization, built and natural environments, and the relationships of leisure to family, work, subcultures, and resources. Prerequisite: Leisure Studies 401 or Sociology 386 or 415, or consent of instructor. 1 unit.
465. **Psychology of Leisure.** Applies psychological theory and research methods to the study of leisure behavior and experience including a consideration of basic motivation, individual differences, and social interaction and implications for developmental intervention and human services. Prerequisite: Graduate standing or consent of instructor. 1 unit.
490. **Seminar.** Student presentation of thesis studies, informal discussions, and critical analysis of problems; informal lectures by invited speakers. 0 hours.
493. **Special Problems.** Independent research on special projects. Open only to students majoring in leisure studies. $\frac{1}{2}$ to 2 units.
494. **Special Topics in Leisure Studies.** Lecture courses in topics of current interest; specific subject matter will be announced in the *Timetable*. Prerequisite: Will be determined for each course offered and will be indicated in the *Timetable*. $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Preparation of thesis in leisure studies. 0 to 4 units.

LIBERAL ARTS AND SCIENCES

Dean of College: Larry R. Faulkner

College Office: 294 Lincoln Hall, 702 South Wright, Urbana

110. **Workshop-Tutorial.** Independent study and experimental seminars open to Unit One students and to others; specific offerings vary each semester. Prerequisite: Allen Hall residency or consent of Unit One director. 1 to 4 hours. At the end of the semester, the instructor may increase or decrease credit up to 2 hours, i.e., to a maximum credit of 6 hours. Credit toward college or departmental requirements is contingent upon approval by the appropriate unit. A combined total of 12 hours of Liberal Arts and Sciences 110 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
294. **Senior Project.** For students seeking graduation with distinction in IPS. Prerequisite: Consent of instructor and IPS Advisory Committee; open only to students whose major is IPS and who have a cumulative grade point average of at least 4.25. 2 or 4 hours. May be repeated to a maximum of 4 hours.

295. **Interdisciplinary Honors Seminar.** Seminar on interdisciplinary topics in the natural sciences, social sciences, humanities, and arts. Open to Chancellor's Scholars and other Honors students. Prerequisite: Junior standing in the Campus Honors Program. 3 hours. May be repeated to a maximum of 6 hours. (Approved for advanced hours in LAS).
299. **LAS Study Abroad.** Provides credit toward the undergraduate degree for study at accredited foreign institutions or approved overseas programs. Final determination of credit is made on the student's completion of the work. Prerequisite: One year of residence at UIUC, good academic standing, and prior approval of the major department and the College of Liberal Arts and Sciences. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 30 semester hours per academic year or to a total of 36 semester hours, all of which must be earned within one calendar year.

LIBRARY AND INFORMATION SCIENCE

Dean of Graduate School of Library and Information Science: Leigh Estabrook
School Office: 410 David Kinley Hall, 1407 West Gregory, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
300. **Foundations of Library and Information Science.** Examines the development of the library and information centers in relation to the society they serve, the library and information science profession, the operation and organization of libraries and information centers, building collections, and the administration of libraries and information centers; serves as an orientation to library and information science. Prerequisite: Junior standing and consent of School. 4 hours or 1 unit.
301. **Bibliography.** Covers enumerative bibliography, the practices of compiling lists; analytical bibliography, the design, production, and handling of books as physical objects; and historical bibliography, the history of books and other library materials, from the invention of printing to the present. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours or 1/2 or 1 unit.
303. **Library Materials for Children.** Selection and use of library materials for children in public libraries and elementary school media centers according to their needs in their physical, mental, social, and emotional development; deals with the standard selection aids for all types of print and nonprint materials and develops the ability to select and describe children's materials according to their developmental uses. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1/2 or 1 unit.
304. **Library Materials for Young Adults.** Evaluation, selection, and use of library materials for young adults in school and public libraries and community organizations according to personal and curricular needs; studies selection sources for all formats of materials and explores techniques for utilization of materials. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1/2 or 1 unit.
307. **Introduction to Services Relating to Organization of Library Materials.** Emphasizes the role of library catalogs in bibliographic control; introduces the functions, forms, and arrangements of library catalogs in all types of libraries; identifies bibliographic data elements in manual and machine-readable catalog records; and emphasizes the basic principles, concepts, practices, and tools of descriptive and subject cataloging and file structures. Prerequisite: Junior standing and consent of the School. 2 hours or 1/2 unit.
308. **Audiovisual Services in Libraries.** Designed to acquaint students with the nonprint media responsibilities of libraries; includes the evaluation, selection, and acquisition of software and hardware, the utilization of media in various types of libraries (by individuals and groups, in formal and informal programs), and the administration of integrated media collections (films, recorded sound, video, and exhibits). Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1 unit.
309. **Storytelling.** Fundamental principles of the art of storytelling including techniques of adaptation and presentation; content and sources of materials; story cycles; methods of learning;

- practice in storytelling; and planning the story hour for the school and public libraries, recreational centers, the radio, and television. Prerequisite: Junior standing and consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
320. **Introduction to Information Sources and Services.** Introduces information referral techniques and readers' advisory and online information services; examines representative printed and online sources, and develops question negotiation skills and search strategies. Prerequisite: Junior standing and consent of the School. 2 hours or $\frac{1}{2}$ unit.
350. **The Theory, Design, and Production of Audiovisual Materials.** Examines the theory and research related to the design and production of audiovisual materials and their application to the design and production of graphic materials, films, sound-slide programs, and television programs; also treats the management of audiovisual production services in libraries. Prerequisite: Junior standing or consent of instructor. 3 hours or 1 unit.
360. **Practicum.** Supervised field experience of professional-level duties in an approved library or information center. Prerequisite: Completion of 4 units of library and information science courses, including Library and Information Science 300; junior standing or consent of instructor. 3 hours or $\frac{1}{2}$ unit. A maximum of $\frac{1}{2}$ unit may be applied toward a degree program.
405. **Library Administration.** Designed to supply knowledge of the internal organization of libraries and of the principles of library administration; emphasis on comparison of the conditions found in the several kinds of libraries and on applications of the general theory of administration. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
406. **Media Programs and Service for Children and Young Adults.** The role, problems, and needs of children's and young adults' library services in the school and public library. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
407. **Cataloging and Classification, I.** Theory and application of basic principles and concepts of descriptive and subject cataloging; emphasis on interpreting catalog entries and making a catalog responsive to the needs of users; provides beginning-level experience with choice of entries, construction of headings, description of monographs (and, to a lesser extent, of serial publications and nonprint media), filing codes, Dewey and Library of Congress classification systems, and Library of Congress subject headings. Prerequisite: Library and Information Science 307 or consent of instructor. 1 unit.
408. **Cataloging and Classification, II.** More complex problems in making and evaluating the changing, modern library catalog; practical and administrative problems in cataloging serial publications, analytics, ephemeral materials, and microforms; deals with various nonprint media, rare books and manuscripts, foreign language materials, and materials in special subject areas. Prerequisite: Library and Information Science 407. 1 unit.
409. **Communication Roles and Responsibilities of Libraries.** Considers mass media of communication in terms of their relations with modern library services; reviews media organization, content, and research; considers problems of intellectual freedom as an aspect of communications behavior; and discusses the potential role of electronic devices in library activities now and for the future. $\frac{1}{2}$ or 1 unit.
410. **Adult Public Services.** The literature, history, and problems of providing library service to the general adult user; investigation of user characteristics and needs, and the effectiveness of various types of adult services. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
411. **Reference Service in the Humanities and Social Sciences.** Detailed consideration of the bibliographical and reference materials in various subject fields; training and practice in their use for solving questions arising in reference service. Prerequisite: Library and Information Science 320 or consent of instructor. 1 unit.
412. **Scientific and Technical Literature and Reference Work.** Aims to acquaint students with typical library materials in science and technology and develop proficiency in selection, evaluation, and use for reference work. Prerequisite: Library and Information Science 320, or consent of instructor. 1 unit.
415. **Library Automation.** Introduction to various types of equipment for handling information and providing services in libraries; study of applications to library operations; and introduction to systems planning, automation concepts, and to computer use. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.

416. **Advanced Library Automation.** The development of computer programs for library processes such as circulation, acquisitions, cataloging, and document retrieval. Includes seminar presentations based on individual research in automation topics. Prerequisite: Library and Information Science 300, or consent of instructor. $\frac{1}{2}$ or 1 unit.
417. **Techniques for Managerial Decision Making in Library and Information Science.** Systematic techniques for achieving rational management decisions; includes problem definition, sampling, decision tables, and critical path analysis. Examples of current issues from the operation of libraries and information centers. Prerequisite: Library and Information Science 300, or consent of instructor. 1 unit.
424. **Government Publications.** Aims to acquaint students with government publications, their variety, interest, value, acquisition, and bibliographic control, and to develop proficiency in their reference and research use; considers publications of all types and all governments (local, national, international) with special emphasis on U.S. state and federal governments and on the United Nations and its related specialized agencies. Prerequisite: Library and Information Science 411, 412, or consent of instructor. 1 unit.
427. **Resources of American Research Libraries.** Acquaints students with the distribution and extent of American library resources for advanced study and research; spatial and financial aspects of library resources; methods of surveying library facilities; growth and use of union catalogs and bibliographical centers; interinstitutional agreements for specialization of collections and other forms of library cooperation; and the use of the research collection by the scientist and scholar. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
428. **Library Buildings.** Studies the library's physical plant in the light of changing concepts and patterns of library service; analyzes present-day library buildings, (both new and remodeled) and their comparison with each other as well as with buildings of the past; examines the interrelationship of staff collections, users, and physical plant; discussion supplemented by visits to new libraries and conference with their staffs. A two-day field trip is required. Prerequisite: Library and Information Science 405 or consent of instructor. $\frac{1}{2}$ or 1 unit.
429. **Information Storage and Retrieval.** Types of systems for storage and retrieval of documents and references; history of retrieval systems, their characteristics, evaluation, and factors affecting their performance, with special reference to modern computer-based systems; procedures in the dissemination of scientific and other information; major information centers and services in the U.S. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
430. **Advanced Reference.** Enables the student to utilize the varied resources of a large research library; deals with the methods of analyzing and solving bibliographic problems that arise in scholarly libraries and in connection with research projects. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ or 1 unit.
431. **Online Information Systems.** Explores the state-of-the-art in online information systems, with particular emphasis on their use as part of reference service in libraries; acquaints students with the characteristics of both bibliographic and nonbibliographic data bases; and trains students in the use of at least one currently available online retrieval system. Prerequisite: Library and Information Science 300 and 320, or consent of instructor. $\frac{1}{2}$ unit.
432. **History of Libraries.** Same as Communications 432. The origins, development, and evolution of libraries and related institutions, from antiquity to the twentieth century, as a reflection of literacy, recognition of archival responsibility, humanistic achievement, scientific information needs, and service to society. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
433. **Information Needs of Particular Communities.** In-depth study of the characteristics and information needs of specialist users of libraries; goals and objectives, policies, and services; reference and bibliographical aids; and effective services that satisfy these special needs. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for a total of 2 units.
434. **Library Systems.** Development of library systems, with special reference to public libraries as a norm for the development of library services; detailed treatment of library standards, the growth and development of county and regional libraries, and the role of the state library

- and of federal legislation. Prerequisite: Library and Information Science 405 or consent of instructor. 1 unit.
437. **Technical Services Functions.** Seminar on the principles, problems, trends, and issues of acquiring, identifying, recording, and conserving/preserving materials in all types of libraries and information centers; includes the special problems of serials management; emphasizes service aspects. Prerequisite: Library and Information Science 300 and 407, or consent of instructor; concurrent registration in Library and Information Science 407 is acceptable with consent of instructor. 1 unit.
438. **Administration and Use of Archival Materials.** Administration of archives and historical manuscripts; emphasizes the processing and research use of archival materials. Prerequisite: Consent of instructor. 1 unit.
440. **Advanced Bibliography.** Discusses the major reference bibliographies, including general works, subject lists in various fields, regional historical and current national bibliographies, and published library catalogs; surveys the nature of bibliographical access to the output of the world's press, descriptive bibliography, and rare-book librarianship. Prerequisite: Library and Information Science 301 or consent of instructor. $\frac{1}{2}$ or 1 unit.
441. **History of Children's Literature.** Interpretation of children's literature from the earliest times, including the impact of changing social and cultural patterns on books for children; attention to early printers and publishers of children's books and to magazines for children. 1 unit.
443. **Contemporary Book Publishing.** Surveys twentieth-century book publishing, placing it in an economic, social, and literary context; emphasizes economic structure, the relationship of author and publisher, promotion, distribution, and the influence of the industry on librarianship. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
444. **Measurement and Evaluation of Library Services.** Methods and criteria for evaluating various facets of library service, including the collection, the catalog, document delivery capabilities, reference service, technical processes, and information retrieval operations; deals with cost-effectiveness considerations. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
450. **Advanced Problems in Librarianship.** Directed and supervised investigation of selected problems in library resources, reference service, research libraries, reading, public libraries, or school libraries. Prerequisite: Library and Information Science 300, or consent of instructor. $\frac{1}{4}$ to 2 units.
451. **Independent Study.** Permits the intermediate or advanced student opportunity to undertake the study of a topic not otherwise offered in the curriculum or to pursue a topic beyond or in greater depth than is possible within the context of a regular course. Prerequisite: Consent of dean. $\frac{1}{2}$ to 1 unit. May be repeated by M.S. students to a maximum of 1 unit; C.A.S. students, 2 units; or Ph.D. students, 4 units.
459. **CAS Project.** Individual study of a problem in library or information science; forms the culmination of the Certificate of Advanced Study program. Prerequisite: Admission to CAS program in library and information science. 0 to 2 units. May be taken for additional units, but only two will apply to the Certificate of Advanced Study.
469. **Principles of Research Methods.** Studies the design of research using historical, descriptive, and experimental methodologies; emphasizes applications in the library and information science fields. For doctoral students only. Prerequisite: A course in the principles of statistics, a library and information science course in quantitative methods; and consent of instructor. 1 unit.
471. **The History of Communications Media and Libraries.** Seminar in the different means of transmitting content through time and space; includes the history and comparison of libraries, books, and other communications media. Prerequisite: Open to doctoral students only. 1 unit.
472. **The Bibliographic Organization of Information and Library Materials.** Seminar in the relationship between knowledge and its bibliographic control; includes the structure of knowledge and classification, the descriptive and subject aspects of bibliography and indexing, and information theory. Prerequisite: Open to doctoral students only. 1 unit.
473. **The Social Basis of Library and Information Science.** Seminar in the interrelationships between librarians and information scientists and their communities of users; includes modern institutions of librarianship and information service, the education of librarians and information

scientists, and the sociology of libraries and information centers. Prerequisite: Open to doctoral students only. 1 unit.

474. **The Management of Libraries and Information.** Seminar in the organizations and structures which facilitate both the achievement of library and information center goals and the flow of information; includes management and decision-making tools. Prerequisite: Open to doctoral students only. 1 unit.
475. **Seminar in Library and Information Science.** Preparation, presentation, and criticism of a scholarly paper of moderate length and publishable quality based on individual study. Prerequisite: Library and Information Science 471, 472, 473, or 474; open to doctoral students only. 1 unit. Required: To be repeated for a total of 4 units.
499. **Thesis Research.** Individual study and research. Section A: M.S. candidates, 0 to 2 units. Section B: doctoral candidates, 0 to 4 units.

LIFE SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: Biology, Cell and Structural Biology, Ecology, Ethology, and Evolution, Entomology, Genetics and Development, Microbiology, Physiology and Biophysics, and Plant Biology.)

Director of School: Jordan Konisky

School Office: 393 Morrill Hall, 505 South Goodwin, Urbana

LINGUISTICS

(Including African Languages, Arabic, Hebrew, Hindi, Persian, and Sanskrit)

Acting Head of Department: Charles W. Kisseberth

Department Office: 4088 Foreign Languages Building, 707 South Mathews, Urbana

Linguistics

191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Introduction to Language Science.** An introduction to the theory and methodology of general linguistics; includes the various branches and applications of linguistics. 3 hours.
202. **Elements of Syntax.** Introduction to the types of syntactic and semantic phenomena found in natural language, with material drawn from a variety of languages; emphasis on the implications of such phenomena for linguistic theory; formalism and application of generative grammar. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
225. **Elements of Psycholinguistics.** Introduction to the theory and methodology of psycholinguistics with emphasis on language acquisition and linguistic behavior. 3 hours.
260. **American Sign Language.** Same as Psychology and Speech and Hearing Science 260. See Psychology 260.
290. **Individual Study.** Individual readings and research reports on special topics dealing with the theoretical or applied aspects of the linguistic sciences. Prerequisite: Written consent of instructor on form available in linguistics departmental office. 2 to 4 hours. May be repeated to a maximum of 8 hours.

291. **Honors Individual Study.** Study and research for honors thesis; open only to seniors in the linguistics major who are eligible for departmental distinction. Prerequisite: Written consent of instructor on form available in linguistics departmental office; linguistics course average of 4.4. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
300. **Introduction to Linguistic Structure.** Same as Anthropology 300. Introduction to the theory and methodology of the science of linguistics with special reference to phonology and syntax. 3 hours or $\frac{1}{2}$ unit.
301. **Introduction to General Phonetics.** Introduction to the main branches of general phonetics and phonological theory; emphasis on analysis of non-Western languages and research techniques. 3 hours or $\frac{1}{2}$ unit.
302. **Introduction to Language History.** Introduction to the nature of language change; includes sound change, change through language contact (such as Pidgins and Creoles), semantic change (etymology), language relationship and reconstruction, and language history as an aid to understanding cultural history (philology). This course cannot be used to fulfill departmental graduate requirements. Prerequisite: Four years of high school foreign language study or fulfillment of the College of Liberal Arts and Sciences foreign language requirement. 3 hours or $\frac{1}{2}$ unit.
303. **Non-Western Linguistic Structures.** Intensive study of linguistic structure of a selected non-Western language. 3 hours or 1 unit. May be repeated for credit with consent of instructor.
304. **Tutorials in Nonwestern Languages.** Advanced or intensive language instruction in a selected nonwestern language; does not cover instruction in East or Southeast Asian languages. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{2}$ to 1 unit. May be repeated with consent of instructor.
305. **Introduction to Applied Linguistics.** Same as English as an International Language 305. Introduction to the applications of general linguistic theory to the specific fields of stylistics, theory of translation, contrastive analyses, and the teaching and learning of foreign and second languages; practical assignment work. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
306. **Introduction to Computational Linguistics.** Introduces the use of computers in linguistics and application of linguistics in high technology. Topics include spelling and grammar-checking in word processing, natural language and man-machine communication, data organization, language understanding systems, and computer-assisted language instruction. Students write several computer programs. Prerequisite: Linguistics 300 or equivalent; and a Computer Science 100-level programming course (not Computer Science 106), or Computer Science 400, or consent of instructor. 3 hours or 1 unit.
307. **Introduction to Mathematical Linguistics.** Same as Anthropology 307. Principles of set theory, logic and formal systems, group theory, and automata theory; introduction to the formal theory of grammars. Prerequisite: Linguistics 300. 3 hours or 1 unit.
309. **Introduction to Indo-European Linguistics.** Same as Greek 310 and Latin 310. Introductory survey of Indo-European languages and their mutual relations; exemplification of methods of reconstruction; principles of comparative phonology and introductory survey of morphology; and discussion of theories about the original home, culture, and society of the Indo-Europeans. Prerequisite: Fulfillment of the language requirement of the College of Liberal Arts and Sciences. 3 hours or 1 unit.
311. **Introduction to Syntax: A Typological Approach.** Introduces the study of syntax through typological survey of syntactic systems of natural languages; examines material from diverse language families; implications of typological studies for syntactic theory. Prerequisite: Linguistics 300. 3 hours, or $\frac{1}{2}$ or 1 unit.
312. **Stylistics and Literary Criticism.** Same as English 304. See English 304.
314. **Introductory Coptic, I.** Same as Coptic and Religious Studies 301. See Coptic 301.
315. **Introductory Coptic, II.** Same as Coptic and Religious Studies 302. See Coptic 302.
316. **Structure of the French Language.** Same as French 316. See French 316.
320. **Introduction to African Linguistics.** Introduction to genetic and typological classification of the main language families of Africa; concentration on grammatical and phonological characteristics. Prerequisite: Linguistics 200 or 300; consent of instructor. 3 hours or 1 unit.
323. **Language Acquisition.** Same as Communications 323 and Psychology 323. See Psychology 323.

325. **Introduction to Psycholinguistics.** Same as Communications 325. Introductory survey of psychological and linguistic approaches to the study of communication. Prerequisite: Credit or concurrent registration in Linguistics 300. 3 hours or 1 unit. Credit is not given for both Linguistics 325 and Psychology 325.
329. **Language of Religion.** Same as Religious Studies and Speech Communications 329. See Religious Studies 329.
330. **Introduction to Far Eastern Linguistics.** Same as Chinese, Japanese, and Korean 330. Introduction to genetic relation of the Far Eastern languages with other languages; concentration on synchronic analysis of phonology and syntax. Prerequisite: Linguistics 300; consent of instructor. 3 hours or 1 unit.
332. **Women and Language.** Same as Speech Communication and Women's Studies 332. See Speech Communication 332.
335. **Neurolinguistics and Second Language Learning.** Same as English as an International Language 335. See English as an International Language 335.
338. **Philosophy of Language.** Same as Philosophy 338. See Philosophy 338.
340. **History of Linguistics.** Survey of linguistic theories from ancient to modern times; special emphasis on comparative grammar and the development of structural linguistics; and extended discussion of at least one other period. 3 hours or 1 unit.
350. **Introduction to Sociolinguistics.** Same as English as an International Language 350. Critical study of the sociologically oriented general linguistic theories; special reference to language varieties, language attitudes, language diversity, language standardization, linguistic geography, and language and political roles (language loyalty); emphasis on research methodology and techniques. Prerequisite: Introductory course in linguistics or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
367. **Introduction to Germanic Linguistics.** Same as Germanic 367. See Germanic 367.
370. **Language, Culture, and Society.** Same as Anthropology 370 and Communications 370. See Anthropology 370.
375. **Speech Science, I.** Same as Speech and Hearing Science and Speech Communication 375. See Speech and Hearing Science 375.
376. **Speech Science, II.** Same as Speech and Hearing Science and Speech Communication 376. See Speech and Hearing Science 376.
380. **Introduction to Slavic Linguistics.** Same as Slavic 380. See Slavic 380.
382. **Introduction to Sanskrit Linguistics.** A linguistic introduction to the structure of Sanskrit (phonetics, phonology, and morphology) and its historical antecedents and development, with reading of sample texts. Prerequisite: Linguistics 300 and consent of instructor. 3 hours or 1 unit.
385. **Reading in a Second Language.** Same as English as an International Language 386. See English as an International Language 386.
386. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382. See Humanities 382.
387. **The Structure of English.** Critical evaluation of traditional and structuralist grammatical descriptions; introduction to transformational grammatical studies; detailed survey of a transformational syntax of English; and brief introduction to generative phonology and morphophonemic analysis of English, especially stress. 3 hours or $\frac{3}{4}$ unit.
388. **English Phonology and Morphology for ESL Teachers.** Same as English as an International Language 388. See English as an International Language 388.
389. **Theoretical Foundations of TESL Methodology.** Same as English as an International Language 389. See English as an International Language 389.
400. **Introduction to General Linguistics.** Same as Anthropology 400 and English as an International Language 402. Introduction to the linguistic sciences; linguistic theory and methodology; and branches of linguistics and their application. 1 unit. Credit may not be applied toward a graduate degree in linguistics.
401. **Syntax.** Critique of traditional and contemporary theories of syntactic structure; systematic introduction to transformational grammar. Prerequisite: Linguistics 300 or equivalent. 1 unit.

402. **Phonology.** Examination of language-specific phonological problems with a view toward formulating a language-independent theory of phonology. Prerequisite: Linguistics 301 or consent of instructor. 1 unit.
403. **Seminar in Linguistic Analysis.** Discussion of advanced topics of current interest. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit with consent of instructor.
404. **Practicum.** Classroom- and homework-solving of assorted problems in syntactic and phonological analysis of many languages. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit as topic varies with consent of instructor.
405. **Seminar in Stylistics.** Same as Comparative Literature 405. Seminar designed to evaluate and discuss earlier and current linguistically motivated stylistic theories; emphasis on the theoretical and methodological problems in application of linguistics to stylistic analysis of literary texts. Prerequisite: Linguistics 300 or 305; consent of instructor. 1 unit.
406. **Topics in Computational Linguistics.** Speech sampling and linguistic redundancy; phonology in speech recognition; syntactic parsing of natural language; domains of linguistic knowledge including lexical, syntactic, semantic discourse, and pragmatic representations; quantitative reasoning; linguistic expert system; speech synthesis. Prerequisite: Linguistics 306 and 401; Linguistics 402 or consent of instructor. 1 unit.
408. **Russian Phonology.** Same as Russian 408. See Russian 408.
411. **Historical Linguistics.** Introduction to historical and comparative linguistics with particular attention to theoretical issues. Prerequisite: Credit or concurrent registration in Linguistics 300 and 301. 1 unit.
412. **Research Seminar in Historical Linguistics.** Research work in etymology, linguistic geography, and historical syntax. Prerequisite: Linguistics 411 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units, as topics vary, with consent of instructor.
413. **Pedagogical Grammar.** Same as English as an International Language 412. See English as an International Language 412.
416. **Field Methods.** Analysis of the phonetic, phonological, morphological, and syntactic structure of an undescribed language through the elicitation of data from a native language consultant. The class develops a linguistic sketch of the language, including a computerized lexicon. Prerequisite: Linguistics 401 and 402. 1 unit.
419. **Contrastive Linguistics.** Same as English as an International Language 419. Critical survey of contemporary linguistic models; special reference to their relevance in preparing contrastive analyses of languages; and detailed discussion on contrastive analysis of English and selected non-Western languages at different linguistic levels. Prerequisite: Linguistics 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
420. **Linguistic Phonetics.** Principles of scientific description of the phonic aspect of language; distinctive features and phonetic alphabets; relations between phonetics and other linguistic levels; and inventory of speech sounds. Prerequisite: Linguistics 301 or equivalent. 1 unit.
424. **Developmental Psycholinguistics.** Same as Communications and Psychology 424. See Psychology 424.
425. **Psycholinguistics.** Same as Communications 425 and Psychology 425. See Psychology 425.
429. **Second Language Acquisition and Bilingualism.** Same as Psychology 429. Examination of the field from a psycholinguistic perspective; topics discussed include first versus second language acquisition; the nature of language aptitude and competence; methods of second language teaching; the nature of bilingualism; and comparative psycholinguistics. Prerequisite: Consent of instructor. 1 unit.
440. **Seminar in History of Linguistics.** Analysis of recent theoretical approaches. Prerequisite: Linguistics 340. 1 unit.
441. **Syntax, II.** Advanced analysis and critique of syntactic descriptions, with special attention to implications for universal grammar. Prerequisite: Linguistics 401 or consent of instructor. 1 unit.
442. **Phonology, II.** Continuation of Linguistics 402. Prerequisite: Linguistics 402. 1 unit.
450. **Linguistics and the Study of Meaning.** Consideration of those aspects of meaning which are the concern of linguistic theory. Prerequisite: Linguistics 300. 1 unit.
460. **Seminar in Bilingualism.** A research-oriented seminar on theoretical and applied aspects of bilingualism; critical evaluation of linguistic, neurolinguistic, sociolinguistic, and psycholinguistic approaches to bilingualism; and concentration on selected case studies from western

- and nonwestern societies, especially Asia and Africa. Prerequisite: Linguistics 350 or an introductory course in linguistics. 1 unit.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
475. **Experimental Phonetics, I.** Same as Speech and Hearing Science 475. See Speech and Hearing Science 475.
476. **Experimental Phonetics, II.** Same as Speech and Hearing Science 476. See Speech and Hearing Science 476.
481. **Topics in Syntactic Theory.** Investigation of syntactic universals; recent developments in the theory of syntax. Prerequisite: Linguistics 441 or consent of instructor. 1 unit. May be repeated as topics vary with consent of instructor.
482. **Topics in Phonological Theory.** Recent developments in the theory of phonology. Prerequisite: Linguistics 442 or consent of instructor. 1 unit. May be repeated for credit as topic varies with consent of instructor.
490. **Special Topics in Linguistics.** Individual studies in the areas of linguistics not covered by regular course offerings. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

LANGUAGES OFFERED BY THE DEPARTMENT OF LINGUISTICS.

Other languages may be offered by tutorial (see Linguistics 304). See also APPENDIX A for a list of all languages currently offered on this campus.

African Languages

201. **Elementary Hausa, I.** Same as African Studies 201. Introduction to Hausa; emphasizes grammar, pronunciation, reading, and conversation in standard Hausa. Language lab participation required. 5 hours.
202. **Elementary Hausa, II.** Same as African Studies 202. Continuation of elementary Hausa, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Hausa. Participation in language laboratory required. Prerequisite: African Languages 201. 5 hours.
211. **Elementary Lingala, I.** Same as African Studies 211. Introduction to Lingala; emphasizes grammar, pronunciation, reading and conversation in standard Lingala. Participation in language laboratory required. 5 hours.
212. **Elementary Lingala, II.** Same as African Studies 212. Continuation of elementary Lingala, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Lingala. Participation in language laboratory required. Prerequisite: African Languages 211. 5 hours.
231. **Elementary Swahili, I.** Same as African Studies 231. Beginning spoken Swahili with minimum of formal grammar; conversation with a native Swahili tutor under the supervision of a linguist-instructor. 5 hours.
232. **Elementary Swahili, II.** Same as African Studies 232. Second semester of spoken Swahili; more conversation with a native tutor; and further grammar. Prerequisite: African Languages 231. 5 hours.
241. **Elementary Wolof, I.** Same as African Studies 241. Introduction to Wolof; emphasizes grammar, pronunciation, reading, and conversation in standard Wolof. Participation in language laboratory required. 5 hours.
242. **Elementary Wolof, II.** Same as African Studies 242. Continuation of elementary Wolof, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Wolof. Participation in language laboratory required. Prerequisite: African Languages 241. 5 hours.
303. **Intermediate Hausa, I.** Same as African Studies 303. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and spoken Hausa, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 202. 5 hours or 1 unit.

304. **Intermediate Hausa, II.** Same as African Studies 304. Continuation of African Languages 303. Emphasizes ability to engage in reasonably fluent discourse in Hausa, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Hausa dialects. Participation in language laboratory required. Prerequisite: African Languages 303. 5 hours or 1 unit.
313. **Intermediate Lingala, I.** Same as African Studies 313. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in the standard and spoken Lingala dialects, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 212. 5 hours or 1 unit.
314. **Intermediate Lingala, II.** Same as African Studies 314. Continuation of African Languages 313. Emphasizes ability to engage in reasonably fluent discourse in Lingala, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Lingala dialects. Participation in language laboratory required. Prerequisite: African Languages 313. 5 hours or 1 unit.
333. **Intermediate Swahili, I.** Same as African Studies 333. Second-year Swahili with emphasis on developing conversational fluency; some readings on Swahili culture and customs. Prerequisite: One year of Swahili. 5 hours or 1 unit.
334. **Intermediate Swahili, II.** Same as African Studies 334. More of second-year Swahili with emphasis on conversational fluency; some reading in Swahili literature. Prerequisite: One year of Swahili. 5 hours or 1 unit.
335. **Advanced Swahili, I.** Same as African Studies 335. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: African Languages 334 or equivalent. 5 hours or 1 unit.
336. **Advanced Swahili, II.** Same as African Studies 336. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: African Languages 335 or equivalent. 5 hours or 1 unit.
343. **Intermediate Wolof, I.** Same as African Studies 343. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and Dakar Wolof, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 242. 5 hours or 1 unit.
344. **Intermediate Wolof, II.** Same as African Studies 344. Continuation of African Languages 343. Emphasizes ability to engage in reasonably fluent discourse in Wolof, comprehensive knowledge of formal grammar, and ability to read ordinary texts in standard and Dakar Wolof. Participation in language laboratory required. Prerequisite: African Languages 343. 5 hours or 1 unit.

Arabic

201. **Elementary Standard Arabic, I.** Mastery of the Arabic alphabet and phonetics; elementary formal grammar and the development of reading and writing skills; and conversation in the formal noncolloquial style. All students are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Standard Arabic, II.** Continuation of Arabic 201. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 201. 5 hours.
210. **Colloquial Arabic, I.** Development of conversational fluency in one of the major colloquial dialects; see *Timetable* for dialect to be taught each semester. 4 hours.
211. **Colloquial Arabic, II.** Continuation of Arabic 210. Prerequisite: Arabic 210. 4 hours.
303. **Intermediate Standard Arabic, I.** Survey of more advanced grammar; emphasis on increasing conversational fluency in the formal noncolloquial style; and reading of prose texts reflecting aspects of Arabic culture. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 202. 5 hours or 1 unit.

304. **Intermediate Standard Arabic, II.** Continuation of Arabic 303. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 303. 5 hours or 1 unit.
305. **Advanced Standard Arabic, I.** Practice to attain conversational fluency in the formal non-colloquial style; introduction to Arabic literature; and readings in social, political, and historic writings. Prerequisite: Arabic 304. 5 hours or 1 unit.
306. **Advanced Standard Arabic, II.** Continuation of Arabic 305. Prerequisite: Arabic 305. 5 hours or 1 unit.

Hebrew

201. **Elementary Modern Hebrew, I.** Introduction to Hebrew; includes conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. Students are required to register for one hour weekly in the language laboratory. 5 hours.
202. **Elementary Modern Hebrew, II.** Continuation of Modern Hebrew 201, with introduction of more advanced grammar, and with emphasis on more fluency in speaking and reading. Prerequisite: Hebrew 201. 5 hours.
205. **Introduction to Classical Hebrew, I.** Same as Religious Studies 205. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills. 4 hours.
206. **Introduction to Classical Hebrew, II.** Same as Religious Studies 206. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills; translation of simple biblical prose. Prerequisite: Hebrew 205 or equivalent. 4 hours.
210. **Biblical Prose.** Same as Religious Studies 210. Reading and discussion of selections from the Books of Samuel with emphasis on grammar and exegesis; exercises in prose composition. Prerequisite: Hebrew 205 and 206. 4 hours.
303. **Intermediate Modern Hebrew, I.** First term of the second year of the Hebrew language, including drill for more advanced conversational fluency, increased study of the written language, and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Modern Hebrew, II.** Concentration on ability to engage in reasonable fluent discourse in Hebrew, comprehensive knowledge of formal grammar, and an ability to read ordinary written Hebrew. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hebrew 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Modern Hebrew, I.** Advanced spoken and written standard modern Hebrew; introduction to modern Hebrew literature. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours or $\frac{3}{4}$ to 1 unit.
306. **Advanced Modern Hebrew, II.** A course for advanced knowledge of spoken and written standard Modern Hebrew with emphasis on Modern Hebrew literature and language. Prerequisite: Hebrew 305 or equivalent. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.
307. **Topics in Modern Hebrew Language and Literature, I.** Selected readings from modern Hebrew authors, with emphasis on the novel and short story; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 306 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
308. **Topics in Modern Hebrew Language and Literature, II.** Selected readings from modern Hebrew authors, with special emphasis on Eastern European "Revival" literature; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 307 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
311. **Hebrew Poetry.** Same as Religious Studies 311. Translation and analysis of ancient Hebrew poetry, with emphasis on the development of Hebrew prosodic style and on textual criticism; research paper required for graduate credit. Prerequisite: Hebrew 210 or equivalent. 4 hours or 1 unit.

Hindi

201. **Elementary Hindi/Urdu, I.** An introduction to the Hindi/Urdu language; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, and a minimum of formal grammar and Devanagari writing; introduction to Arabic-Persian script by arrangement. All students are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Hindi/Urdu, II.** Second term of spoken Hindi/Urdu; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, formal grammar based on conversational materials, and work on written Hindi; concentration on written Urdu by arrangement. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 201. 5 hours.
301. **Intensive Hindi, I.** An intensive course on the Hindi language including conversation with a native Hindi-speaking tutor under the direction of a linguist-instructor; study of the formal grammar and the Devanagari script. 10 hours or 2 units.
302. **Intensive Hindi, II.** Includes drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; increasing study of the written language and more formal grammar; and concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 301 or equivalent, or consent of instructor. 10 hours or 2 units.
303. **Intermediate Hindi, I.** First term of second year of the Hindi language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Hindi, II.** Concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Hindi, I.** A course for advanced knowledge of spoken and written Hindi. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 304 or consent of instructor. 5 hours or 1 unit.
306. **Advanced Hindi, II.** A course for advanced knowledge of spoken and written Hindi with emphasis on modern Hindi literature and language. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 305 or consent of instructor. 5 hours or 1 unit.
308. **Introduction to South Asian Literature.** Introduces selected literatures of South Asia in a cross-cultural and comparative perspective; emphasizes relating literary texts and trends to the historical, sociocultural, political, and literary contexts of the subcontinent. Texts for South Asian languages are offered in English translation; in addition, there will be texts by South Asian authors written in English. Knowledge of a South Asian language not required. Prerequisite: Consent of course coordinator. 3 hours, or ½ or 1 unit.

Persian

201. **Elementary Persian, I.** Introduction to Persian, including conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
202. **Elementary Persian, II.** Continuation of Persian 201, with introduction of more advanced grammar and with emphasis on more fluency in speaking and reading. Prerequisite: Persian 201 or equivalent. 5 hours.

205. **Introduction to Persian Culture and Literature, I.** Same as Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
206. **Introduction to Persian Culture and Literature, II.** Same as Comparative Literature 204. Continuation of Persian 205 - Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
303. **Intermediate Persian, I.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 202. 5 hours or 1 unit.
304. **Intermediate Persian, II.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 303. 5 hours or 1 unit.
305. **Advanced Persian, I.** Designed to improve competence in speaking, writing, and reading Persian: includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 304. 3 hours or 1 unit.
306. **Advanced Persian, II.** Continuation of Persian 305. Designed to improve competence in speaking, writing, and reading Persian: includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 305. 3 hours or 1 unit.

Sanskrit

201. **Elementary Sanskrit, I.** Introduction to Sanskrit, treating in full the grammar of the language as preparation for reading, and including the reading of sections of the Mahabharata. 5 hours.
202. **Elementary Sanskrit, II.** Continuation of Sanskrit 201. Prerequisite: Sanskrit 201. 5 hours.
303. **Readings in Sanskrit, I.** Same as Religious Studies 312. Introduction to the reading of Sanskrit texts. Prerequisite: Sanskrit 202. 3 hours or 1 unit.
304. **Readings in Sanskrit, II.** Same as Religious Studies 313. Readings in Sanskrit texts. Topics may vary according to students' needs; they may include religious texts, classical literature, or general survey of texts. Prerequisite: Sanskrit 303 and consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.

MATERIALS SCIENCE AND ENGINEERING

(Including Ceramic Engineering and Metallurgy Engineering)

Head of Department: James Economy

Department Office: 201 Metallurgy and Mining Building, 1034 West Green, Urbana

Ceramic Engineering

190. **Topics in Ceramic Engineering.** A course for freshmen providing an opportunity to become acquainted with ceramic engineering, and to participate in an engineering course in the freshman year; discussions and demonstrations on ceramic materials, processes, and properties; ceramic articles - glasses, ceramic magnets, and coatings are made in laboratory demonstrations. Discusses environmental concerns of the ceramic industries. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Ceramic Crystal Chemistry.** Crystal structure and crystal chemistry of ceramic materials, including the structure of silicates; geometrical crystallography and discussions of crystal character and crystal growth of ceramic materials. 3 hours.

202. **Ceramic Materials and Processes.** Characterization of ceramic raw materials and their preparation, fabrication, and processing. Prerequisite: Sophomore standing. 3 hours.
205. **Phase Equilibria in Ceramic Systems.** The concepts, interpretations, and utilization of phase equilibrium diagrams in multicomponent ceramic systems at high temperatures; methods of determining equilibrium relationships; and interpretation of binary, ternary, and quaternary systems emphasizing quantitative calculations, metastability, and the origin of microstructure. Lecture and discussion. Prerequisite: Concurrent registration in Ceramic Engineering 245 or consent of instructor. 3 hours. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
208. **Thermal Processing.** The application of the principles involved in drying and high-temperature operations utilized in processing ceramic materials. Prerequisite: Junior standing in ceramic engineering. 3 hours.
216. **Rate Processes in Ceramic Engineering.** Reaction kinetics of ceramic processes; high-temperature phase transformations; sintering and grain growth; nucleation and crystal growth from melts; and mechanisms of material transport in solid and liquid systems. Prerequisite: Ceramic Engineering 245; junior standing in ceramic engineering. 3 hours.
245. **Thermodynamics of Materials.** Same as Chemistry 245. Materials Science and Engineering 301, and Metallurgical Engineering 314. See Materials Science and Engineering 301.
271. **Design of High-Temperature Systems.** Design for dryers, kilns, and furnaces for ceramic facilities. Prerequisite: Ceramic Engineering 208; Theoretical and Applied Mechanics 221. 3 hours.
297. **Senior Seminar.** Lectures and discussions dealing with professional practice, job selection, employment practice, continuing education, professional growth, and economics of the ceramic industries. Prerequisite: Senior standing in ceramic engineering. 1 hour.
298. **Special Topics.** Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. Prerequisite: Sophomore standing. 1 to 4 hours. May be repeated to a maximum of 4 hours.
299. **Senior Thesis.** Research in ceramics and ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's adviser at the time of registration. To receive credit, a thesis must be presented. Prerequisite: Senior standing; grade-point average of 4.0 or better. 1 to 5 hours. May be repeated to a maximum of 5 hours. A minimum total credit of 3 hours is required.
307. **Thermal and Mechanical Properties of Ceramics.** Interprets the thermal and mechanical behavior of crystalline and amorphous ceramics in terms of atomistic concepts of materials; examines influences of microstructure, composition, temperature, pressure, time and other controllable parameters. Prerequisite: Ceramic Engineering 216 and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
309. **Ceramic Processing.** Examines principles and details of ceramic processing operations; case histories and unit operations for a wide variety of ceramic products; and interrelationships that exist between materials, composition, fabrication, properties, and characterization. Prerequisite: Junior standing in engineering or physical sciences. 3 hours or $\frac{3}{4}$ unit.
310. **Refractory Technology.** Engineering properties and thermochemistry of polycrystalline materials for use at elevated temperatures including processing of raw materials and the manufacture, heat treatment, quality control, and specification of refractory products; particular emphasis on oxides, silicates, carbides, borides, cermets, and refractory metals with a correlation of the properties of those materials to certain design criteria. Includes laboratory if taken for 1 unit of graduate credit. Prerequisite: Senior standing in engineering. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Ceramic X-Ray Analysis.** X-ray diffraction for phase identification, for the determination of crystalline lattice parameters, and for the determination of the thermal expansion of crystalline solids; analytical methods of indexing powder diffraction patterns; the determination of precise lattice parameters by means of computer programming and high-temperature x-ray techniques. Prerequisite: Computer Science 101 and senior standing in engineering, chemistry, or geology, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

312. **Ceramic Coatings.** Examines principles and technology of a wide range of ceramic coatings; emphasizes chemistry and physics that underlie coating properties, and application processes; and studies types of coatings treated including porcelain enamels, glazes, melt-sprayed coatings, vapor deposited coatings, electrolytically deposited coatings, weld-rod coatings, and sputtered coatings. Prerequisite: Ceramic Engineering 245; or Metallurgical Engineering 314 and 370; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Chemistry and Technology of Glass.** Glass structure and constitution and their relationship to chemical, physical, and electrical properties; melting, forming, and annealing operations; preparation of glasses and measurement of important glass properties; lectures and laboratory. Prerequisite: Junior standing in engineering, chemistry, physics, or geology. 3 hours or $\frac{3}{4}$ unit.
320. **Surfaces and Colloids.** An introduction to the chemistry and physics of surfaces and interfaces, with emphasis on behavior in liquid media; major areas include surface composition, surface and interfacial forces, colloidal stability and flocculation, and amphiphilic molecules. Prerequisite: Metallurgical Engineering 314, or Ceramic Engineering 245, or Chemistry 342, or Physics 361, or equivalent undergraduate course in thermodynamics or physical chemistry, or consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit.
331. **Ceramic Microscopy.** Studies the optical activity in isotropic and anisotropic media with particular emphasis on the materials and products of ceramics; the application of these principles and related topics of optical microscopy to the study of the morphology, aggregation, size, and microstructure of the products of high-temperature thermochemical reactions and equilibria. Includes studies in thermal microscopy if taken for 1 unit of graduate credit. Prerequisite: Ceramic Engineering 205 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
340. **Electrical Ceramics.** Presents the subject of dielectric crystals and their electrical properties; discussion and correlation of ferroelectric and piezoelectric properties of several crystal classes; coverage in detail of the perovskite class of ferroelectric compounds; and discussion of spinel, garnet, and hexagonal type ferrimagnetic crystals and their properties. Prerequisite: Ceramic Engineering 309 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
346. **Hybrid Circuit Fabrication Laboratory.** Same as Electrical Engineering 346. See Electrical Engineering 346.
347. **Portland Cement Technology.** An introduction to the production, composition, and properties of portland cement, emphasizing the technology and chemistry of cement manufacture, composition and characterization of cements, quality control and specifications, and reactions of cement with water in concrete. Prerequisite: Senior standing in engineering or chemistry, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
398. **Special Topics.** Studies advanced topics related to ceramic engineering. Prerequisite: Junior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
401. **Ceramic Chemistry.** Silica, silicates, fusions, and phase relations. Prerequisite: Courses in chemistry and physics. 1 unit.
405. **Glass Technology.** Following a brief review of unit processes and operations in glass manufacture, the course treats selected major topics relating to the glass preparation process and the chemical, mechanical, optical, and electrical properties of glass from a dominantly theoretical and research point of view. Prerequisite: Ceramic Engineering 314 or equivalent, or consent of instructor. $\frac{3}{4}$ or 1 unit.
410. **Dielectric Properties of Ceramic Materials.** Review of fundamental properties of vector fields; consideration of the reaction of insulating solids to external electric fields in terms of dielectric theory; the properties of ceramic dielectrics including treatment of ferroelectrics in terms of present theory; and correlation of the piezoelectric properties of ferroelectric crystals and ceramics with the crystal structure, microstructure, and the ferroelectric properties. Prerequisite: Mathematics 345 and 343, or consent of instructor. $\frac{3}{4}$ or 1 unit.
414. **Physical Chemistry of Clays and Soils.** Same as Soils 414 and Mining Engineering 414. See Soils 414.
418. **Physics of Strong Solids.** Characterization and interpretation of physical properties of single-phase and composite materials of high strength; covalently bonded semiconductors; transition-

- metal carbides; borides and nitrides; graphite; glass; fibers; and precipitation-hardened metals. Prerequisite: Any one of the following: Ceramic Engineering 307 or 421, Metallurgical Engineering 384, Chemistry 342 or Physics 490, or consent of instructor. 1 unit.
454. **Advanced Methods in Electron Microscopy.** Same as Biology 454. See Biology 454.
461. **Mineralogy of Clays.** Same as Geology 461. See Geology 461.
462. **Petrology of Clay Minerals.** Same as Geology 462. See Geology 462.
469. **Introductory Electron Microscopy in Physical Sciences.** Introduction to the theory, practice, design, operation, and routine maintenance of scanning and transmission electron microscopes and ancillary equipment; examines techniques for research-oriented studies in electron microscopy, electron diffraction, x-ray energy microanalysis, and practical interpretation of data. Introduces related photographic techniques, safety procedures, and established laboratory protocol. Prerequisite: Graduate standing or equivalent; consent of instructor or endorsement of advisor or supervisor. $\frac{1}{2}$ or 1 unit. Students may receive $\frac{1}{2}$ unit for either the first or latter section and 1 unit for both sections.
495. **Materials and Special Problems.** Conference and laboratory. Prerequisite: Graduate standing in ceramic engineering. 0 to 2 units.
497. **Research Seminars.** Discussion and lectures on current research topics. 0 or $\frac{1}{4}$ unit. May be repeated each semester.
498. **Seminar in Ceramics.** Lectures on current ceramic research and development; presentations by visiting lecturers as well as graduate students and staff in the department. Registration required of all graduate students in ceramic engineering. Graduate students nearing completion of their theses are required to make a seminar presentation. Prerequisite: Graduate standing in ceramic engineering. 0 credit.
499. **Thesis Research.** Research in any of the branches of ceramics. Prerequisite: Graduate standing in ceramic engineering; Ceramic Engineering 311. 0 to 4 units.

Materials Science and Engineering

301. **Thermodynamics of Materials.** Same as Ceramic Engineering 245 and Metallurgical Engineering 314. Introduces basic thermodynamic principles including energy, entropy, and free energy. These principles are used to describe the macroscopic properties such as equilibrium states, phases, and phase transitions of various materials systems. Emphasizes materials systems such as metals, ceramics, polymers, and electronic materials. Introduces the statistical interpretation of thermodynamics on the atomistic level. Prerequisite: Chemistry 102; Physics 107; Mathematics 242 or equivalent; or consent of instructor. 4 hours or 1 unit. Graduate students in Materials Science and Engineering may not receive graduate credit for this course.
400. **Statistical Thermodynamics of Materials.** Presents the atomistic concepts of statistical thermodynamics and shows its relationship to classical phenomenological thermodynamics. Applies the methods of statistical thermodynamics and statistical mechanical mechanics to describing the properties of a variety of materials, especially ceramics, polymers, electronic materials and metals. Prerequisite: Undergraduate course in thermodynamics or consent of instructor. 1 unit.
401. **Kinetic Processes in Materials.** Examines the fundamentals of rate processes in materials, both from a phenomenological and an atomistic point of view, with special emphasis on the kinetics of transformations and the transport of matter in solids. Prerequisite: Graduate course in statistical thermodynamics or consent of instructor.
444. **Molecular Statistics of Polymer Viscoelasticity.** Examines the rubber elastic and viscoelastic properties of polymers from the molecular statistical point of view. Describes and compares theoretical models in terms of their conceptual foundations and mathematical development. Analyzes experiments to test the theories in terms of the experimental design and data treatment. Compares the theoretical predictions and experimental findings. Prerequisite: Metallurgical Engineering 375 and 420 or equivalent graduate courses. Advanced undergraduate mathematics courses are helpful but not required. 1 unit.

Metallurgical Engineering

198. **Introduction to Metallurgy.** Lecture series by the faculty to orient freshmen to the field of metallurgy and to the study of materials. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
296. **Metallurgical Seminar.** Review of current metallurgical literature; classroom reports and discussions; and preparation of technical abstracts and reports. Prerequisite: Senior standing in metallurgical engineering. 2 hours.
299. **Thesis.** Investigation of special problems and preparation of a thesis. May be substituted for certain technical subjects in the senior year. Prerequisite: Senior standing; approval of head of department. 1 to 5 hours.
301. **Welding and Joining Processes.** Same as Civil Engineering 375. The physical principles of fusion welding; heat flow; thermal cycles; physical metallurgy and mechanical properties of welded joints; applications of welding to large structures; testing of welds; nondestructive testing; design, economics, and weld specifications; and laboratory experiments in welding. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
306. **Design of Engineering Alloys.** A study of the fundamental principles which determine the constitution, structure, treatment, and application of alloy steels and other special-purpose high-performance alloys. Prerequisite: Metallurgical Engineering 372. 3 hours, or $\frac{3}{4}$ or 1 unit.
307. **Corrosion of Metals.** Electrochemistry, thermodynamics, and kinetics of corrosion; behavior of ferrous and nonferrous metals; corrosion rates; corrosion control; cathodic and anodic protection; high-temperature corrosion; corrosion testing; and electrolytic machining methods. Prerequisite: Mechanical Engineering 234 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
310. **Crystallography and Diffraction.** Study of structure and composition of solids using X-rays and electron beams; radiography, spectroscopy, and X-ray and electron metallography. Prerequisite: Physics 108. 4 hours or 1 unit.
312. **Ternary Phase Diagrams.** Interpretation of ternary phase diagrams and applications to engineering alloy systems. Prerequisite: Metallurgical Engineering 334 or 370 or equivalent, or consent of instructor. 1 hour or $\frac{1}{4}$ unit. Students may not receive credit for both Metallurgical Engineering 312 and Ceramic Engineering 205.
314. **Thermodynamics of Materials.** Same as Chemistry 245, Materials Science and Engineering 301, and Metallurgical Engineering 314. See Materials Science and Engineering 301.
316. **Mechanical Metallurgy.** Fundamentals of plastic deformation of crystalline solids; elementary theory of statics and dynamics of dislocations; applications to deformation of single crystals and polycrystals; fracture; and effect of metallurgical variables on mechanical properties. Prerequisite: Junior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
317. **Fracture Mechanisms and Failure Analysis.** Mechanisms of the various forms of fracture of metals and alloys; relationships between microstructure and resistance to common modes of fracture; environmental effects on fracture; alloy design to optimize fracture resistance; and failure analysis using optical and electron microscopy. This course emphasizes the atomistic aspects of fracture and is complementary to Theoretical and Applied Mechanics 324. Prerequisite: Theoretical and Applied Mechanics 224 or Metallurgical Engineering 316, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
318. **Physics of Metals.** The nature of the perfect and imperfect crystal, the electronic structure of solids, electrical conduction in metals and semiconductors, and dielectric and magnetic properties of solids. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
334. **Physical Metallurgy for Engineers.** Fundamentals of crystallography, imperfections, alloying, and deformation; consideration of composition, temperature, and prior thermal and mechanical treatment in the use of metals, with emphasis on their mechanical properties. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 or Aeronautical and Astronautical Engineering 224, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
370. **Physical Metallurgy, I.** First of a two-semester sequence treating metallurgical phenomena and their utilization in engineering materials and processes; defects, diffusion, phase diagrams, solidification and casting, and plastic deformation and annealing. Prerequisite: Ju-

- nior standing in engineering; Mathematics 345; Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
371. **Physical Metallurgy Laboratory, I.** Laboratory course to be taken simultaneously with Metallurgical Engineering 370. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 370. 3 hours or 1 unit.
372. **Physical Metallurgy, II.** Continuation of Metallurgical Engineering 370. Precipitation; eutectoid reactions; martensite; ordering; surface reactions; cast iron; and joining. Prerequisite: Metallurgical Engineering 370 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
373. **Physical Metallurgy Laboratory, II.** Laboratory course to be taken simultaneously with Metallurgical Engineering 372. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 372. 3 hours or 1 unit.
375. **Introduction to Polymers.** Fundamentals of polymer science and engineering; polymer chain structure and statistics; polymerization mechanisms and kinetics; molecular weight distributions; rheological and mechanical properties of amorphous polymers; the glassy state; crystalline morphology, mechanisms and kinetics of polymer crystallization, and mechanical behavior of crystalline polymers; methods of fabrication; and solution properties. Prerequisite: Advanced undergraduate or graduate standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
378. **Polymer Characterization Laboratory.** Characterizes polymeric materials experimentally to investigate molecular, microstructural and macroscopic aspects of their mechanical, thermal, electrical, and optical properties. Prerequisite: Metallurgical Engineering 375 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
386. **Electron Microscopy and Diffraction Theory.** Theory and application of transmission electron microscopy and diffraction with emphasis on thin crystals; electron optics, interference phenomena, interpretation of images and diffraction patterns, specimen preparation, etc. Prerequisite: Metallurgical Engineering 310 or equivalent. 3 hours or 1 unit.
387. **Advanced Physical Metallurgy.** Advanced physical metallurgy designed for graduate students whose undergraduate degrees are in engineering or physical science fields other than metallurgy or materials science; discusses the standard topics of physical metallurgy with an emphasis on underlying physical principles; and includes selected laboratory experiments. Prerequisite: Advanced undergraduate standing in a field other than metallurgy. 4 hours or 1 unit.
401. **Defects and Plastic Deformation in Metals.** Studies point, line, and surface defects in metals; configuration, thermodynamics, and motion; quantitative description of single dislocation properties; and interactions among defects. For students in metallurgy, ceramics, physics, and other solid state sciences. Prerequisite: Mathematics 345 and Metallurgical Engineering 316 and 318; or consent of instructor. 1 unit.
408. **Dislocations and Mechanical Properties of Metals.** General static and dynamic properties of single dislocations in crystals; dislocation interactions; properties of dislocation arrays; and role of dislocations in metallurgical phenomena with particular emphasis on mechanical properties. Prerequisite: Consent of instructor. 1 unit.
410. **Advanced X-Ray Metallography.** X-ray diffraction as applied to the study of metals and alloys; effects of cold work, annealing, substructures, preferred orientation, and ordering; and principles of electron and neutron diffraction. Prerequisite: Consent of instructor. 1 unit.
430. **Surface Physics.** Same as Physics 430. Introduction to theory and experiment of atomic behavior on crystal surfaces; thermodynamics of surfaces; surface energy; diffraction and structure; gas-solid collisions; Brownian motion, diffusion, and evaporation; electron and ion emission, tunnelling; Van der Waals forces; theory of chemical interactions; and kinetics and statistics of adsorption. Prerequisite: Metallurgical Engineering 421 or Physics 489, or consent of instructor. 1 unit.
444. **Molecular Statistics of Polymer Viscoelasticity.** The rubber elastic and viscoelastic properties of polymers are examined from the molecular statistical point of view. Theoretical models are described and compared in terms of their conceptual foundations and mathematical development. Experiments to test the theories are analyzed in terms of the experimental design and data treatment. A comparison is made between the theoretical predictions and experimen-

- tal findings. Prerequisites: Metallurgical Engineering 375 and 420 or equivalent graduate courses. Advanced undergraduate mathematics courses are helpful but not required. 1 unit.
452. **Solidification Processing.** Same as Mechanical Engineering 452. See Mechanical Engineering 452.
485. **Metallurgical Engineering Problems.** Individual study in areas of metallurgy not covered by regular course offerings; carried out under the supervision of a member of the faculty. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
486. **Laboratory Investigations in Metallurgy.** Special investigations in metallurgy providing an opportunity for instruction in experimental methods of research. Available only to nonthesis students enrolled in a Master of Science program. Prerequisite: Consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
492. **Research Seminars.** Discussion and lectures on current research topics. 0 or $\frac{1}{4}$ unit. May be repeated each semester.
498. **Colloquium on Materials Research.** Reviews current materials research in other laboratories by visiting lecturers; also presents some of the research currently done in the department. Required of all graduate students in the department. 0 or $\frac{1}{4}$ unit. May be repeated. No more than $\frac{1}{2}$ unit may be counted toward the M.S. degree.
499. **Thesis Research.** Individual research in specialized problems under the supervision of members of the staff. Results of research may be used for graduate thesis. 0 to 4 units.

MATHEMATICS

Chair of Department: C. Ward Henson

Department Office: 273 Altgeld Hall, 1409 West Green, Urbana

101. **Basic Mathematics.** Review of arithmetic and the following topics in basic algebra: signed numbers, absolute value and the number line, first degree equations and inequalities, algebraic expressions and rules of exponents, factoring, and graphing. Enrollment is restricted. Prerequisite: Placement is determined by score on appropriate placement test, or consent of the Mathematics Department. 3 hours. Credit may not be used toward graduation in the College of LAS.
102. **Introductory Algebra.** Methods of elementary algebra, including simplification of algebraic expressions, solving linear and quadratic equations, equations of lines, systems of linear equations, and radicals. Enrollment is restricted. Prerequisite: Mathematics 101, or score on appropriate placement test, or consent of Mathematics Department. 3 hours. Credit may not be used toward graduation in the College of LAS.
103. **Elementary Algebra Review.** Review and supplementary material in intermediate algebra in preparation for, or as a supplement to, Algebra (Mathematics 112). 0 hours. Not intended for credit toward a baccalaureate degree.
104. **Trigonometry Tutorial.** Trigonometry instruction in small classes as a supplement to Mathematics 114. Prerequisite: Concurrent registration in Mathematics 114. 0 hours. Not intended for credit toward a baccalaureate degree.
112. **Algebra.** Rapid review of basic techniques of factoring, rational expressions, equations and inequalities; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; and the binomial theorem. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 $\frac{1}{2}$ units of high school algebra, and 1 unit of high school geometry. 3 hours. Credit is not given for both Mathematics 112 and 116. Credit not applicable toward graduation in certain colleges.
114. **Trigonometry.** Studies degrees and radians, the trigonometric functions, identities and equations, inverse functions, oblique triangles and applications. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: 1 $\frac{1}{2}$ units of high school algebra, or concurrent registration in Mathematics 112; 1 unit of high school geometry. 2 hours. Credit is not given for both Mathematics 114 and 116. Credit not applicable toward graduation in certain colleges.

116. **Algebra and Trigonometry.** A unified treatment of algebra and trigonometry that combines Mathematics 112 and 114. Students who need Mathematics 112 and 114 should enroll in Mathematics 116. Prerequisite: 1 ½ units of high school algebra; 1 unit of high school geometry. 5 hours. Credit is not given for both Mathematics 116 and 112. Students with credit in Mathematics 114 may receive 3 hours credit for Mathematics 116. Credit not applicable toward graduation in certain colleges.
118. **Introduction to Mathematics, I.** An elementary course for students whose major interests are not in engineering or the physical sciences; provides an overall view of mathematics; emphasizes ideas and concepts rather than routine drill; and includes concepts from the following areas: combinatorics, number theory, the real and rational number systems, topology, representation of numbers, and map coloring. Prerequisite: 1 unit of high school algebra; 1 unit of high school plane geometry; or equivalent. 3 hours.
119. **Introduction to Mathematics, II.** Continuation of Mathematics 118; includes concepts from the following areas: combinatorics, algebraic number theory, constructions, cardinal numbers, probability and statistics, analytic geometry, and calculus. Prerequisite: Mathematics 118. 3 hours.
120. **Calculus and Analytic Geometry, I.** First course in calculus and analytic geometry; basic techniques of differentiation and integration with applications, including curve tracing in the plane. Students with strong backgrounds in analytic geometry should normally enroll in Mathematics 135. Prerequisite: Mathematics 116; or Mathematics 112 and 114; or an adequate mathematics placement test score. 5 hours. Credit is not given for Mathematics 120 and Mathematics 134 or 135.
124. **Finite Mathematics.** An introduction to finite mathematics for students in the social sciences; introduces the student to the basic ideas of logic, set theory, probability, vectors and matrices, and Markov chains. Problems are selected from social sciences and business. Prerequisite: Mathematics 112, or an adequate mathematics placement test score. 3 hours.
125. **Elementary Linear Algebra with Applications.** Basic concepts and techniques of linear algebra; includes systems of linear equations, matrices, determinants, vectors in n -space, and eigenvectors, together with selected applications, such as Markov processes, linear programming, economic models, least squares, and population growth. Prerequisite: Mathematics 112, or an adequate placement test score. 3 hours. Credit is not given for both Mathematics 125 and 225.
132. **Calculus and Analytic Geometry, II.** Second course in calculus and analytic geometry; techniques of integration, conic sections, polar coordinates, and infinite series. Prerequisite: Mathematics 120. 3 hours.
134. **Calculus for Social Scientists, I.** Introduction to the concept of functions and the basic ideas of the calculus. Prerequisite: Mathematics 112. 4 hours. Credit is not given for Mathematics 134 and Mathematics 120 or 135.
135. **Calculus.** First course in calculus. Differentiation and integration; applications to curve-tracing, maxima and minima, area, and volume. Prerequisite: Completion of a thorough course in plane and solid analytic geometry, or equivalent. 5 hours. Credit is not given for both Mathematics 135 and 120.
149. **Honors Course in Mathematics.** Prerequisite: Concurrent registration in an honors section of Mathematics 120, 132, 135, 242, or 245; consent of the department. Enrollment is strictly limited to students with superior mathematical talents. 1 hour.
161. **Statistics.** Same as Statistics 100. See Statistics 100.
198. **Freshman Seminar.** Guides the student in the study of selected topics not considered in standard courses. Prerequisite: Enrollment in the mathematics honors program; consent of department. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Computers for Elementary Teachers.** Introduction to computers and basic programming principles and practices with special emphasis on applications to elementary mathematics. 3 hours. May be used for credit only in teacher preparation programs leading to certification in elementary or early childhood education.
201. **Mathematics for Elementary Teachers.** Analyzes the mathematical issues underlying elementary school mathematics. Topics include sets, place-value notation, arithmetic algorithms, elementary number theory, rational and irrational numbers, applications. Simple programming prob-

lems are assigned. Prerequisite: Mathematics 200 or equivalent. 3 hours. May be used for credit only in teacher preparation programs leading to certification in elementary or early childhood education.

210. **Theory of Interest.** A study of compound interest and annuities; applications to problems in finance. Prerequisite: Mathematics 132 or equivalent. 3 hours.
213. **Introduction to Discrete Mathematics.** Beginning course on discrete mathematics, including sets and relations, functions, basic counting techniques, recurrence relations, graphs and trees, and matrix algebra; emphasis throughout is on algorithms and their efficacy. Prerequisite: Mathematics 120 or 135. 3 hours.
225. **Introductory Matrix Theory.** Systems of linear equations, matrices and inverses, determinants, and a glimpse at vector spaces, eigenvalues and eigenvectors. Prerequisite: Mathematics 120. 2 hours. Credit is not given for both Mathematics 225 and 125. Also, students with earned credit in Mathematics 315 may not receive additional credit for Mathematics 225, when 225 is taken after 315.
242. **Calculus of Several Variables.** Third course in calculus and analytic geometry: three dimensional space, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 132. 3 hours. Credit is not given for both Mathematics 242 and either Mathematics 244 or 245.
244. **Calculus for Social Scientists, II.** Continuation of Mathematics 134. The calculus of the trigonometric functions, Taylor polynomials, and infinite series; analytic geometry in n dimensions, vector calculus, classical extremum problems in n variables, and Lagrange multipliers; and multiple integrals. Prerequisite: Mathematics 134 or consent of instructor. 5 hours. Students may not receive credit for both Mathematics 244 and either Mathematics 242 or 245.
245. **Calculus, II.** Continuation of Mathematics 135. Polar coordinates, vectors and parametric equations, infinite series, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 135. 5 hours. Students may not receive credit for both Mathematics 245 and either Mathematics 242 or 244.
247. **Intermediate Analysis.** Advanced calculus for students in mathematics: topics include continuity, gradients, Jacobians, optimization, vector integration, Stokes' theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 247 and 280. (Counts for advanced hours in LAS.)
257. **Numerical Methods.** Same as Computer Science 257. See Computer Science 257.
263. **Statistics for Scientists.** Same as Statistics 210. See Statistics 210.
270. **Actuarial Problem Solving.** Methods and techniques of solving problems in actuarial mathematics for advanced students intending to enter the actuarial profession. Prerequisite: Consent of instructor. 1 to 2 hours. May be repeated to a maximum of 4 hours.
280. **Advanced Calculus.** Introductory study of vector calculus and functions of several variables; topics include directional derivatives; Jacobians; change of variables in multiple integrals; maxima and minima; line and surface integrals; theorems of Gauss, Green, and Stokes; infinite series; and uniform convergence. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 280 and 247. (Counts for advanced hours in LAS.)
285. **Differential Equations and Orthogonal Functions.** Intended for engineering students and others who require a working knowledge of differential equations; included are techniques and applications of ordinary differential equations and an introduction to partial differential equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Credit is not given for both Mathematics 285 and 341. (Counts for advanced hours in LAS.)
290. **Individual Study.** Guided individual study of advanced topics not covered in other courses. Prerequisite: Mathematics 347 with grade of B or better, or consent of department. 2 hours. May be repeated to a maximum of 8 hours.
291. **Honors Individual Study.** Guided individual study of advanced topics not covered in other courses; for students seeking honors credit. Prerequisite: Mathematics 347 with grade of B or better, or consent of Mathematics Honors Committee. 2 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
296. **Honors Seminar.** Careful study of a selected area of mathematics, carried out either deductively from axioms or inductively through problems; subject matter varies with instructor.

Prerequisite: Consent of Mathematics Honors Committee. 3 hours. May be repeated to a maximum of 6 hours.

302. **Topics on Geometry.** Historical development of geometry; includes tacit assumptions made by Euclid; the discovery of non-Euclidean geometries; geometry as a mathematical structure; and an axiomatic development of plane geometry. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
303. **Advanced Aspects of Euclidean Geometry.** Selected topics from geometry, including the nine-point circle, theorems of Ceva and Menelaus, regular figures, isometries in the plane, ordered and affine geometries, and the inversive plane. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
305. **Teacher's Course.** Presents selected topics in mathematics that are related to the content of secondary school mathematics programs; provides background for enrichment topics for secondary school students. Subject matter varies with the instructor. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
306. **History of Calculus.** An examination of the historical origins and genesis of the concepts of the calculus; includes mathematical developments from the ancient Greeks to the eighteenth century. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
308. **Actuarial Statistics, I.** Same as Statistics 308. Examines elementary theory of probability, including independence, conditional probability, and Bayes' theorem; combinations and permutations; random variables, expectations, and probability distributions; joint and conditional distributions; functions of random variables; sampling; central limit theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit. Credit is not given for both Mathematics 308 and either Mathematics 361 or Statistics 310.
309. **Actuarial Statistics, II.** Same as Statistics 309. Continuation of Mathematics 308. Examines parametric point and interval estimation, including maximum likelihood estimation, sufficiency, completeness, and Bayesian estimation; hypothesis testing; linear models; regression and correlation. Prerequisite: Mathematics 308. 4 hours or 1 unit. Credit is not given for both Mathematics 309 and Statistics 311.
311. **Actuarial Linear Techniques.** Introduces techniques of linear algebra and linear programming; topics include matrix operations, determinants, linear equations, vector spaces, linear programs, the simplex method, and duality for linear programs. Prerequisite: Credit or concurrent registration in Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 311 and 315.
312. **Graph Theory and Its Applications.** Examines basic concepts and applications of graph theory, where graph refers to a set of vertices and edges that join some pairs of vertices; topics include subgraphs, connectivity, trees, cycles, vertex and edge coloring, planar graphs and their colorings. Draws applications from computer science, operations research, chemistry, the social sciences, and other branches of mathematics, but emphasis is placed on theoretical aspects of graphs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
313. **Combinatorial Mathematics.** Same as Computer Science 313. Permutations and combinations, generating functions, recurrence relations, inclusion and exclusion, Polya's theory of counting, and block designs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
314. **Introduction to Mathematical Logic.** Introduction to the formalization of mathematics and the study of axiomatic systems; expressive power of logical formulas; detailed treatment of propositional logical and predicate logic; compactness theorem and Godel completeness theorem, with applications to specific mathematical theories; algorithmic aspects of logical formulas. Proofs are emphasized in this course, which can serve as an introduction to abstract mathematics and rigorous proof; some ability to do mathematical reasoning required. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or 1 unit.
315. **Linear Transformations and Matrices.** An introductory course emphasizing techniques of linear algebra; topics include matrix operations, determinants, linear equations, vector spaces, linear transformations, eigenvalues, and eigenvectors. Prerequisite: Mathematics 242 or 245; elementary knowledge of matrix multiplication, Gaussian elimination, matrix inverses, and calculation of determinants (students who lack this linear algebra background can take Mathematics 125 or 225). 3 hours or 1 unit.

317. **Introduction to Abstract Algebra.** An introductory course in abstract algebra; includes modular arithmetic, permutations, group theory through the isomorphism theorems, ring theory through the notions of prime and maximal ideals, and additional topics such as unique factorization domains and classification of groups of small order. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
318. **Introduction to Linear Algebra.** Abstract approach emphasizing concept of linear transformation; topics include linear equations, vector spaces, linear transformations, matrices, determinants, invariant subspaces, direct sum decompositions, canonical forms, inner product spaces, and bilinear forms. Emphasizes proofs. Prerequisite: Mathematics 317 or consent of instructor. 3 hours or 1 unit.
319. **Applied Modern Algebra.** Same as Electrical Engineering 319. Sets and functions, finite-state machines, partially ordered sets, Boolean algebras, normal form of switching functions, the semigroup of a machine, and group codes. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
323. **The Calculus of Curves and Surfaces.** Applications of the calculus to the study of shape and curvature of curves and surfaces; introduction to vector fields, differential forms on Euclidean spaces, and the method of moving frames for low-dimensional differential geometry. Prerequisite: Mathematics 242 or 245; or equivalent. 3 hours or 1 unit.
332. **Introduction to Set Theory and Topology.** Informal set theory, cardinal and ordinal numbers, and axiom of choice; topology of metric spaces and introduction to general topological spaces. Prerequisite: Credit or concurrent registration in Mathematics 347. 3 hours or 1 unit.
339. **Philosophy of Mathematics.** Same as Philosophy 339. See Philosophy 339.
341. **Differential Equations.** A basic course in ordinary differential equations; topics include existence and uniqueness of solutions and the general theory of linear differential equations; treatment is more rigorous than that given in Mathematics 285. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit. Credit is not given for both Mathematics 341 and 285.
342. **Fourier Series and Boundary Value Problems.** Deals with the theory of Fourier series and applications to solving partial differential equations. Prerequisite: Mathematics 285 or 341. 3 hours or 1 unit.
344. **Elementary Real Analysis.** Careful treatment of the theoretical aspects of the calculus of functions of a real variable; topics include the real number system, limits, continuity, derivatives, and the Riemann integral. Prerequisite: Mathematics 242 or 245. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
346. **Complex Variables and Applications.** For students who desire a working knowledge of complex variables; covers the standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, and potential fields. Students desiring a systematic development of the foundations of the subject should take Mathematics 348. Prerequisite: Mathematics 280 or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
347. **Introduction to Higher Analysis: Real Variables.** Careful development of elementary real analysis including such topics as completeness property of the real number system; basic topological properties of n -dimensional space; convergence of numerical sequences and series of functions; properties of continuous functions; and basic theorems concerning differentiation and Riemann integration. Prerequisite: Mathematics 242 or 245 (or equivalent) and junior standing; or consent of instructor. 3 hours or 1 unit. Credit is not given for both Mathematics 344 and 347.
348. **Introduction to Higher Analysis: Complex Variables.** For students who desire a rigorous introduction to the theory of functions of a complex variable; topics include Cauchy's theorem, the residue theorem, the maximum modulus theorem, Laurent series, the fundamental theorem of algebra, and the argument principle. Prerequisite: Mathematics 347. 3 hours or 1 unit. Credit is not given for both Mathematics 346 and 348.
351. **Topics in Applied Mathematics.** Deals with topics in the application of mathematics to the physical, biological, and social sciences; see *Timetable* or department office for current topics. Prerequisite: Consent of instructor. 3 hours or 1 unit. May be repeated with consent of instructor.
352. **Multivariate Real Analysis.** Rigorous treatment of the calculus of functions of several real variables; topics covered include differentials, maxima and minima, Lagrange multipliers, trans-

formation of multiple integrals, Jacobian's, implicit function theorems, line and surface integrals, Stokes' theorem, and vector analysis. Prerequisite: Mathematics 347. 3 hours or 1 unit.

353. **Elementary Theory of Numbers.** Topics covered include divisibility, primes, congruences, quadratic reciprocity, and Farey sequences. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
355. **Numerical Methods for Partial Differential Equations.** Same as Computer Science 355. See Computer Science 355.
358. **Numerical Linear Algebra.** Same as Computer Science 358. See Computer Science 358.
359. **Numerical Approximation and Ordinary Differential Equations.** Same as Computer Science 359. See Computer Science 359.
361. **Introduction to Probability Theory, I.** Same as Statistics 351. Introduction to mathematical probability; includes the calculus of probability, combinatorial analysis, random variables, expectation, distribution functions, moment-generating functions, and central limit theorem. Prepares students for Mathematics 366. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
363. **Introduction to Mathematical Statistics and Probability, I.** Same as Statistics 310. See Statistics 310.
364. **Introduction to Mathematical Statistics and Probability, II.** Same as Statistics 311. See Statistics 311.
365. **Analysis of Variance.** Same as Statistics 324. See Statistics 324.
366. **Introduction to Probability Theory, II.** Same as Statistics 356. Continuation of Mathematics 361. Includes random walks, discrete and continuous time Markov chains, and special topics selected from weak stationarity, multivariate central limit theorem, probability model building, stochastic equations, martingale theory, and renewal theory. Prerequisite: Mathematics 361 or Statistics 311. 3 hours or 1 unit.
368. **Topics in Applied Statistics.** Same as Statistics 330. See Statistics 330.
369. **Methods of Applied Statistics.** Same as Statistics 320. See Statistics 320.
370. **Finite Differences.** Finite differences, finite integration, interpolation, difference equations, numerical integration, and iterative methods of solving equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or 1 unit.
371. **Actuarial Theory, I.** Distribution of the time-to-death random variable for a single life, and its implications for evaluations of insurance and annuity functions, net premiums, and reserves. Prerequisite: Math 308 and 210. 4 hours or 1 unit.
372. **Actuarial Theory, II.** Continuation of Mathematics 371. Emphasis is on multiple-life functions. Prerequisite: Mathematics 371. 3 hours or 1 unit.
373. **Combinatorial Algorithms.** Same as Computer Science 373. See Computer Science 373.
375. **Automata, Formal Languages, and Computational Complexity.** Same as Computer Science 375. See Computer Science 375.
376. **Actuarial Risk Theory.** Mathematical analysis of the risk to an insurer due to variations in expected claim numbers and amounts; optimal insurance systems; the probability of ruin in the long run; reinsurance; dividend formulas. Prerequisite: Credit or concurrent registration in Statistics 309 or 311. 3 hours or 1 unit.
381. **Vector and Tensor Analysis.** Vector spaces, transformation properties, covariant and contravariant tensors, and differential geometry of surfaces; applications to relativity theory. Prerequisite: Mathematics 247, 280 or equivalent, or consent of instructor. 3 hours or 1 unit.
382. **Linear Programming and Combinational Optimization.** Rigorous introduction to wide range of topics in optimization; includes thorough treatment of basic ideas of linear programming; additional topics are drawn from numerical considerations, linear complementarity, integer programming and networks, polyhedral methods and matroids. Prerequisite: Mathematics 315. 3 hours or 1 unit. Credit not given for Mathematics 383 if taken after Mathematics 382.
383. **Linear Programming.** Same as Computer Science 383. Systems of linear inequalities, the standard canonical and general linear problems, and simplex methods of solution. Prerequisite: Mathematics 125, 225, or 315; or equivalent. 3 hours or 1 unit.
384. **Nonlinear Programming.** Iterative and analytical solutions of constrained and unconstrained problems of optimization; gradient and conjugate gradient solution methods; Newton's method, Lagrange multipliers, and duality and the Kuhn-Tucker theorem; and quadratic,

- convex, and geometric programming. Prerequisite: Mathematics 242 or 245, and a knowledge of linear algebra equivalent to Mathematics 315, or consent of instructor. 3 hours or 1 unit.
385. **Differential Equations, II.** Continuation of Mathematics 285. Linear systems of differential equations, including a self-contained development of the necessary matrix theory; the Laplace transform; and nonlinear differential equations. Prerequisite: Mathematics 285 or 341. 3 hours or 1 unit.
388. **Mathematical Methods in Engineering and Science.** Matrices, determinants, bounds and approximations to eigenvalues, introduction to linear operator theory and inner product spaces, orthogonal expansions, and Fourier transforms. Prerequisite: Mathematics 280 or equivalent. 3 hours or 1 unit.
391. **Logic Design.** Same as Computer Science 362 and Electrical Engineering 391. See Electrical Engineering 362.
393. **Statistical Computing.** Same as Statistics 328. See Statistics 328.
394. **Time Series Analysis.** Same as Statistics 329. See Statistics 329.
400. **General Seminar.** General seminar required of all graduate students who have passed the departmental written qualifying examination for the Ph.D. 0 units.
401. **Second Course in Abstract Algebra, I.** Isomorphism theorems for groups; solvability of p -groups; simplicity of the alternating group on 5 letters; Sylow theorems and Jordan-Hölder theorem; principal ideal domains; Gauss' lemma; Eisenstein's criterion; fundamental theorem of Galois theory; finite fields; cyclotomic fields; and solvability of equations by radicals. Prerequisite: Mathematics 317 and 318. 1 unit.
402. **Second Course in Abstract Algebra, II.** Modules; Hilbert basis theorem; Krull-Schmidt theorem; Wedderburn theorem on semisimple rings; finitely generated modules over principal ideal domains, with applications to abelian groups and canonical forms for matrices; categories and functors; tensor products; and bilinear and quadratic forms. Prerequisite: Mathematics 401. 1 unit.
403. **Theory of Rings.** Ideal theory in commutative rings; structure of noncommutative rings. Prerequisite: Mathematics 402 or equivalent. 1 unit.
404. **Group Theory.** Structure of groups, derived groups, nilpotence and solvability, and extensions and products. Prerequisite: Mathematics 402 or equivalent. 1 unit.
405. **Algebraic Number Theory.** Further development of the theory of fields covering topics from valuation theory, ideal theory, units in algebraic number fields, ramification, function fields, and local class field theory. Prerequisite: Mathematics 402 or equivalent. 1 unit.
406. **Homological Algebra.** Definition and properties of the functors Ext and Tor ; projective, injective, and flat modules; group extensions; dimensions of rings, and Hilbert theorem on syzygies. Prerequisite: Mathematics 402 or equivalent. 1 unit.
407. **Group Representation Theory.** Representation of groups by linear transformations, group algebras, character theory, and modular representations. Prerequisite: Mathematics 402 or equivalent. 1 unit.
408. **Lie Algebras.** Examples of Lie algebras (low dimensions, Lie algebras of Lie groups, free algebras, and universal enveloping algebra); Poincaré-Birkhoff-Witt theorem; nilpotent and solvable algebras; Cartan subalgebras; structure of semisimple algebras; real forms; and representations. Prerequisite: Mathematics 401; credit or concurrent registration in Mathematics 402. 1 unit.
410. **Mathematical Logic.** Development of first order predicate logic; completeness theorem; formalized number theory and the Gödel incompleteness theorem. Prerequisite: Mathematics 314 or 317 or consent of instructor. 1 unit.
411. **Model Theory.** Techniques for constructing models, including compactness and Löwenheim-Skolem theorems, unions of elementary chains, and omitting types construction; categorical theories; ultraproducts; saturated models; quantifier elimination; applications to algebraically closed fields, real closed fields, and other fundamental structures of mathematics. Prerequisite: Mathematics 410, or consent of instructor. 1 unit.
412. **Recursive Function Theory.** Various characterizations of the class of recursive (i.e., computable) functions; the Church-Turing thesis; unsolvability of the halting problem; the recursion theorem and the enumeration theorem; relative computability, the jump operation, and the

- arithmetical hierarchy; recursively enumerable sets; degrees of unsolvability; and the priority method. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.
413. **Set Theory.** Zermelo-Fraenkel axiomatic set theory; basic concepts in set theory such as ordinal, cardinal, rank, and definition by transfinite recursion; Godel's constructible universe; introduction to forcing; Boolean valued universes; large cardinals; consistency and independence of the continuum hypothesis and the axiom of choice. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.
414. **Advanced Topics in Logic.** Prerequisite: Mathematics 410; consent of instructor. 1 unit.
415. **Advanced Topics in the Theory of Groups.** Prerequisite: Consent of instructor. 1 unit.
416. **Advanced Topics in Abstract Algebra.** Prerequisite: Consent of instructor. 1 unit.
418. **Graph Theory.** Same as Computer Science 472. Structure of graphs; planarity and colorability of graphs; matrices associated with a graph; and automorphism group of a graph. Prerequisite: Mathematics 313, 317, or 319, or equivalent. 1 unit.
422. **Algebraic Geometry.** Properties of affine and projective varieties defined over algebraically closed fields; rational mappings, birational geometry and divisors, especially on curves and surfaces; introduction to the language of schemes; and Riemann-Roch theorem for curves. Prerequisite: Mathematics 402. 1 unit.
423. **Differentiable Manifolds.** Definition and properties of differentiable manifolds and maps, introducing vector fields, tangent bundles, differential forms, exterior derivatives, and foliations. Prerequisite: Mathematics 323 or 381, or consent of instructor. 1 unit.
424. **Riemannian Geometry.** Local and global properties of Riemannian manifolds. Prerequisite: Mathematics 423. 1 unit.
425. **Linear Analysis on Manifolds.** Study of topological invariants of differentiable and complex manifolds. Prerequisite: Mathematics 423 and 431, or consent of instructor. 1 unit.
427. **Lie Groups.** Study of groups which are also differentiable manifolds. Prerequisite: Mathematics 423. 1 unit.
428. **Topics in Geometry.** Prerequisite: Consent of instructor. 1 unit.
430. **Elementary Geometry from a Modern Viewpoint.** Designed for secondary school teachers of mathematics; primary purpose is to discuss critically the logical structure and content of Euclidean geometry from the modern point of view; and consideration is given to the historical development of the modern approach. Prerequisite: Consent of instructor. 1 unit.
431. **Algebraic Topology, I.** Homological algebra techniques, simplicial and singular homology, fundamental group and covering spaces, and applications. Prerequisite: Mathematics 318 and 332; concurrent registration in Mathematics 401 or consent of instructor. 1 unit.
432. **Algebraic Topology, II.** Continuation of Mathematics 431. Axiomatic homology theory, fibrations and cofibrations, CW-complexes, cohomology products, and other topics. Prerequisite: Mathematics 431; concurrent registration in Mathematics 402. 1 unit.
433. **Fiber Spaces and Characteristic Classes.** Continuation of Mathematics 432. Study of fiber bundles and their associated characteristic classes; applications to geometric problems. Prerequisite: Mathematics 432. 1 unit.
435. **General Topology, I.** Study of topological spaces and maps, including Cartesian products, identifications, connectedness, compactness, uniform spaces, and function spaces. Prerequisite: Mathematics 332 or consent of instructor. 1 unit.
436. **General Topology, II.** Continuation of Mathematics 435. Prerequisite: Mathematics 435. 1 unit.
438. **Topics in Topology.** Prerequisite: Consent of instructor. 1 unit.
440. **Theory of Functions of a Complex Variable, I.** Topics include the Cauchy theory, harmonic functions, entire and meromorphic functions, and the Riemann mapping theorem. Prerequisite: Mathematics 346 and 347, or Mathematics 348. 1 unit.
441. **Real Analysis, I.** Lebesgue measure on the real line; integration and differentiation of real valued functions of a real variable; and additional topics at discretion of instructor. Prerequisite: Mathematics 347 or equivalent. 1 unit. Credit is not given for both Mathematics 441 and 481.
442. **Real Analysis, II.** Abstract measure theory; integration on general measure spaces; and introduction to functional analysis. Prerequisite: Mathematics 441. 1 unit.
443. **Ordinary Differential Equations.** Existence, uniqueness, and continuation of solutions; topics selected from the following: the theory of linear differential operators, Sturm-Liouville theory,

- stability theory, and qualitative theory of differential equations. Prerequisite: Mathematics 347; a first course in ordinary differential equations. 1 unit.
444. **Partial Differential Equations.** A basic introduction to the study of partial differential equations; topics include: the Cauchy problem, power-series methods, characteristics, classification, canonical forms, well-posed problems, Riemann's method for hyperbolic equations, the Goursat problem, the wave equation, Sturm-Liouville problems and separation of variables, Fourier series, the heat equation, integral transforms, Laplace's equation, harmonic functions, potential theory, the Dirichlet and Neumann problems, and Green's functions. Prerequisite: Consent of instructor. 1 unit.
445. **Theory of Functions of a Complex Variable, II.** Continuation of Mathematics 440. Topics include subharmonic functions, Nevanlinna theory, analytic continuation and Riemann surfaces, and univalent functions. Prerequisite: Mathematics 440. 1 unit.
446. **Hilbert Spaces.** Geometrical properties of Hilbert spaces; linear operators; and the spectral theory for self adjoint and related operators. Prerequisite: Mathematics 442. 1 unit.
447. **Banach Spaces.** Geometrical properties of Banach spaces; bounded linear operators; applications to analysis; and linear topological spaces. Prerequisite: Mathematics 442. 1 unit.
448. **Harmonic Analysis.** Harmonic analysis on the circle, the line, and the integers, i.e., Fourier series and transforms; locally compact Abelian groups; convergence and summability; conjugate functions; Hardy spaces; uniqueness; Tauberian theorems; almost-periodic functions; commutative Banach algebras. Prerequisite: Mathematics 348 and 442; knowledge of Banach spaces. 1 unit.
451. **Theory of Probability, I.** Same as Statistics 451. Mathematical foundations or probability and stochastic processes; probability measures, random variables, distribution functions, convergence theory, the Central Limit Theorem, conditional expectation, and martingale theory. Prerequisite: Mathematics 442. 1 unit. Credit is not given for both Mathematics 451 and either 481 or 482.
452. **Theory of Probability, II.** Same as Statistics 452. Continuation of Mathematics 451. Prerequisite: Mathematics 451. 1 unit. Credit is not given for both Mathematics 452 and 482.
453. **Analytic Theory of Numbers, I.** Problems in number theory treated by methods of analysis; topics chosen from prime number theory, Riemann zeta function, sieve methods, diophantine approximation, metric theory, partitions, lattice points, Waring's problem, and asymptotic properties of arithmetical functions. Prerequisite: Mathematics 317 or 348. 1 unit.
454. **Analytic Theory of Numbers, II.** Continuation of Mathematics 453. Prerequisite: Mathematics 453. 1 unit. May be repeated.
455. **Mathematical Methods of Physics.** Introduction to inner product spaces, linear operators, and Schwartz distribution theory; Green's functions for ordinary differential equations; and integral equations: Hilbert-Schmidt theory and Sturm-Liouville theory. Prerequisite: Mathematics 280 and 346. 1 unit.
456. **Mathematical Methods of Physics.** Calculus of variations: Euler-Lagrange theory, Rayleigh-Ritz method, and Dirichlet principle; integral transform methods and separation of variables; and approximation methods: finite differences, Galerkin's method, and asymptotic expansions. Prerequisite: Mathematics 455 or consent of instructor. 1 unit.
457. **Numerical Solution of Ordinary Differential Equations.** Same as Computer Science 457. See Computer Science 457.
458. **Topics in Numerical Analysis.** Same as Computer Science 458. See Computer Science 458.
459. **Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Nuclear Engineering, Physics and Theoretical and Applied Mechanics 459. An advanced methods course in asymptotic methods, with examples drawn from fluid mechanics, but designed to be mathematically instructive to all students of applied mathematics, engineering, and the physical sciences. Prerequisite: Mathematics 346 or Physics 413; or consent of instructor. 1 unit.
460. **General Relativity and Cosmology.** Same as Astronomy and Physics 424. See Physics 424.
461. **Applied Stochastic Processes.** Same as Statistics 455. Introduction to topics such as spectral analysis, filtering theory, and prediction theory of stationary processes; Markov chains and Markov processes. Prerequisite: Mathematics 346 and 347. 1 unit.
463. **Information Theory.** Same as Computer Science, Electrical and Computer Engineering, and Statistics 463. Mathematical models for information channels and sources; existence theorems for and construction of error-correcting codes. Prerequisite: Mathematics 361. 1 unit.

465. **Topics in Automata Theory.** Same as Computer Science 465 and Electrical and Computer Engineering 465. Prerequisite: Consent of instructor. 1 unit.
466. **Topics in Ordinary Differential Equations.** Introduction to current research in such areas as stability and asymptotic behavior of solutions; topological dynamics; numerical methods; and boundary value problems and spectral theory of differential operators. Prerequisite: Consent of instructor. 1 unit.
468. **Topics in Analysis.** Prerequisite: Consent of instructor. 1 unit.
470. **Statistical Decision Functions.** Same as Statistics 470. See Statistics 470.
471. **Multivariate Analysis.** Same as Statistics 471. See Statistics 471.
472. **Special Topics in Actuarial Theory.** Selected topics in advanced actuarial science. Prerequisite: Consent of instructor. 1 unit. May be repeated once for credit.
475. **Topics in Combinatorics.** Same as Computer Science 475. See Computer Science 475.
476. **Coding Theory.** Same as Electrical and Computer Engineering and Computer Science 456. See Electrical and Computer Engineering 456.
477. **Graduation and Demography.** Construction and graduation of mortality and other tables; mathematical aspects of demography, especially measures of mortality and morbidity; and risk theory and reinsurance. Prerequisite: Mathematics 370 and 371. 1 unit.
478. **Topics in Statistics.** Same as Statistics 478. See Statistics 478.
479. **Computational Complexity.** Same as Computer Science 479 and Electrical and Computer Engineering 479. See Electrical and Computer Engineering 479.
480. **Optimization by Vector Space Methods.** Same as Electrical and Computer Engineering 480. Introduction to normed, Banach, and Hilbert spaces; applications of the projection theorem and the Hahn-Banach Theorem to problems of minimum norm, least squares estimation, mathematical programming, and optimal control; the Kuhn-Tucker Theorem and Pontryagin's maximum principle; and introduction to iterative methods. Prerequisite: Mathematics 315 or 383, and Mathematics 347 or consent of instructor. 1 unit.
481. **Probability and Measure, I.** Same as Statistics 453. Measures and probabilities; integration and expectation; convergence theorems and inequalities for integrals and expectations; independence; convergence in probability, almost surely, and mean; Three Series Theorem; laws of large numbers. Prerequisite: Mathematics 347 or consent of instructor. 1 unit. Credit is not given for both Mathematics 481 and either Mathematics 441 or 451.
482. **Probability and Measure, II.** Same as Statistics 454. Measure extensions, Lebesgue-Stieltjes measure, Kolmogorov consistency theorem; conditional expectation, conditional probability, martingales; distribution functions and characteristic functions; convergence in distribution; Central Limit Theorem. Prerequisite: Mathematics 481. 1 unit. Credit is not given for both Mathematics 482 and either 451 or 452.
483. **Optimization in Networks.** Theory and methods for optimization over directed graphs; paths, cuts, flows, and potentials; matchings; PERT and CPM; max flow, min path, out-of-kilter, Hungarian, and other algorithms; nonlinear cost functionals; painting theory; and existence and duality. Prerequisite: Mathematics 242 or 245. 1 unit.
484. **Conjugate Duality and Optimization.** Convex analysis for constrained extremum problems; convex sets, cones, and functions; separation; Fenchel transform; duality correspondences; differential theory; nonlinear programming; sensitivity; and perturbational duality for primal, dual, and Lagrangian problems. Prerequisite: Mathematics 315 and 347, or consent of instructor. 1 unit.
485. **Topics in Optimization.** May be repeated for credit. Prerequisite: Consent of instructor. 1 unit.
486. **Parallel Numerical Algorithms.** Same as Computer Science 454. See Computer Science 454.
487. **Theory of Approximation.** Same as Computer Science 487. General approximation theory in normed linear spaces; primary emphasis on functions defined on an interval, and periodic functions; existence and uniqueness theorems; characterization of Chebyshev approximants; degree of approximation; interpolation with emphasis on the quality of interpolants as approximants; and use of approximations in computing. Prerequisite: Mathematics 318 and 348, or consent of instructor. 1 unit.
488. **Topics in Applied Mathematics.** Prerequisite: Consent of instructor. 1 unit.
490. **Reading Course.** Prerequisite: Consent of instructor. 1 to 2 units.
499. **Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

MECHANICAL AND INDUSTRIAL ENGINEERING

Head of Department: A. L. Addy

Department Office: 154 Mechanical Engineering Building, 1206 West Green, Urbana

Industrial Engineering

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Engineering Economics.** Principles of engineering economy and their applications to manufacturing problems; relevant accounting principles; studies of typical manufacturing processes and their economic factors; and exercises in planning processes for maximum efficiency. Prerequisite: Junior standing in engineering. 4 hours.
232. **Methods-Time Analysis.** Principles of motion economy affecting the design of a product or service; the effective use of human effort as related to the tools and equipment used in manufacturing and commercial endeavors; reasons for time study and the principles of determining time standards; study of standard data and other specific types of micromotion standards; and applications of all phases of the studies to specific cases. Prerequisite: Industrial Engineering 248 and junior standing. 3 hours.
238. **Analysis of Data.** Nature of probabilistic models for observed data; discrete and continuous distribution function models; inferences on universe parameters based on sample values; and introduction to control charts, acceptance sampling, and measurement theory. Prerequisite: Completion of basic calculus. 3 hours.
248. **Human Factors in Human-Machine Systems.** Same as Psychology 258. See Psychology 258.
287. **Job Evaluation and Wage Incentives.** Study of job evaluation techniques and wage incentive systems; problems of installing and maintaining job and position evaluation systems in industrial organizations. Prerequisite: Industrial Engineering 232 or equivalent; senior standing. 3 hours.
291. **Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of industrial engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in industrial engineering; must be taken in Spring Semester. 0 hours.
296. **Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
305. **Principles of Ergonomics.** Same as Physiology and Kinesiology 305. Concepts and design criteria to achieve optimum mutual adjustment of man and his work; consideration of such topics as static and dynamic forces on the human frame; response to environmental stress (heat, vibration, noise); vigilance and fatigue; and man-machine systems. Prerequisite: Senior standing; consent of instructor. 4 hours or 1 unit.
329. **Human-Computer Interaction Laboratory.** Same as Psychology 329. See Psychology 329.
332. **Standard Time Systems.** The study of development, uses, and limitations of standard time data and predetermined time systems. Prerequisite: Industrial Engineering 232. 3 hours, or $\frac{3}{4}$ or 1 unit.
334. **Introduction to Reliability Engineering.** Same as General Engineering 334. An introduction to concepts in engineering design, testing, and management for highly reliable components and systems. Prerequisite: Industrial Engineering 238 or Mathematics 361, or equivalent with consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Industrial Quality Control.** Control charts for attributes and variables; modified control chart techniques; acceptance sampling for attributes and variables; relationship to design, production, and procurement; quality cost analysis; military standards practice; survey and reports of current quality literature; and management of quality programs. Prerequisite: Industrial Engineering 238 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

336. **Design and Analysis of Industrial Experimentation.** Randomized blocks, t-tests, and factorial and fractional factorial designs; concepts of randomization, blocking, screening, and confounding; second-order designs, response surface methodology, and evolutionary operation; and introduction to mechanistic model building and nonlinear estimation. All topics are treated through engineering applications and case studies. Prerequisite: Industrial Engineering 238 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
346. **Human Performance and Engineering Psychology.** Same as Psychology 356. See Psychology 356.
350. **Computer-aided Manufacturing Systems.** The application of computer technology and operations research in manufacturing systems; includes the use of minicomputers and microprocessors for direct numeric control of machine tools, adaptive control and optimization, and integrated manufacturing systems, including applications of industrial robots. Prerequisite: Mechanical Engineering 285 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
355. **Numerical Control of Manufacturing Processes.** Study of numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control. Prerequisite: Mechanical Engineering 285 or consent of instructor; background in computer technology. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **Safety Engineering.** Study of engineering principles applied to industrial accident prevention; safe plant layout; safety in maintenance; boilers and pressure vessels; design and application of machine guards; material handling and storage; hand and power tools; welding hazards; electrical hazards; flammable liquids and fire protection; industrial health engineering; and toxic materials. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
360. **Analysis of Materials Machining.** An analytical approach to the mechanics and physics of various machining processes; covers the basic phenomena underlying process characteristics, such as wear, plastic flow, surface integrity, friction, and economics. Prerequisite: Mechanical Engineering 231 and 285, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
363. **Facilities Planning and Design.** Reviews the process of facility planning, plant layout design and materials handling analysis; includes the determination of facilities requirements, site selection, materials flow, use of analytical and computerized techniques, and applications to several areas such as manufacturing, warehousing, and office planning. Prerequisite: Industrial Engineering 238 and 385. 3 hours or $\frac{3}{4}$ unit. Graduate students in industrial engineering may not receive credit for Industrial Engineering 363.
370. **Industrial Engineering Design Laboratory.** Covers basic experiments and computer-based laboratory projects in manufacturing, production planning and facilities management, and human factors, using realistic industrial engineering problem settings; stresses the development of objectives and evaluation criteria as well as methods for design synthesis, analysis, and testing. Prerequisite: Credit or concurrent registration in all required courses in the industrial engineering curriculum which carry the I E designation. 3 hours or $\frac{3}{4}$ unit.
373. **Production Planning and Control.** Examines the scope of production systems, and the activities involved in their design, establishment, management, operation, and maintenance; mathematical and computer models for planning and control of facilities, human resources, projects, products, material, and information in production systems. Prerequisite: Industrial Engineering 203 and 385. 3 hours or $\frac{3}{4}$ unit. Graduate students in industrial engineering may not receive credit for Industrial Engineering 373.
385. **Operations Research, I.** A first course in operations research techniques and their application to systems analysis and design; includes linear programming, linear models, simplex method, transportation methods, assignment algorithms, sensitivity analysis, dynamic programming, and introduction to inventory and queueing theory. May not be used toward fulfillment of the M.S. in industrial engineering degree requirements nor toward the Ph.D. in mechanical engineering degree requirements for industrial engineering majors. Prerequisite: Completion of basic calculus; junior standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
386. **Operations Research, II.** Continuation of Industrial Engineering 385; includes advanced linear programming, matrix forms, revised simplex method, bounded variables, primal-dual methods, parametric programming, integer programming, stochastic processes, queues, inven-

- tories, maintenance, simulation, and modeling; and emphasizes model building and treatment of uncertainty. Prerequisite: Industrial Engineering 238 and 385, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
393. **Special Problems.** Study of advanced problems related to industrial engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
401. **Mathematical Programming, I: Applied Nonlinear Programming.** Optimization of nonlinear systems, including a survey of classical methods and concepts such as the Lagrangian method, the Jacobian method, and Kuhn-Tucker conditions; emphasizes modern algorithms, numerical methods for digital computers, applications in engineering design, and use of state of the art computer codes. Prerequisite: Industrial Engineering 385 or equivalent, or consent of instructor. 1 unit.
402. **Mathematical Programming, II: Dynamic and Geometric Programming.** The formulation and construction of dynamic programming models and advanced dynamic programming concepts such as treatment of multistate variables, nonserial systems, and Markov processes; geometric programming, including treatment of degree of difficulty, mixed signs, and computational refinements; and emphasis on applications in engineering design. Prerequisite: Statistics 310 and Industrial Engineering 385, or equivalent; or consent of instructor. 1 unit.
416. **Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Civil Engineering 416. Basic concepts, theories, and techniques of systems analysis, including modeling of large scale systems, forecasting, planning, control, and information handling; emphasizes the modeling of systems with network techniques, including distance, flow, and project networks; and discusses advanced network topics such as out-of-kilter algorithm and project resource analysis. Prerequisite: Industrial Engineering 373 or Civil Engineering 292, or equivalent, or consent of instructor. 1 unit.
417. **Systems Analysis, II: Digital Simulation.** Same as Civil Engineering 417. The application of simulation techniques to systems analysis; includes modeling for simulation, design of simulation experiments, random number generation, process generation, simulation of queueing systems, inventory systems, and project networks, analysis of simulation results, and some digital simulation languages and programs in use, such as GASP II and GERTS III. Prerequisite: Industrial Engineering 385 or Civil Engineering 293, and some exposure to computer programming. 1 unit.
440. **Analysis, Modeling, and Design of Man-Machine Systems.** Input-output models of man as an information processor, controller, and decision maker are critically evaluated and applied to the analysis and design of specific man-machine systems. Intended for graduate students working in areas of man-machine systems, engineering psychology, control systems, or operations research. Prerequisite: Mechanical Engineering 240 and Industrial Engineering 238, or equivalent and consent of instructor. 1 unit.
458. **Laboratory Investigations in Industrial Engineering.** Special investigations of such problems as optimization of operations, programming systems, work standards, plant layout, and flow of materials. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.

Mechanical Engineering

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
205. **Thermodynamics.** Introduction to classical thermodynamics through the second law; system and control volume analyses of thermodynamic processes; irreversibility and availability; relations for ideal gas mixtures. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
207. **Thermodynamics.** Energy and its transformations; properties of thermodynamic media, including kinetic theory analysis; thermodynamic processes of open and closed systems; reversibility and limitations; entropy and the second law; thermodynamics temperature scales; and second law analysis of chemically reactive systems. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
209. **Thermodynamics and Heat Transfer.** Thermodynamic analysis of energy transfer and transformation; properties of simple working substances; analysis of open and closed systems,

- direct and reversed cycles, and processes involving transfers of mass and energy; and basic laws of heat transfer. Prerequisite: Physics 107 and Mathematics 242; or equivalent. 3 hours.
211. **Introductory Gas Dynamics.** Introduction to dynamics; special emphasis on the theory and engineering applications of compressible high velocity flows. Prerequisite: Mathematics 285, Physics 107, Theoretical and Applied Mechanics 154, and credit or concurrent registration in Mechanical Engineering 205. 3 hours.
213. **Heat Transfer.** Principles and application of heat transfer by conduction, convection, and thermal radiation. Prerequisite: Mechanical Engineering 211. 3 hours.
220. **Mechanics of Machinery.** Fundamentals of linkages, design of cams, kinematics of gearing, analysis of gear trains, velocity, acceleration and force analysis of systems of rigid bodies, and balance of rigid rotors and reciprocating machinery. Prerequisite: Engineering mechanics (statics and dynamics) and Computer Science 101. 3 hours.
231. **Processing and Structure of Materials.** Atomic and microscopic structure of materials as the basis for their properties; processing to both shape materials and control their structure; chemical bonding, crystal defects, forming processes, phases and phase change, heat treatment, solidification processing; metals, polymers, composites, ceramics. Prerequisite: Theoretical and Applied Mechanics 221; either Mechanical Engineering 209 or credit or concurrent registration in Mechanical Engineering 213. 4 hours.
232. **Behavior of Materials in Service.** Introduction to material response to stress, cyclic load, impact, high temperature, corrosive and abrasive conditions; selection of materials for specified service conditions; characteristics of major material project and case study; microstructural dependence of performance characteristics. Prerequisite: Mechanical Engineering 231. 2 hours.
240. **Modeling and Analysis of Dynamic Systems.** Dynamic analysis of mechanical systems; modeling of mechanical components and systems; analysis of single and multiple degree of freedom linear systems; simulation of nonlinear systems; introduction to continuous systems and lumping techniques; and introduction to feedback control systems. Prerequisite: Mathematics 285 and Theoretical and Applied Mechanics 154. 4 hours. Credit is not given for both Mechanical Engineering 240 and General Engineering 222.
250. **Thermal Science Laboratory.** Basic experiments in thermodynamics, gas dynamics, and heat transfer and their applications; experiments selected to introduce pertinent instrumentation and experimental techniques, and to further the understanding of fundamentals via physical observations. Prerequisite: Mechanical Engineering 205 and 213, and credit or concurrent registration in Mechanical Engineering 304. 3 hours.
261. **Introduction to Instrumentation, Measurement, and Control Fundamentals.** Basic elements of a measurement system; recording instruments, transducers, and signal conditioning; and data recording and controls, analog and digital devices and control. Prerequisite: Electrical Engineering 270. 3 hours.
270. **Analysis and Design of Machines.** Applications of mathematics, material science, and engineering mechanics to problems in analysis and design of machine components; considers function, production, and economic factors of design; and includes fasteners, springs, gearing, bearings, shafting, clutches, and lubrication. Prerequisite: Mechanical Engineering 220 and Theoretical and Applied Mechanics 221. 4 hours.
275. **Creativity in Engineering Design.** Study of engineering systems to show the creative use of scientific principles and design procedures; survey of natural laws and examples of their creative application; and introduction to methods for promoting creativity in engineering. Prerequisite: Mechanical Engineering 270. 3 hours.
280. **Senior Mechanical Design.** The creative process and inductive reasoning in engineering design; emphasizes alternative solutions by considering open-ended problems; considers realistic constraints as part of the design process. Prerequisite: Senior standing in Mechanical Engineering. 3 hours.
285. **Analysis of Manufacturing Processes.** Introduction to materials processing methods, including chip formation and deformation processes; analysis of process performance, including forces and energy, surface roughness, tool wear and tool life, and dimension precision; machine tool dynamics and vibrations, process planning, and optimization; nontraditional machining processes; introduction to numerical control of machine tools; and polymer processing and the use of various materials including plastics. Prerequisite: Credit or concurrent registration in Mechanical Engineering 231, or equivalent. 3 hours.

291. **Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of mechanical engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in mechanical engineering; must be taken in Spring Semester. 0 hours.
293. **Special Projects.** Experimental and analytical investigation in mechanical engineering research. Prerequisite: Senior standing in mechanical engineering; consent of head of department. 1 to 3 hours. May be repeated; students may register for two different topics in the same semester.
296. **Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
301. **Intermediate Thermodynamics.** Basic considerations of the three laws of thermodynamics; elementary statistical principles for the prediction of properties of pure substances and mixtures; transport properties; electric, magnetic, and chemical processes. Prerequisite: Mechanical Engineering 205 or first course in thermodynamics. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Nuclear Power Engineering.** Same as Nuclear Engineering 302. See Nuclear Engineering 302.
303. **Applied Combustion.** Applies thermodynamics, heat transfer, and chemical reaction rate concepts to combustion and combustion devices; discusses basic combustion phenomena and practical combustion systems, including gas turbine combustor, coal furnaces, and rocket motors. Prerequisite: Mechanical Engineering 213 and 304. 3 hours, or $\frac{3}{4}$ or 1 unit.
304. **Energy Conversion Systems.** Analyzes processes and systems for energy conversion, including power and refrigeration cycles, air conditioning, thermoelectrics, and fuel cells. Prerequisite: Mechanical Engineering 205 or 209; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in mechanical engineering.
305. **Intermediate Gas Dynamics.** Solution of internal compressible flow problems by one-dimensional techniques, both steady and unsteady; considers flows with area change (smooth and abrupt), with friction, with heat addition, and with mass addition. Examines flows with weak and strong waves, multiple confined streams, and shock waves. Prerequisite: Mechanical Engineering 205 and 211, or first course in fluid mechanics. 4 hours or 1 unit.
306. **Intermediate Heat Transfer.** Conduction heat transfer, radiation heat transfer, mass transfer, phase change, heat exchangers, and introductory numerical methods. Prerequisite: Undergraduate courses in fluid mechanics and heat transfer, or consent of instructor. 4 hours or 1 unit.
307. **Solar Energy Utilization.** Emphasizes solar thermal processes; considers basic sun-earth geometry, the optics of solar energy collectors, and associated heat transfer mechanisms in detail; and includes flat plate collectors, concentrating collectors, energy storage, modeling and system simulation, and economics. Prerequisite: Mechanical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
308. **Fluid Mechanics of Convective Heat Transfer.** Same as Theoretical and Applied Mechanics 308. Analyzes viscous flows and heat transfer by convection processes; solution to Navier-Stokes equations for heat conducting laminar and turbulent shear layers; similarity concepts; thermal entry-lengths pipe flows; computer solution techniques. Prerequisite: Mechanical Engineering 211 or first course in fluid mechanics. 4 hours or 1 unit.
312. **Modern Control Theory.** The concept of state; state-space representation of systems; transfer function decomposition and state-variable diagrams; state response of continuous and discrete-data systems; determination of the transition matrix; diagonalization; state response of time-varying systems; controllability and observability; stability and Lyapunov's method; and introduction to optimization and design. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 4 hours or 1 unit.
313. **Computer Control of Mechanical Engineering Systems.** Examines microcomputer control of thermal and mechanical systems: sensing and transducing of variables, transmitting and converting signals, and actuating regulators associated with mechanical engineering systems. Prerequisite: Mechanical Engineering 261 or Agricultural Engineering 311. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 314. Introduction to Tribology.** Basic concepts of friction and wear; lubricants and their application; hydrodynamic bearing theory; lubrication requirements and methods; externally pressurized bearings; gas bearings; dynamics and stability of bearings systems; elastohydrodynamic lubrication of rolling element bearings and gears; numerical approaches to lubrication problems. Prerequisite: Mechanical Engineering 211 or equivalent; or consent of instructor. 4 hours or 1 unit.
- 315. Tribology.** Surface interactions; fundamentals of contact mechanics; friction theories; types and measurement of wear; response of materials to surface tractions; plastic deformation; void and crack nucleation; crack propagation; delamination wear; microstructural effects in wear process; mechanics of coated surfaces; solid film and boundary liquid film lubrication; friction and wear of polymers and fiber-reinforced polymeric composites; introduction to metal cutting and tool wear; novel methods of improving tribological behavior of sliding surfaces. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 321. Refrigeration and Cryogenics.** The theory of operation and the design of equipment for the production of low temperatures from below ambient down to near absolute zero; applications to industrial, consumer, aerospace, medical, and various research uses. Prerequisite: Mechanical Engineering 205, 211, and 213, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 323. Design of Thermal Systems.** Selection of components in fluid- and energy-processing systems to meet system performance requirements; computer-aided design; system simulation; optimization techniques; and investment economics and statistical combinations of operating conditions. Prerequisite: Credit or concurrent registration in Mechanical Engineering 213. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 331. Internal Combustion Engines.** Study of the fundamental principles underlying the theory and analysis of reciprocating internal combustion engines, fuels, carburetion, combustion, exhaust emissions, detonation, fuel injection, and factors affecting performance; basic laboratory work involving measurements of effects of variables on performance. Prerequisite: Credit or concurrent registration in Mechanical Engineering 304 or Agricultural Engineering 346, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 332. Theory of Internal Combustion Engines.** Analysis of internal combustion engines, including thermodynamics, combustion and effects of mixtures, chemical equilibrium and dissociation, exhaust emissions and air pollution, flow through valves, breathing, supercharging and turbocharging, lubrication, friction, and combustion chamber design. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 335. Power Systems Engineering and Economy.** Application of thermodynamic principles and fluid flow and heat transfer processes to power systems; determination of system characteristics and methods to satisfy these requirements with awareness of economic factors and ecological considerations. Prerequisite: Mechanical Engineering 211, 213, and credit or concurrent registration in Mechanical Engineering 304; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 336. Automotive Vehicle Dynamics.** Introduction to the dynamics and control of automotive multidegree of freedom systems; the development and solution of governing equations for both steady state and transient conditions by computer simulation techniques; investigation of the performance, handling, and safety aspects of vehicles and their interaction with external and internal interfaces; examination of the influence of tires, suspension, steering, and aerodynamic forces; and laboratory experiments and demonstrations. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Engineering Analysis and Design.** Correlation of previously acquired design experience with the creative problem of synthesis and analysis that depend upon design judgment. Prerequisite: Mechanical Engineering 270 or senior standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 342. Kinematic Analysis and Synthesis.** Geometry of constrained motion; application of mathematical and other techniques to the kinematic analysis and synthesis of mechanisms. Prerequisite: Undergraduate course in kinematics and senior standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 345. Introduction to Finite Element Analysis.** Applies the finite element method to solve problems from various branches of mechanical engineering; topics include stress analysis, vibration, heat transfer, and fluid flow. Prerequisite: Computer Science 101, Mechanical Engineering 213, and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit. Credit is not given

for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.

346. **Materials and Design.** Examines the relationship of material properties and mechanics concepts to the design of structures and components; topics include a brief introduction to elasticity, plasticity, viscoelasticity, creep, fatigue, and fracture as they relate to materials selection and design. Prerequisite: Theoretical and Applied Mechanics 221, Mechanical Engineering 232, or Theoretical and Applied Mechanics 224; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
347. **Failure Prevention and Reliability of Mechanical Components.** Mechanisms of material deterioration in service, root cause analysis with applications to design, reliability, and residual life assessments; applications of fault tree analysis, Weibull analysis, cause-consequence diagrams to identification of errors and defects in design and production; discussion of probabilistic structural mechanics and its relationship to reliability; human error analysis, reliability of inspection techniques, quality assurance. Prerequisite: Mechanical Engineering 231, 232, and 270. 3 hours, or $\frac{3}{4}$ or 1 unit.
355. **Polymer Processing.** Analyzes polymer processing operations from engineering fundamentals; fluid and heat flow of non-Newtonian fluids; relationship of processing to material structure and properties; considers conventional processes, such as extrusion and injection molding; uses computer-aided design techniques; synthesis of new processes. Prerequisite: Mechanical Engineering 213 and 231, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
357. **Introduction to Laser Materials Processing.** Examines the application of lasers in materials processing: laser/material interaction mechanisms, laser optics, welding, surface alloying, cladding, chemical vapor deposition, heat treatment, cutting and surface glazing processes, mathematical modeling of processes, microstructure and mechanical properties of processed materials, and correlation of process parameters and properties through transport phenomena modeling. Prerequisite: Mechanical Engineering 231 or equivalent, or consent of instructor. 4 hours or 1 unit.
375. **Introduction to Bionics.** Biological concepts and data aiding in the solution of engineering problems; analysis of mechanisms found in living systems and their application to the design of mechanical devices. Prerequisite: Mechanical Engineering 270 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
388. **Industrial Control Systems.** The study of industrial control techniques by case studies of actual industrial systems; provides competence in the design, selection, and maintenance of industrial control systems; and introduces applications to electromechanical, pneumatic, thermal, and hydraulic systems. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
389. **Solidification Processing.** Fundamentals of control of shape, structure, and properties of metals in casting processes; relationships between processing conditions and microstructure and introduction to simulation of processes; examples of processes considered: foundry-, die-, continuous casting, and rapid solidification processes. Prerequisite: Mechanical Engineering 231. 3 hours, or $\frac{3}{4}$ or 1 unit.
393. **Special Problems.** Study of advanced problems related to mechanical engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
401. **Thermodynamics and Transport Properties.** Thermodynamic and microscopic considerations for the prediction of properties; caratheodory principle; relations among properties; microscopic considerations and statistical methods; thermodynamic and transport properties; and fluctuation and nonequilibrium thermodynamics. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
402. **Nonequilibrium Multiphase Processes.** Dynamics and thermodynamics of multiphase and multicomponent systems with special relevance to air pollution control and energy conversion; relaxation phenomena; general motion of systems of disparate elemental masses; diffusion in gravitational and electric fields, and boundary layer motion with mass transport; dispersion and collection of particulate matter; and transport with surface reactions. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
403. **Fundamentals of Combustion.** Same as Aeronautical and Astronautical Engineering 438. See Aeronautical and Astronautical Engineering 438.

404. **Gas Dynamics, I.** Introduction to theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Prerequisite: Mechanical Engineering 305 or equivalent, or consent of instructor. 1 unit.
405. **Convective Heat Transfer.** Fundamentals of convective heat transfer; calculation of heat transfer within conductor and over submerged objects for laminar and turbulent flow; natural convection; film condensation and boiling; and liquid metals. Prerequisite: Mechanical Engineering 308 or consent of instructor. 1 unit.
406. **Heat Conduction.** Fundamentals of heat conduction in isotropic and anisotropic materials; methods of solution to steady and transient heat conduction problems in one, two, and three dimensions; internal heat sources; periodic flow of heat; problems involving phase change; approximate analytical techniques; numerical methods; study of current articles on the subject. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
409. **Laboratory Investigations in Mechanical Engineering.** Special investigation in flow, metering, heat transfer, and heat exchanger performance and design. Prerequisite: Courses in thermodynamics and fluid mechanics. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
410. **Thermal Radiation.** Fundamentals of radiant energy transport in absorbing and nonabsorbing media; pyrometry; and applications to selected problems involving combined energy transport mechanisms. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
411. **Control of Air Pollution from Stationary Sources.** Same as Civil Engineering 448. See Civil Engineering 448.
412. **Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Environmental Studies 449. See Civil Engineering 449.
423. **Thermal Systems.** Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: Mechanical Engineering 323. 1 unit.
433. **Gas Turbine Engines.** Comprehensive description of gas turbine theory and technology; aerothermodynamics of inlet, compressor, combustor, turbine, and nozzle flows; optimization of performance; and applications to aircraft engines and stationary gas turbine power plants. Prerequisite: Mechanical Engineering 305 or equivalent. 1 unit.
443. **Dynamics of Machinery.** Examines generalized equations of motion for single-degree-of-freedom mechanisms; modeling of mechanical systems; dynamics of flexible cam systems; dynamics of rotor systems; dynamics of clutches and brakes; isolation of mechanical vibration and impact; introduction to impact; balancing of machines. Prerequisite: Theoretical and Applied Mechanics 311 or equivalent; consent of instructor. 1 unit.
445. **Design of Internal Combustion Engines.** Comprehensive study of the design of internal combustion engines, including gas forces, inertia loads, bearing analysis, torsional vibration, balance, lubrication, valve and cam design, and stress analysis of major parts of the engine. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 1 unit.
452. **Solidification Processing.** Same as Metallurgical Engineering 452. Principles of control of structure, properties, and shape in processes involving liquid/solid transformations; stresses heat flow, mass transport, solute redistribution, nucleation and growth kinetics; and the relationship between process variables and structures and properties in the resultant material. Examples are drawn from existing commercial and new developing processes. Prerequisite: Mechanical Engineering 389 or consent of instructor. 1 unit.
455. **Polymer Rheology and Processing.** Continuum models for non-Newtonian fluids: generalized Newtonian, linear viscoelastic and nonlinear viscoelastic models; examines relationship of rheology to processing; considers advanced problems in polymer processing such as numerical simulations of nonisothermal non-Newtonian flows, reactive processing and processing of composites. Prerequisite: Mechanical Engineering 355 or consent of instructor. 1 unit.
456. **Fatigue Analysis.** Examines fatigue analysis methods for the design of structures and components; includes stress life, strain life, and crack propagation approaches; considers multiaxial and high temperature fatigue; emphasis is placed on the interrelationship between material properties, geometry, and design methodology appropriate for the wide range of mechanical engineering components. Prerequisite: Mechanical Engineering 346 or consent of instructor. 1 unit.

- 457. **Inelastic Design Methods.** Principles of material deformation under combined and thermal loading; constitutive equation applications in engineering design and in inelastic finite element methods; material and structural degradation under fatigue and creep conditions. Prerequisite: Mechanical Engineering 345 and 346, or consent of instructor. 1 unit.
- 458. **Fracture Resistant Design.** Application of fracture mechanics and microstructural behavior to material selection for design; practical approximation of linear and inelastic fracture parameters for evaluation of complex components; destructive and nondestructive tests for control of toughness in manufacture; residual life assessment involving time dependent fracture (creep, fatigue, stress, corrosion); case study and design project oriented. Prerequisite: Mechanical Engineering 346 or consent of instructor. 1 unit.
- 468. **Modeling and Control of Electro-Mechanical Systems.** Same as Electrical Engineering 468. See Electrical Engineering 468.
- 493. **Seminar.** Required of all graduate students each semester with the exception of doctoral candidates who have passed their preliminary examination. Presentation and discussion of significant developments in mechanical engineering. 0 units.
- 497. **Special Problems in Mechanical Engineering.** Lectures, seminars, and individual investigations or studies in selected areas of mechanical engineering. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
- 499. **Thesis Research.** 0 to 4 units.

MEDICAL SCIENCES

Associate Dean of College of Medicine: William E. Sorlie

College Office: 190 Medical Sciences Building, 506 South Mathews, Urbana

- 300. **Medical Sciences.** First-year program in preparation for the M.D. degree involving guided study of gross anatomy, behavioral science, biochemistry, genetics, immunology, microbiology, neuroscience, embryology, histology, introduction to nutrition and medical statistics, and physiology. Elements of clinical experience are monitored and presented by faculty in the clinical and basic medical sciences. Prerequisite: Enrollment is limited to students accepted by the College of Medicine. 19 hours (summer session, 9 hours).
- 301. **Clinical Medicine.** Second-year program in preparation for the M.D. degree involving classroom and clinical instruction in skills required for acquisition of clinical data base: history and physical diagnosis, principals of diagnostic medical imaging, epidemiology, clinical laboratory sciences, clinical tutorials, pathology and pharmacology; and patho-physiological bases of clinical problems. Faculty present and monitor learning experiences, which include lecture/discussion, clinical tutorials, and supervised clinical experiences. Prerequisite: Limited to second-year students in the College of Medicine. 19 hours (summer session, 9 hours).
- 302. **Supervised Medical Practice.** Third year of preparation for the M.D. degree. Students rotate among affiliated hospitals in internal medicine, surgery, obstetrics and gynecology, psychiatry, pediatrics, and other fields and are assigned to patient care teams. Physicians and clinical faculty supervise their clinical practice. Increases students' understanding of the pathophysiological basis of patient problems and teaches patient management skills. Prerequisite: Third-year standing in the College of Medicine. 19 hours (summer session, 9 hours).
- 303. **Medical Electives.** Fourth year of preparation for the M.D. degree. With approval and guidance of their faculty advisor, students select a program of elective courses which will enhance their clinical skills. These elective courses may be in medicine, surgery, obstetrics and gynecology, pediatrics, family practice, urology, dermatology, basic science or clinical research, and other fields. Prerequisite: Fourth-year standing in the College of Medicine. 0 or 19 hours (summer session, 0 or 9 hours).
- 374. **General Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
- 461. **Advanced Clinical Nutrition, I.** Same as Nutritional Sciences 461. See Nutritional Sciences 461.

462. **Advanced Clinical Nutrition, II.** Same as Nutritional Sciences 462. See Nutritional Sciences 462.
463. **Statistical Techniques in Epidemiological Research.** Same as Health and Safety Studies 427, Environmental Studies 427, and Veterinary Pathobiology 426. See Health and Safety Studies 427.

METALLURGICAL ENGINEERING

(See Materials Science and Engineering)

MICROBIOLOGY

Acting Head of Department: R. Wolfe

Department Office: 131 Burrill Hall, 407 South Goodwin, Urbana

100. **Introductory Microbiology.** Introduction to the principal activities and properties of microorganisms, including bacteria, yeasts, molds, and viruses; consideration of the role of natural processes, such as photosynthesis; and man's use and control of microorganisms in the production of antibodies and vaccines in industrial fermentations, in sanitation and public health, and in agriculture. There are no prerequisites for Microbiology 100, but some chemistry is recommended. 3 hours. Credit is not given for more than one of the following: Microbiology 100, 113, or 200.
101. **Introductory Experimental Microbiology.** Laboratory introduction to the techniques employed in the investigation of microbial activities and properties; experiments designed to familiarize the student with the handling, identification, and characterization of microorganisms and their activities, particularly those of interest to man. Prerequisite: Credit or concurrent registration in Microbiology 100. 2 hours. Credit is not given for both Microbiology 101 and 201.
113. **Man and Microbes.** General education biological science course for nonscience majors; examines the effects of microbes on the activities of man; emphasizes environmental, economic, and disease effects of microbial activity on society; and presents microbiology as an example of a modern biological science. 3 hours. Credit is not given for more than one of the following: Microbiology 113, 200, or 100.
200. **Microbiology.** Emphasizes fundamental concepts of microbiology, including nutrition, ecology, physiology, genetics and molecular biology of microorganisms, and their role in nature and in infection and immunity. Prerequisite: Credit or concurrent registration in organic chemistry. 3 hours. Credit is not given for more than one of the following: Microbiology 200, 100, or 113. (Counts for advanced hours in LAS.)
201. **Experimental Microbiology.** Laboratory emphasizing the fundamentals of microbiology, including the biochemical basis of microbial physiology, ecology, and nutrition; microbial genetics and gene-enzyme relationships. Emphasis and encouragement are given to the experimental approach to microbiology. Prerequisite: Credit or concurrent registration in Microbiology 200 and in organic chemistry. 3 to 5 hours. Credit is not given for both Microbiology 201 and 101. (Counts for advanced hours in LAS.)
290. **Research and Special Problems.** Prerequisite: Fifteen hours of microbiology; consent of instructor. 3 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
292. **Senior Thesis.** Research under the direction of a senior staff member in microbiology. Normally, the student takes two semesters of Microbiology 292 in the senior year. Recommended for all those planning future research and graduate study; prerequisite for graduation with

distinction in microbiology. In the semester preceding initial enrollment, interested students should consult with their advisors concerning the procedures for enrollment. A minimum of 2 hours per senior semester is required, and a thesis must be presented for credit to be received, but graduation with distinction is not an automatic result of enrollment in Microbiology 292. Prerequisite: Consent of senior thesis adviser. 2 to 6 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.

309. **Biochemical Basis of Microbial Diversity.** Examines the biochemical ecology of diverse microbial groups with emphasis on anaerobic systems. Prerequisite: Biochemistry 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.
311. **Food and Industrial Microbiology.** Same as Food Science 311. Relationship of microorganisms to food manufacture and preservation, to industrial fermentation and processing, and to sanitation. Prerequisite: Microbiology 101 or 201 or equivalent; credit or concurrent registration in organic chemistry laboratory, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
312. **Techniques of Applied Microbiology.** Consideration, through experimentation, of properties of bacteria, yeasts, molds, and actinomycetes important to industrial processes; exploration of methods of control of microbial processes in industry and sanitation. Prerequisite: Credit or concurrent registration in Microbiology 311, and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
313. **Genetics of Industrially Important Microorganisms.** Laboratory techniques of genetics and molecular biology as applied to the improvement of industrially important organisms; emphasis on streptomycetes and eucaryotic microorganisms (yeast, *Aspergillus*, and *Neurospora*). Prerequisite: Biology 210, and Microbiology 200 and 201. 4 hours or 1 unit.
316. **Genetic Analysis of Microorganisms.** Prokaryotic and eucaryotic microbial genetic systems; emphasis on typical data analyses, together with the basic classes of genetic phenomena. Prerequisite: General genetics, Microbiology 200, or Microbiology 330. 3 hours or $\frac{3}{4}$ unit.
317. **Experimental Techniques in Molecular Biology.** Laboratory emphasizing current molecular biology techniques. Topics include genetic techniques, use of transposons, genetic regulation, *in vitro* transcription, restriction endonuclease mapping, cloning, and DNA sequencing. Prerequisite: Microbiology 201, and credit or concurrent registration in Microbiology 316; Biochemistry 355; consent of instructor. 5 hours or 1 unit.
319. **Yeast Cell Biology.** Emphasis on fundamental problems in eukaryotic cell biology with yeast as the focal organism. Topics include: chromosome structure, regulation, mRNA splicing, cell cycle, growth control, organelle biogenesis, and secretion. Prerequisite: Microbiology 200 or Biology 213; and Biology 210; and credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.
326. **Biology of Bacterial Pathogens.** Emphasizes prokaryotes that cause important diseases in humans and other animals; host-parasite bacteriology; and chemistry and genetics of mechanisms of pathogenesis. Prerequisite: Microbiology 200 or 309; and Biochemistry 350 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
327. **Immunochemistry.** Study of the field of immunology with emphasis on the chemistry of the proteins and cells involved in the immune response. Lectures and laboratory. Prerequisite: Credit or concurrent registration in biochemistry, and consent of instructor. 5 hours or 1 unit.
328. **Properties of Bacterial Pathogens.** Laboratory study of methods of recognition and differentiation, diagnostic tests, and mechanisms of pathogenesis; students are voluntary donors of microorganisms used in experiments. Prerequisite: Microbiology 101 or 201; credit or concurrent registration in Microbiology 326 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
330. **Molecular Biology of Microorganisms.** Modern contributions to the science of microbiology; emphasizes the structure, function, and synthesis of informational macromolecules and on the role microorganisms have played in molecular biology. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.

- 331. Microbial Physiology.** Examines bacterial physiology, including discussions of energetics, regulation of metabolism, and cell structure. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in biochemistry. 3 hours or $\frac{3}{4}$ unit.
- 351. Viruses.** Same as Plant Biology 351. Introduces the molecular basis of virus structure, replication, genetics, infection, and virus-host interactions; discusses also animal viruses as agents of disease and their role in epidemics and persistent infections. Prerequisite: Credit or concurrent registration in Microbiology 330 or Biochemistry 350; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 405. Molecular Genetics: Gene Action.** Structure, synthesis, and function of molecules and organelles concerned with the intracellular transmission of genetic information (including gene regulation, transcription, and translation). Prerequisite: Microbiology 330, Microbiology 316 plus biochemistry, or consent of instructor. $\frac{3}{4}$ unit.
- 412. Advances in Microbiology.** Discussions of current research in the following areas of microbiology: (a) general microbiology; (b) microbial physiology and metabolism; (c) immunochemistry; and (d) molecular genetics. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 419. Animal Virology.** Same as Veterinary Pathobiology 419. See Veterinary Pathobiology 419.
- 446. Bacterial Energetics.** Same as Biophysics 446. See Biophysics 446.
- 485. Topics in Microbiology and Molecular Biology.** Discussions, reviews, and appraisal of special topics in microbiology and molecular biology; seminar or lecture. Topics do not repeat. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
- 490. Individual Problems.** Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.
- 491. Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. First seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 492. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 492. Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. Second seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 491. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 495. Seminar.** Required of all graduate students whose major is microbiology. Prerequisite: Ten hours of microbiology; consent of instructor. 0 or $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

MILITARY SCIENCE

Head of Department: Denton R. Brown

Department Office: 113 Armory Building, 505 East Armory, Champaign

- 111. Introduction to Military Science.** An introduction to the U.S. Defense Establishment and its significance in modern society; includes the organization, mission, and functions of the Army, as well as an insight into military life and customs. Normally the first Military Science course taken. 1 hour.
- 112. Leadership Laboratory.** Introductory practical application of military skills and leadership; includes basic military mountaineering and rappelling, first aid, individual marching and weapons familiarization. Field trip may be required. 0 hours.
- 113. Military Rifle Marksmanship.** Characteristics of small bore rifles, weapons safety, and basic military marksmanship techniques. Prerequisite: Military Science 111 or consent of the instructor. 1 hour.
- 114. Leadership Laboratory.** A continuation of Military Science 112 to include actual firing of weapons. Field trip may be required. 0 hours.

121. **Land Navigation.** Fundamentals of military and USGS map reading including methods such as intersection and resection; includes land navigation and orienteering techniques and their application during a field trip. 1 hour.
122. **Leadership Laboratory.** Intermediate level practical application of military skills and leadership; includes mountaineering and rappelling, first aid, small unit marching, weapons firing, and physical fitness. Field trip required. 0 hours.
123. **Military Tactics.** Basic concepts of tactical doctrine including Principles of War, the evolution of tactics, mechanized warfare, Soviet doctrine and tactics, the affect of technology on modern tactics, and the application of contemporary tactics in small unit offensive and defensive operations. 1 hour.
124. **Leadership Laboratory.** A continuation of Military Science 122 to include military radio communication procedures and defense measures in a nuclear or chemical environment. Field trip required. 0 hours.
231. **Military Operations.** Fundamentals of small unit military operations including operations planning, military orders, troop leading procedures, deployment techniques such as fire and maneuver, and combined arms operations. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 3 hours.
232. **Leadership Laboratory.** Advanced level practical application of military skills and leadership with emphasis on the student's ability to direct and supervise others; includes advanced land navigation, advanced first aid, platoon and company drill and ceremonies, and advanced communications procedures. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
233. **Military Leadership.** Principles of leadership including management practices and their relationship to leadership, problem solving, decision making, human behavior and motivation, superior-subordinate relations and the problems of leadership in the military environment. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
234. **Leadership Laboratory.** A continuation of Military Science 232 to include small unit tactics and reconnaissance operations. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
241. **Military Law.** Fundamentals of military law including the Law of Land Warfare, the application of federal law to the military, and the Military Justice system; includes financial and legal affairs. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
242. **Leadership Laboratory.** A unique opportunity for advanced course students to fully plan, execute, and supervise the military training and activities of other military science students. Emphasis is on leadership, organizing and managing activities, decision making, and effective instructional techniques. Prerequisite: Concurrent registration in the AROTC advanced course. Field trip required. 0 hours.
243. **Military Professionalism and Ethics.** Examines ethics, values and professional standards through military case studies; discusses military administrative skills, written and verbal communications, meeting management, and briefing techniques. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
244. **Leadership Laboratory.** A continuation of Military Science 242. Prerequisite: Concurrent registration in AROTC advanced course. Field trip required. 0 hours.

MUSIC

Director of School: Don V Moses

School Office: 3054 Music Building, 1114 West Nevada, Urbana

100. **Introduction to Music Theory.** Basic terminology and notation of Western music, plus visual and aural recognition of simple melodic and harmonic intervals; provides remedial assistance to music majors wishing to take Music 101. Music majors can not use this course as credit for graduation. 2 hours.
101. **Fundamentals of Music Theory and Practice, I.** Notation, vocabulary, and basic concepts, including scales, modes, intervals, chords, and terminology; aural and visual analysis of musical forms and procedures; stresses the development of melodic, harmonic, and rhythmic vocabularies. Prerequisite: Music 100 or placement by examination. 3 hours.
102. **Fundamentals of Music Theory and Practice, II.** Continuation of Music 101 with gradually increased emphasis on visual elements (score reading and analysis); links theory and practice through analytical understanding. Prerequisite: Music 101. 3 hours.
103. **Fundamentals of Music Theory and Practice, III.** Continuation of Music 102 with gradually increased emphasis on contrapuntal techniques, dissonance in tonal music, and musical form. Prerequisite: Music 102 and 107. 3 hours.
104. **Fundamentals of Music Theory and Practice, IV.** Continuation of Music 103 with emphasis on late tonal chromaticism; introduction to serial techniques, nontonal centricity, cellular structure, twentieth-century rhythmic techniques, and noise and indeterminacy. Prerequisite: Music 103 and 108. 3 hours.
106. **Beginning Composition.** Music composition in its beginning stages; practice in phrase, section, and short form construction, analysis, and writing; instruction in range, characteristics, and idiom of instruments and voices. Prerequisite: Consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
107. **Aural Skills, I.** Practice in developing basic reading, notating, and listening skills in rhythmic, melodic, contrapuntal, harmonic, and formal aspects of musical structure; emphasizes diatonic tonal pitch structures. Prerequisite: Music 101 or placement by examination. 1 hour.
108. **Aural Skills, II.** Continuation of Music 107 with emphasis on extensions of tonality by means of changing tonal centers and altered chords. Prerequisite: Music 107 or placement by examination. 1 hour.
109. **Aural Skills, III.** Continuation of Music 108 with emphasis on atonal pitch structures. Prerequisite: Music 108 or placement by examination. 1 hour.
110. **Basic Music Literature.** Introduction to the standard concert repertory through intensive guided listening. Representative works by major composers are chosen to illustrate the principal forms, styles, and techniques of vocal and instrumental music emphasizing the period since 1700. 2 hours.
120. **Seminar in Music Education.** Lecture and performance series in music education. Selected topics and performances focus on trends in music and music education. Prerequisite: Registration in music education. 0 hours.
130. **Introduction to the Art of Music.** Provides non-music students with basic listening skills, the ability to discuss music intelligently, and an acquaintance with many types of music. 4 hours.
131. **Masterworks of Western Music.** Studies in detail approximately half a dozen works of different eras and types with regard to form, style, performance practice, and historical significance. Prerequisite: Music 130; consent of instructor. 4 hours.
132. **The Varieties of Music.** Appreciation of a major musical type such as the symphony, the concerto, chamber music, opera, jazz, or popular music. 3 hours.
133. **Introduction to World Music.** Survey of the musics of Asia, Africa, and Oceania and the native traditions of the Americas. 3 hours.
134. **The Eras of Music.** Examines major works and composers representative of an era in the history of music such as the baroque, the classical, or the romantic. 3 hours.
135. **Composers' Lives and Works.** Survey of the life and work of specific composers, that will relate the musical and biographical material to pertinent social and historical events. 3 hours.

140. **Introduction to Music Education.** Basic issues and principles of music education and teaching with an emphasis on philosophy; identification of the exceptional child and learning disabilities; includes 16 hours of early field experience in the teaching of music. 2 hours.
142. **Elements of Conducting.** Fundamentals of conducting, score preparation, and transcription for choral and instrumental ensembles. 2 hours.
143. **Pre-Student Teaching Experience.** Early field experience in teacher education, including a practicum of observation, teacher aide, and teaching experiences in music. 32 hours of early field experience is required for each 1 hour of credit. 1 or 2 hours. May be repeated to a maximum of 4 hours; only 2 hours may be applied toward the degree.
144. **Music Teaching Technique Laboratory.** Class and individual instruction on musical instruments and voice for non-music majors; serves as a laboratory for undergraduate music education students to teach in their major applied music field. 2 hours. May be repeated to a maximum of 6 hours.
145. **Unit One Seminar and Instruction in Music.** Experimental seminar courses and individual and group music lessons to introduce non-music students to contemporary ideas in music and to encourage personal exploration of instrumental and vocal performance. 1 to 4 hours.
150. **Jazz Piano Improvisation, I.** Study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 162 or equivalent; Music 104 and 109, or equivalent; consent of instructor. 2 hours.
151. **Jazz Piano Improvisation, II.** Continuation of Music 150. Study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 150 or consent of instructor. 2 hours.
158. **Group Instruction in Piano for Non-Music Majors, I.** Beginning plans for non-music majors: fundamentals of reading, technique, and creative activities; includes study and performance of simple solo and ensemble repertoire. 2 hours.
159. **Group Instruction in Piano for Non-Music Majors, II.** Elementary piano for non-music majors. Continuation of basic skills presented in Music 158: reading, technique, creative work, simple solo and ensemble repertoire. Prerequisite: Music 158 or equivalent. 2 hours.
160. **Group Instruction in Piano, I.** Beginning group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; studies simple piano literature and the development of skills in technique, sight reading, harmonization, transposition, improvisation, and analysis. 2 hours.
161. **Group Instruction in Piano, II.** Elementary group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; continuation of skills introduced in Music 160; easy solos from the main historical periods with appropriate technical development; introduction to piano ensemble literature. Prerequisite: Music 160 or equivalent; consent of instructor. 2 hours.
162. **Group Instruction in Piano, III.** Intermediate group instruction in piano for music majors whose principal main performing medium is voice or an orchestral or band instrument. Continuation of skills introduced in Music 161: study of intermediate level solos and ensemble compositions; harmonization with chromatic chords, sight reading, transposition of four-voice works, improvisation, and learning of patriotic songs. Prerequisite: Music 161 or equivalent; consent of instructor. 2 hours.
163. **Group Instruction in Piano, IV.** Moderately advanced group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument. Continuation of Music 162: emphasis on solos, ensemble compositions, technical development, and more advanced work in sight reading, harmonization, improvisation, transposition, and aural skills. 2 hours.
165. **Class Instruction in Voice.** Group instruction in the fundamentals of singing. Places special emphasis upon the vocal skills needed for music teachers in the public schools unique to: elementary-general or instrumental specializations. 2 hours.
166. **English Diction.** Phonetics applied to English song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.

167. **Italian Diction.** Phonetics applied to Italian song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
168. **German Diction.** German pronunciation as applied to German vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
169. **French Diction.** Principles of French pronunciation applied to French vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
170. **String Instruments.** Class instruction in the fundamentals of playing and teaching violin, viola, cello, and string bass. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 2 hours.
171. **Woodwind Instruments.** Class instruction in the fundamentals of playing and teaching clarinet, flute, saxophone, oboe, and bassoon. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. $\frac{1}{2}$ or 2 hours.
172. **Brass Instruments.** Class instruction in the fundamentals of playing and teaching trumpet, French horn, trombone, euphonium, and tuba. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. $\frac{1}{2}$ or 2 hours.
173. **Percussion Instruments.** Class instruction in the fundamentals of playing and teaching percussion instruments. Prerequisite: Enrollment in the School of Music; for non majors, consent of instructor. 2 hours.
175. **Techniques of Teaching Classroom Instruments.** Fundamental techniques for playing the guitar, the recorder, and the autoharp; includes methods for implementing the use of these instruments in the teaching of elementary and junior high school vocal-music classes. 2 hours.

NOTE: Music 178 through 198 (applied music) have the following prerequisite: Passing of a performance audition is required prior to the initial registration in any applied music course.

178. **Guitar.** Instruction in guitar at the undergraduate level, predominantly classical. 2 or 4 hours (summer session, 1 or 2 hours).
179. **Harpsichord.** Instruction in harpsichord at the undergraduate level. 2 or 4 hours. (Summer session, 1 to 2 hours).
180. **Piano.** Instruction in piano at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
181. **Voice.** Instruction in voice at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
182. **Organ.** Instruction in organ at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
183. **Violin.** Instruction in violin at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
184. **Viola.** Instruction in viola at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
185. **Cello.** Instruction in violoncello at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
186. **String Bass.** Instruction in string bass at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
187. **Flute.** Instruction in flute at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
188. **Clarinet.** Instruction in clarinet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
189. **Oboe.** Instruction in oboe at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
190. **Bassoon.** Instruction in bassoon at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
191. **Cornet and Trumpet.** Instruction in cornet and trumpet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).

192. **Horn.** Instruction in horn at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
193. **Trombone.** Instruction in trombone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
194. **Euphonium.** Instruction in euphonium at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
195. **Tuba.** Instruction in tuba at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
196. **Percussion.** Instruction in percussion at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
197. **Harp.** Instruction in harp at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
198. **Saxophone.** Instruction in saxophone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Instrumentation, I.** Orchestration and arranging for orchestral groups. Prerequisite: Senior standing in music. 2 hours.
201. **Instrumentation, II.** Problems in arranging for all wind instruments. Required of composition majors. Prerequisite: Music 200 or consent of instructor. 2 hours.
202. **Rudiments of Theory, I.** Introduces non-music students to basic terminology and notation, intervals, and triads; concepts of scale, tonality, and musical form. 3 hours.
203. **Rudiments of Theory, II.** Continuation of Music 202, for nonmajors only; includes: modulations, chromatically altered chords, 18th/19th centuries musical forms, twentieth century trends and contemporary music notation. Prerequisite: Music 202. 3 hours.
204. **Compositional Problems: Serial Techniques.** Studies serial techniques and levels of determinacy through composition and analysis. Prerequisite: Consent of composition-theory faculty. 2 hours.
205. **Compositional Problems: Technological and Visual Aspects.** Studies electronic and computer applications, visual and gestural elements, and levels of determinacy through composition and analysis. Prerequisite: Consent of composition-theory faculty. 2 hours.
206. **Intermediate Composition.** Music composition at the secondary stages; analysis and writing of shorter musical forms. Prerequisite: Music 106 and consent of composition-theory faculty. 2 hours. May be repeated to a maximum of 6 hours.
209. **Kodaly: Philosophy and Methods.** Introduction to the music education philosophy of Zoltan Kodaly through experiences in relative sol-fa and the expansion of aural awareness. Prerequisite: Consent of instructor. 2 hours.
210. **Computer-Assisted Instruction in Music.** Introduction to computer-assisted instruction (CAI) and its uses in public school, college, and continuing education programs in music; familiarization with visual and audio programming strategies and the research potential of CAI systems. Prerequisite: Consent of instructor. 2 hours.
211. **Practicum in Piano Teaching.** Coordinates lesson planning for teaching pre-college piano pupils with extensive teaching experiences; gives close examination to beginning and intermediate teaching literature. Prerequisite: Music 143 or 242. 2 hours.
213. **The History of Music, I.** Survey of music and its development in Western civilization to 1750; emphasis on an acquaintance with representative musical works and style, and on understanding musical concepts in the light of their historical background. Prerequisite: Music 110 or consent of instructor. 3 hours.
214. **The History of Music, II.** Survey of the development of music as an art in Western civilization from 1750 to the present; emphasizes an acquaintance with formal and stylistic problems through the study of representative works and on understanding specific musical concepts in the light of their historical and general cultural context. Prerequisite: Music 213. 3 hours.
229. **Thesis and Advanced Undergraduate Honors in Music.** Special individual research projects. Required of seniors in the history of music and composition-theory curricula; open also to advanced undergraduates, including James Scholars, who have achieved university or college honors and who desire to do research in specialized areas of music, including performance. Prerequisite: Senior standing in the history of music and composition-theory, curriculum or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)

- 230. Choral Literature and Conducting, I.** Laboratory course which includes literature for secondary choral groups. Students conduct choral groups, learn to analyze and prepare scores, and conduct in a laboratory setting. Prerequisite: Music 142. 2 hours.
- 231. Choral Literature and Conducting, II.** Laboratory course which includes the study and conducting of public school choral music. Students conduct choral groups, prepare choral scores, learn rehearsal techniques, conduct in a choral laboratory, and conduct vocal ensembles in the public schools. Prerequisite: Music 230. 2 hours.
- 232. Instrumental Literature and Conducting, I.** Survey of music literature for wind ensemble and band; principles of interpretation and techniques of conducting emphasized through detailed study and performance of selected compositions. Prerequisite: Music 142. 3 hours.
- 233. Instrumental Literature and Conducting, II.** Principles of interpretation and techniques of orchestral conducting emphasized through detailed study and performance of selected orchestral compositions appropriate for public school groups. Prerequisite: Music 232. 3 hours.
- 234. Workshop in Elementary Music Education.** Detailed consideration of music objectives, principles of learning, and their implications for teaching methods; major emphasis on techniques and materials suitable for teaching music in the elementary school by the classroom teacher. Specifically designed for the experienced classroom teacher. Prerequisite: Consent of instructor; public school teaching experience. 2 hours. Offered in the summer session only.
- 235. Elementary and Junior High School Instrumental Music.** Examines pedagogical and organizational techniques for teaching elementary and junior high school instrumental music in a laboratory school setting. Prerequisite: Music 232. 2 hours.
- 236. Choral Techniques in Elementary and Junior High School.** Detailed consideration of literature, arranging for elementary and junior high school choruses, and the changing voice. Prerequisite: Advanced undergraduate standing in music or consent of instructor. 3 hours.
- 237. Orff: Philosophy and Methods.** Introduction to the Carl Orff-Schulwerk approach to music for children; techniques include the use of Orff instruments and materials and the adaptation of these materials for classroom use with or without instruments. Prerequisite: Sophomore standing in music education or consent of instructor. 2 hours.
- 239. Principles and Techniques in Music Education.** Comprehensive examination of interrelationships among the various segments of music education; the role of music education at all levels in the total school program, elementary through secondary, with emphasis upon philosophy, learning theory, curriculum design, identification of exceptional children and learning disabilities, administration and current trends; includes 20 hours of early field experience in the teaching of music. Prerequisite: Senior standing in music education or consent of instructor, plus 80 hours of early field experiences in the teaching of music. 3 hours.
- 240. Music for Elementary Teachers, I.** Presentation of music for students preparing to teach in the elementary schools. Prerequisite: Junior standing in elementary education or consent of instructor. 3 hours.
- 241. Music for Elementary Teachers, II.** Continuation of Music 240. A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Music 240 or consent of instructor. 3 hours.
- 242. Teaching Music in the Elementary School.** Techniques of and material suitable for teaching music in the elementary school. 3 hours.
- 243. Teaching Music in the Junior High School.** Detailed consideration of the music program in the junior high school; special emphasis on instructional material and methods of instruction. 3 hours.
- 244. Teaching of Instrumental Music.** Organizing and rehearsing school marching and jazz bands; techniques of administering and publicizing school instrumental music programs. Prerequisite: Music 232. 3 hours.
- 245. Choral Score Preparation.** Detailed consideration of the techniques of choral music analysis and score preparation for performance; includes stylistic considerations and effective programming. Prerequisite: Music 142, 230, or 231, or consent of instructor. 2 hours.
- 246. Teaching of Choral Music.** Methods course designed for junior and senior high school vocal and choral majors; includes rehearsal management, choral style, and materials suitable for organizing and teaching choral music in the public schools. Prerequisite: Music 142, 230, 231, or consent of instructor. 3 hours.

247. **Repertory for the Secondary School Choral Program.** Exploration of literature appropriate for public school music groups through demonstrative rehearsals and public performances. Prerequisite: Music 142, 230, 231, or consent of instructor. 1 or 2 hours. May be repeated to a maximum of 6 hours.
249. **Music for Early Childhood Teachers.** Development of musical competencies essential for teachers in nursery schools and kindergartens; singing, rhythmic keyboard improvisation, and creative and music reading skills; extensive study of music materials suitable for use in early childhood music. Prerequisite: Music 240 or consent of instructor. 3 hours.
250. **University Orchestra.** Prerequisite: Consent of instructor. 0 or 1 hour.
251. **Chamber Orchestra.** Performs literature of all periods written specifically for a chamber-sized orchestra. Prerequisite: Consent of instructor. 1 hour.
253. **Collegium Musicum.** Performs medieval, renaissance, and baroque music; various small groups formed for the performance of sonatas and cantatas of Bach and Handel, wind serenades of Mozart, etc. Interested students may play on lute, harpsichord, and other instruments from the University's collection. Prerequisite: Consent of instructor. 1 hour.
254. **String Ensemble.** Participation in various ensemble groups, such as trios, quartets, quintets, etc., for the study of chamber music literature. The course may be repeated or taken during the freshman and sophomore year without credit. Prerequisite: Consent of instructor. 1 hour.
255. **Woodwind Ensemble.** Prerequisite: Consent of instructor. 1 hour.
256. **Brass Ensemble.** Ensembles of mixed brasses in both small and large forms. Prerequisite: Consent of instructor. 1 hour.
257. **Percussion Ensemble.** Prerequisite: Consent of instructor. 1 hour.
258. **Piano Ensemble.** Prerequisite: Consent of instructor. 1 hour.
259. **Organ Keyboard Techniques.** Development of practical keyboard skills related to the work of the church organist; transposition, score-reading, harmonization, modulation, hymn-playing, and solo and anthem accompaniment. Prerequisite: Consent of instructor. 1 hour.
260. **Oratorio Society.** Performance of oratorios and other major choral works in cooperation with the University Symphony Orchestra; an advanced mixed-voice chorus open to students, faculty, and members of the community. Prerequisite: Consent of instructor. 0 or 1 hour.
261. **University Chorus.** Performance of cantatas and other choral works; a mixed-voice chorus for average and beginning singers. Open to students, faculty, and members of the community. Prerequisite: Consent of instructor. 0 or 1 hour.
262. **Women's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all women students. Prerequisite: Consent of instructor. 0 or 1 hour.
263. **Men's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all men students. Prerequisite: Consent of instructor. 0 or 1 hour.
264. **Concert Choir.** Practical experience in mixed-voice singing of accompanied and unaccompanied music of various periods and styles; a highly advanced group of competent student singers. Prerequisite: Consent of instructor. 0 or 1 hour.
265. **Opera-Musical Theatre.** Preparation and public performance of grand or light opera; includes only singing and acting. (Students desiring experience in costuming, stage management, scenery, publicity, etc., should apply to the University Theatre which cooperates in the opera productions). Prerequisite: Consent of instructor. 1 hour.
266. **Jazz Band.** Designed to acquaint proficient instrumentalists with jazz compositions, arrangements, and improvisational procedures, and to promote a high degree of stylistic and technical competence in performance. Prerequisite: Consent of instructor. 0 or 1 hour.
267. **Harp Ensemble.** Ensembles of multiple harps and harp in combination with other instruments. Prerequisite: Consent of instructor, or Music 197 or 397. 1 hour.
268. **Small Choral Ensembles.** Open to a limited number of undergraduate students who desire experience in performance of music specifically written for smaller choral groups. Prerequisite: Consent of instructor. 1 hour.
269. **String Chamber Music, Literature, and Performance.** Extensive study of chamber music literature for or including string instruments (violin, viola, cello, double bass); weekly coaching by members of the string faculty. Requires one performance per semester. Prerequisite: Consent of instructor. 1 hour. May be repeated to a maximum of 8 hours.

270. **String Education, I: Teaching of Stringed Instruments at the Elementary Level.** Organization, materials, and techniques. Prerequisite: String major standing or consent of instructor. 3 hours.
271. **String Education, II: Teaching of Stringed Instruments at the Secondary Level.** Organization, materials, and techniques. Prerequisite: Music 270 or consent of instructor. 3 hours.

Music 280-290 are open to all students who have been accepted by audition, with assignments made according to proficiency and instrumentation. Completion of each course involves, in addition to the regular schedule of rehearsals, participation in the public appearances by the bands.

280. **Wind Ensemble.** Mixed woodwind-brass-percussion ensembles for the study and performance of wind chamber compositions. Prerequisite: Junior standing or consent of instructor. 0 or 1 hour.
281. **Symphonic Band.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 0 or 1 hour.
282. **Symphonic Band, II.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 0 or 1 hour.
283. **First Concert Band.** Maintains the instrumentation of the standard band and serves as a training organization for the symphonic bands. The literature studied and performed is of the highest calibre and technical difficulty. 0 or 1 hour.
284. **Second Concert Band—A.** Training for the Symphonic Bands and the First Concert Band. The high quality band literature is technically less difficult than that of Music 281, 282, and 283. Promotion contingent upon improvement and chair vacancies. 0 or 1 hour.
285. **Second Concert Band—B.** Training for the Symphonic Bands and the First Concert Band. The high quality band literature is technically less difficult than that of Music, 281, 282, and 283. Promotion contingent upon improvement and chair vacancies. 0 or 1 hour.
286. **Marching Band.** Prepares and performs at least six shows per football season; music used is of the highest available quality. 1 hour.
287. **Basketball Band.** Performs for home basketball games. Prerequisite: Band Department audition during early November. 1 hour. Credit is given for spring semester only.
288. **Brass Band.** Maintains a complete British Brass Band Instrumentation for the study and performance of all types and styles of brass band literature. Prerequisite: Concurrent registration in one of the concert bands: Music 281, 282, 283, 284, or 285. 1 hour.
289. **Summer Band.** Maintains the instrumentation of the standard band for the study and performance of all types of band literature. Prerequisite: Consent of instructor. 1 hour.
290. **Clarinet Choir.** Maintains a complete clarinet choir instrumentation for the study and performance of all types and styles of clarinet choir literature. Prerequisite: Concurrent registration in one of the concert bands: Music 281, 282, 283, 284, or 285. 1 hour.
300. **Counterpoint and Fugue.** The study of contrapuntal writing in the eighteenth century, including fugue, with emphasis on the works of J. S. Bach; involves both writing and analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
301. **Schenkerian Analysis of Tonal Music.** Studies analytical systems and their application to tonal music; includes a survey of theoretical works by important theorists from Rameau to Schenker. Emphasizes practical application of Schenkerian analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
302. **Musical Acoustics.** Theory and application of simple resonators, wave motion, resonances of string and pipes; perception of loudness, pitch and timbre; musical scales; and acoustics of rooms and musical instruments. Prerequisite: Mathematics 112 and Music 101, or equivalent. 3 hours or $\frac{3}{4}$ unit.
303. **Music Formalization.** Surveys the logical tools introduced in the theory and practice of the musical composition by Xenakis, Hiller, and others; intended for musicians with no more than limited familiarity with mathematics. Prerequisite: Music 104 and consent of instructor. 3 hours or $\frac{3}{4}$ unit.
304. **Contemporary Compositional Techniques.** Studies in specialized areas of composition for advanced undergraduates and graduates majoring in composition-theory. May be elected by others with consent of instructor. Prerequisite: Music 104, 106, or 109, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.

305. **Analytical Systems for Twentieth Century Music.** Studies analytical techniques developed for music written in the twentieth century not based upon tonal principles from the common practice period. Includes a survey of important theorists; studies set theory and twelve-tone theory; and surveys other specialized analytical systems. Prerequisite: Music 104, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
306. **Composition.** Work in original composition including small and large forms. Prerequisite: for undergraduates, Music 204, 205, and 206 and consent of composition faculty; for graduate students, consent of composition faculty. Students submit scores of their compositions to the composition faculty in order to obtain consent to register; consent is granted on the basis of the quality of the music the student has composed and the level of skill demonstrated in the work submitted. 3 hours or $\frac{1}{2}$ unit.
308. **Analysis of Musical Form.** Extensive study of the formal structure of representative musical compositions from various historical periods, including renaissance and baroque, Viennese classical, nineteenth century, first half of twentieth century, and since World War II. Prerequisite: Music 104 and 109. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 9 hours or 1 $\frac{1}{2}$ units.
310. **Ancient and Medieval Music.** History of Western music to about 1400. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Music in the Renaissance.** History of music from about 1400 to 1600. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
312. **Music of the Seventeenth Century.** History of music from about 1600 to 1700. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Music of the Eighteenth Century.** History of music from about 1700 to 1800. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Music of the Nineteenth Century.** History of music from about 1800 to 1900. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Music of the Twentieth Century.** History of music from about 1900 to the present. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
316. **Anthropology of Music.** Same as Anthropology 316. Introduction to the anthropological study of music, including the role of music in the world's societies and nonwestern musical systems and cultures. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
317. **Area Studies in Ethnomusicology.** Same as Anthropology 315. Seminar devoted to intensive study in the music of one specific culture, e.g., Japan, China, Indonesia, India, the Near East, African and New World Negro, European and American folk cultures, or American Indian. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 12 hours or 2 units.
318. **History of Performance Practices, I.** Study of musical performance from about 900 to 1650 A.D.; discussion of musical instruments, makeup of instrumental and vocal ensembles, etc., supplemented by demonstration performances of selected works using the University's collection of instruments. Prerequisite: Senior standing in music theory or music history, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
319. **History of Performance Practices, II.** Study of musical performance from 1600 to 1750 A.D.; discussion of musical instruments, ornamentation, basso, continuo, etc., supplemented by demonstration performances using the University's collection of instruments. Prerequisite: Senior standing in music theory or music history, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
320. **Proseminar.** Special preparation in specialized fields of musicology, composition-theory, and music education. Prerequisite: Senior or graduate standing in music or music education; consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units. Students in open studies option may repeat to a maximum of 16 hours.
321. **Electronic Music Techniques, I.** Introduces electro-acoustic music, including historical background, literature, techniques of notation and realization, and compositional application in the areas of musique concrete, classical electronic music, and voltage-controlled electronic music. Prerequisite: Junior standing in music or consent of instructor. 4 hours or 1 unit.
322. **Electronic Music Techniques, II.** Advanced study in the use of voltage-controlled synthesizers in music composition and study of compositional, technical, and performance considera-

- tions in combining electronics with traditional instruments and/or voices in music composition. Prerequisite: Music 321 or placement by examination. 2 hours or $\frac{1}{2}$ unit.
323. **Opera Production, I.** Studies the problems of the lyric stage; investigation of and practice with casting methods, program selection, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 265 and 381; consent of instructor. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
324. **Opera Production, II.** Studies continuation of topics introduced in Music 323. Prerequisite: Music 323. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
325. **Introduction to Musicology, I.** Survey of the discipline of musicology, its scope, and its history with bibliographical studies and sample problems for investigation. Prerequisite: Graduate standing in musicology or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit).
326. **Introduction to Musicology, II.** Continuation of a survey of the discipline of musicology; special attention to class projects in systematic musicology and to the philosophy of music history. Prerequisite: Music 325 or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit).
327. **Urban Popular Music.** Introduction to the world's popular music; emphasis on its role in society, based on American, European, Latin American, and non-Western repertoires. Prerequisite: Music 130 or equivalent, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
328. **Composer-Choreographer Workshop.** Same as Dance 328. See Dance 328.
330. **Applied Music Pedagogy.** Survey of techniques, practices, and materials; presentation of group and individual instruction; an approach to teaching problems, tone production, musical styles, and interpretation for various age levels; actual teaching experience under faculty supervision. Required of applied music majors in voice and string instruments. Prerequisite: Junior standing in music or consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
331. **Piano Pedagogy, I.** Objectives, techniques, literature, and materials for teaching the child from about ages five through ten (elementary level); observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
332. **Piano Pedagogy, II.** Objectives, techniques, literature, and materials for teaching the young pianist from about ages eleven through eighteen (middle school to pre-college level); teaching the adult beginner; observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
333. **The History of Opera.** Surveys opera and related forms from the end of the 16th century to the present; studies representative works in some detail. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
334. **The Music of America, I.** Study of folk, popular, and art music in America from the time of the first European settlers through the middle of the nineteenth century; psalmody, early opera and concert life, African and European folk music, the singing school, music of European immigrants, and the roots of jazz. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
335. **The Music of America, II.** Study of chamber, choral, and orchestral music written by American composers from 1850 to the present; jazz and its offshoots; folk and popular music; and experimental music in America. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
336. **Music in Latin America.** History of music in Latin America from colonial times to the present, including its cultural and social background. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
337. **National and Regional Studies in European Music History.** Studies in the history of music of individual nations and regions of Europe. Each semester is devoted to one area, such as Great Britain, Spain and Portugal, Russia, Scandinavia, or eastern Europe. Prerequisite: Junior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
339. **Functional Music for Exceptional Children and Youth.** Techniques and methods to aid exceptional children and youth in acquiring and improving self-concept, socialization skills, attention

span, listening skills, language acquisition, and academic readiness; considers the use of music techniques and methods in acquiring these skills in the mainstreamed classroom. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.

340. **Marching Band Procedures.** Detailed consideration of principles and procedures for preparing a marching band to participate in parades, ceremonies, and shows for sports events. Prerequisite: Junior standing in instrumental music education. 2 hours or $\frac{1}{2}$ unit.
341. **Seminar in Instrumental Music Education.** Intensive study of musical, scientific, and educational concepts and principles related to the teaching of heterogeneous combinations of instruments. Prerequisite: Completion of student teaching or graduate standing in music education. 2 hours or $\frac{1}{2}$ unit.
342. **Band Arranging.** Development of basic scoring and arranging skills for various small instrumental ensembles and marching band. Prerequisite: Music 104 or equivalent. 2 hours or $\frac{1}{2}$ unit.
343. **Tests and Measurement in Music Education.** Construction, design, appraisal, and use of measurement devices for music teaching and research. Prerequisite: Consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
344. **Jazz Ensemble Research Techniques.** Emphasizes principles of interpretation and techniques for conducting the school jazz ensemble through detailed study, with practicum experience in a laboratory setting. Prerequisite: Music 232 or consent of instructor. Credit: 2 hours or $\frac{1}{2}$ unit. Graduate credit requires written project.
345. **Teaching Techniques of Music Theory.** Discussion and analysis of teaching materials, methods, texts, and pedagogical sequence, including an intensive survey of the structural materials normally covered during the first two years of collegiate study. Prerequisite: Music 300 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
346. **Workshop in Music Education.** Development of essential facts, attitudes, and principles through a consideration of problems encountered in music education. Parallel with this study is the preparation of resource materials for music programs in elementary and secondary schools. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units. Offered in the summer session only.
347. **Teaching of Woodwind Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
348. **Teaching of Brass Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
349. **Music in Early Childhood.** Same as Human Development and Family Ecology 349. Detailed consideration of the music program in nursery schools, kindergarten, and the primary grades; topics include the nature of early musical responses, objectives, experience levels of the program, methods of teaching, and materials. Observation of music teaching at the Child Development Laboratory is included in the course work. Prerequisite: Senior or graduate standing in music or human resources and family studies, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
350. **Advanced Ensemble Music.** Selected projects in the study and performance of ensemble literature, including the areas of operatic, instrumental, and vocal-choral music and accompanying. Prerequisite: Consent of instructor. 0 to 2 hours, or 0 to $\frac{1}{2}$ unit.
355. **School/Community Musical Theatre Production.** Problems and techniques involved with technical and artistic production of musicals in the junior and senior high schools and in the community. Prerequisite: Advanced undergraduate or graduate standing in music education or performance curricula, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
360. **Advanced Group Instruction in Piano, I.** Comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163, and Music 104 and 109, or equivalent; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
361. **Advanced Group Instruction in Piano, II.** Continuation of the topics introduced in Music 360. Prerequisite: Music 180 (12 hours completed) or Music 163; Music 104 and 109 or equivalent; Music 360 or equivalent and consent of instructor. 2 hours or $\frac{1}{2}$ unit.

- 362. Advanced Jazz Piano Improvisation.** Study of solo jazz piano improvisation on an advanced level. Includes practical experience in traditional, modern, and abstract solo performance, as well as theoretical, stylistic, and historical background. Prerequisite: Music 151 or equivalent. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
- 366. Vocal Repertoire, I.** Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice or consent of instructor and concurrent registration in Music 381. 1 hour.
- 367. Vocal Repertoire, II.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his special field. Prerequisite: Junior standing in voice or consent of instructor and concurrent registration in Music 381. 1 hour.
- 369. Accompaniment for Dance.** Same as Dance 369. See Dance 369.
- 377. Principles of Accompanying.** Fundamental principles of accompanying singers and instrumentalists; practical experience in accompanying; and facility in sight reading for keyboard performers. Prerequisite: Advanced undergraduate or graduate standing in music or music education and consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit). May be repeated to a maximum of 16 hours or 4 units.

NOTE: Music 378 through 398 (applied music) have the following prerequisite: For students in the Bachelor of Music programs for the curricula in Vocal and Instrumental Music, junior standing in the major applied music subject as approved by the faculty of the appropriate applied music division; for students in music education, completion of the curricular requirement in the major applied music subject; and for students in other colleges of the University, completion of four semesters in the comparable applied music course at the 100-level.

- 378. Guitar.** Instruction in guitar at the advanced undergraduate and graduate levels, predominantly classical. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 379. Harpsichord.** Instruction in harpsichord at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 380. Piano.** Instruction in piano at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 381. Voice.** Instruction in voice at the advanced undergraduate and graduate level. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 382. Organ.** Instruction in organ at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 383. Violin.** Instruction in violin at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 384. Viola.** Instruction in viola at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 385. Cello.** Instruction in violoncello at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 386. String Bass.** Instruction in string bass at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 387. Flute.** Instruction in flute at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 388. Clarinet.** Instruction in clarinet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 389. Oboe.** Instruction in oboe at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
- 390. Bassoon.** Instruction in bassoon at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).

391. **Cornet and Trumpet.** Instruction in cornet and trumpet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
392. **French Horn.** Instruction in French horn at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
393. **Trombone.** Instruction in trombone at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
394. **Euphonium.** Instruction in euphonium at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
395. **Tuba.** Instruction in tuba at the advanced undergraduate and graduate level. 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
396. **Percussion.** Instruction in percussion at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
397. **Harp.** Instruction in harp at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
398. **Saxophone.** Instruction in saxophone at the advanced undergraduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
400. **Advanced Instrumentation: Chamber and Symphonic.** Orchestration for chamber and symphony orchestras; works of classical, romantic, and modern composers. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
401. **Advanced Instrumentation: Band.** Arrangement for the concert band of works from orchestra, organ, and chamber music by composers of the classical, romantic, and modern periods. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
402. **Analysis in Relation to Performance and Interpretation, I.** Unifying course in the structure of music, in which analysis is related to the performance and understanding of music; course material drawn from standard literature from the Renaissance to the present day with emphasis on the smaller forms. Prerequisite: Music 104 or equivalent; consent of instructor. $\frac{1}{2}$ or 1 unit.
405. **Individual Topics in Music Theory.** Studies in specialized areas of analysis, theory systems, and aesthetics for composition-theory majors. Prerequisite: Graduate standing in music; consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
406. **Composition.** Advanced study of contrapuntal forms; study of contemporary melodic and harmonic practices; and original work in advanced composition. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units.
410. **History of Music Theory.** Prerequisite: Graduate standing in musicology or composition, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
411. **Introduction to Ethnomusicology.** Comprehensive survey of concepts, problems, and methods of research in non-Western and folk music. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
412. **History of Musical Aesthetics, I.** Survey of the principal philosophies of music from Pythagoreanism to the humanistic period, their historical backgrounds, and their relation to musical styles. Prerequisite: Graduate standing in music. $\frac{1}{2}$ or 1 unit.
414. **Notation, I.** History of notation from its beginning to 1400. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
415. **Notation, II.** History of notation from 1400 to 1600, including instrumental tablatures. Prerequisite: Music 414 or consent of instructor. $\frac{1}{2}$ unit.
417. **History of Instrumental Music from 1600 to 1750.** Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
418. **Topics in Opera History.** Intensive study of a period or school of opera composition or of a particular aspect of the history of opera. Wide reading in the social and intellectual climate of the period concerned; literary, dramatic, and musical analysis; and work with primary sources whenever possible. Prerequisite: Music 428, graduate standing in musicology, or consent of instructor. 1 unit (summer session, $\frac{1}{2}$ unit).
419. **Orchestral Literature, I.** Study of orchestral and symphonic literature from 1700 to 1850. Prerequisite: Graduate standing in music and consent of instructor. $\frac{1}{2}$ unit.
420. **Orchestral Literature, II.** Study of orchestral and symphonic literature from 1850 to the present. Prerequisite: Graduate standing in music and consent of instructor. $\frac{1}{2}$ unit.
421. **Research in Music Education.** Introduction to problems and methods of research in music education. Required of all candidates for the Doctor of Education in music education. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.

422. **Seminar in Theory of Music.** Intensive study of selected topics in the fields of music theory, history of theory, and history of musical materials. Prerequisite: Graduate standing in music theory or consent of instructor. $\frac{1}{2}$ or 1 unit.
423. **Seminar in Musicology.** Problems in historical and systematic musicology or ethnomusicology; discussions of special problems and reports on individual research. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
424. **Seminar in the Works of a Selected Composer.** Intensive historical and analytical study of the works of important composers; each semester devoted to one composer, e.g., Bach, Beethoven, Handel, Haydn, Mozart, or Wagner. Prerequisite: Music 213 and 214; two of the following: Music 310, 311, 312, 313, or 315, or equivalent. 1 unit (summer session, $\frac{1}{2}$ or 1 unit). May be repeated for a maximum of 2 units.
425. **Readings in Musicology and Music Theory.** Individual guidance in intensive readings in the literature of musicology or music theory, selected in consultation with the instructor and in accordance with the needs and interests of the student. Prerequisite: Graduate standing in musicology or music theory. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit).
426. **Choral Literature, I.** Survey of choral and vocal ensemble repertoire from the Middle Ages to 1750. Prerequisite: Graduate standing in music, consent of instructor. $\frac{1}{2}$ unit.
427. **Choral Literature, II.** Survey of choral repertoire from 1750 to the present. Prerequisite: Graduate standing in music, consent of instructor. $\frac{1}{2}$ unit.
428. **Problems and Methods.** Introduction to methods in research and stylistic criticism and to bibliographic aids, editions, and editing of music, as related to the work of the musician and composer. Reports of bibliographic problems and on individual projects are presented orally and in writing. Required of all students in the Master of Music program, except those majoring in musicology. 1 unit.
429. **Historical Studies in Twentieth-Century Music.** Seminar in contemporary music, with emphasis on the historical foundations of current trends in musical composition. Prerequisite: Music 315 or 422, or equivalent. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit). May be repeated to a maximum of 2 units.
430. **Advanced Orchestra Conducting and Literature.** Intensive study of conducting techniques and problems related to standard orchestral literature; survey of materials for school and community orchestras. Prerequisite: Music 233 or equivalent, and consent of instructor. $\frac{1}{2}$ or 1 unit.
431. **Advanced Band Conducting and Literature.** Study of problems and techniques of band conducting; survey of literature for the concert band. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
432. **Advanced Choral Techniques, I.** Intensive laboratory approach to the development of advanced techniques necessary for working effectively with choral ensembles. Choral majors must enroll each semester in residence. Prerequisite: Graduate standing in choral music or consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
433. **Advanced Choral Techniques, II.** Intensive survey of choral literature with laboratory organization for reading, conducting, and interpreting choral music of all periods, styles, and voice arrangements. Prerequisite: Graduate standing in choral music, Music 432 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
434. **Piano Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
435. **Vocal Literature.** Study of solo song in larger works, and solo art song. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
436. **Organ Literature.** Intensive study of organ literature from Bach to the present; includes the music itself, recordings, and collateral readings. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
437. **String Instrument Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
438. **Wind Instrument Literature.** Survey of solo and ensemble wind literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. 1 unit. May be repeated to a maximum of 2 units.

439. **Percussion Instruments Literature.** Survey and analysis of the field of solo and ensemble percussion literature; includes analysis and performance, when possible, of the music itself, recordings, and collateral readings. Prerequisite: Graduate standing in music; consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
440. **Foundations and Principles of Music Education, I.** Consideration of the historical and philosophical foundations of music education and their application to the process of program development in music education. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
441. **Foundations and Principles of Music Education, II.** Consideration of the psychological foundations of music education and their application to the processes of instruction, administration, supervision, and evaluation of music education programs. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
442. **The General Music Program in Secondary Schools.** Detailed consideration of the secondary general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
443. **Administration and Supervision of Music Education.** Studies the functions of supervisors and directors of music education in administering music programs in elementary and secondary schools. $\frac{1}{2}$ or 1 unit.
444. **The General Music Program in Elementary Schools.** Detailed consideration of the elementary general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
445. **Music in Higher Education.** Orientation to the organization, teaching, and administration of music in the college and university. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit. Offered in summer session only.
446. **Seminar in Experimental Music, I.** Survey of contemporary electronic music, computer music, and related types of music; discussion of relevant music theory. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
447. **Seminar in Experimental Music, II.** Continuation of Music 446. Prerequisite: Music 446 or consent of instructor. $\frac{1}{2}$ unit.
448. **Computer Music.** Representation of sound signals in a digital computer; methods for input and output of sounds to and from a computer; sound synthesis programs; synthesis of simple musical structures; use of graphics; processing of live sounds by computer; editing and retrieval; fidelity of computer-produced sounds; and hybrid analog/digital computers. Prerequisite: Graduate standing in composition-theory or consent of instructor. 1 unit.
449. **Problems in Band Conducting.** Examination of techniques of rehearsal, conducting, and preparation of band organizations for concert performance; emphasizes discussion, analysis, and preparation of selected scores and the problems they present. Prerequisite: Graduate standing or experience as a band conductor. $\frac{1}{2}$ or 1 unit.
450. **History of Vocal Ensemble and Choral Music.** Critical and analytical study of vocal ensemble and choral music from the Middle Ages to the present. Prerequisite: Music 426 and 427, or equivalent, or consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
452. **Choral Conducting Project.** Participation in a graduate choral conducting laboratory and preparation of a choral ensemble for public performance. [Required during the final semester in residence for Master of Music with choral music option candidates.] Prerequisite: Music 432 and consent of instructor. $\frac{1}{2}$ unit.
454. **Advanced Choral Performance Techniques.** Study of performance problems and musical analysis of choral music with techniques of preparation and rehearsal from the various style periods: renaissance, baroque, classic-romantic, and contemporary. Prerequisite: Admission into the Doctor of Musical Arts choral music program, or the equivalent background in other doctoral degree programs. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
455. **The Choral Program in Secondary Schools.** In-depth study of the methods and materials appropriate for teaching choral music in the secondary schools. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
456. **Advanced Computer Music.** Compositional approaches to computer music; advanced digital computer sound synthesis using the computer programs MUSIC 360 and MUSIC 4BF; compositional algorithms; user-written sound generation routines; new concepts of timbre

in digital sound synthesis; digital/analog and analog/digital conversion; and installation of computer music programs. Prerequisite: Music 448 or consent of instructor. 1 unit.

460. **Practicum in Piano Teaching: Children and Teenagers.** Student teaching of group piano and musicianship classes for elementary, middle, and high school students; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 331 or equivalent. 1 unit.
461. **Practicum in Piano Teaching: Adults.** Student teaching of group piano for adults in the private studio, community college, and university; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 332 or equivalent. 1 unit.
477. **Advanced Accompanying.** Fundamental principles of accompanying singers and instrumentalists, practical experience in accompanying, and facility in sight reading for keyboard performers. Prerequisite: Graduate standing in music or music education or consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
480. **Piano.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the piano faculty. $\frac{1}{2}$ or 1 unit.
481. **Voice.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the voice faculty. $\frac{1}{2}$ or 1 unit.
482. **Organ.** Selected studies from the masterworks of organ literature. Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the organ faculty. $\frac{1}{2}$ or 1 unit.
483. **String Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the appropriate applied music faculty; concurrent registration in Music 250 or 350, section K, for students working toward the Master of Music. $\frac{1}{2}$ or 1 unit.
484. **Wind Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
485. **Percussion Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the percussion faculty. $\frac{1}{2}$ or 1 unit.
489. **Doctoral Projects.** Special projects for candidates for the Doctor of Musical Arts degree. Open only to students in the Doctor of Musical Arts program. Prerequisite: Consent of instructor. 0 to 4 units (summer session, 0 to 2 units).
499. **Thesis Research.** Research in special projects. Prerequisite: Consent of instructor. 0 to 4 units.

NAVAL SCIENCE

Head of Department: Marietta A. Pane, USN

Department Office: 236 Armory Building, 505 East Armory, Champaign

100. **Naval Science Laboratory.** A noncredit course designed to give the Naval ROTC student, through practical application, a better grasp of the naval science subjects taught in the classroom and a working knowledge of close order drill. 0 hours.
111. **Introduction to Naval Science.** Naval organization and management practices examined within the context of the naval service; command and control, organization for logistics, service and support, functions and services of major components of the Navy and Marine Corps, and shipboard organization; and emphasis on management and leadership functions. Prerequisite: Approval of professor of naval science; concurrent registration in Naval Science 100. 2 hours.
112. **Naval Ships Systems, I.** Studies ship compartmentation, propulsion systems, auxiliary power systems, interior communications, and ship control; types, structure, and purpose of naval ships; and examination of elements of ship design and ship stability. Prerequisite: Naval Science 111 or consent of instructor. 3 hours.
121. **Naval Ships Systems, II.** Introduction to concepts of naval weapons systems, their capabilities and limitations, and their individual and complementary roles in a wide variety of offensive and defensive situations. Prerequisite: Credit or concurrent registration in Physics 102 or equivalent, and one course in computer science; or consent of instructor. 3 hours.

124. **Sea Power and Maritime Affairs.** Investigates the characteristics of sea power and their impact on the affairs of our nation; discusses those characteristics with historical and modern applications to the United States and other world powers. 2 hours.
231. **Navigation and Naval Operations, I.** Provides the student with an understanding of the theory and techniques of the three types of marine (nautical) navigation: piloting, electronic, and celestial. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100 or consent of instructor. 3 hours.
232. **Navigation and Naval Operations, II.** Designed to give an understanding of the concepts and use of relative motion principles, international maritime law and the rules of the nautical road, and the fundamentals of U.S. fleet organization, communication, and operations. Prerequisite: Junior standing in NROTC Program; concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
242. **Naval Leadership and Management, II.** Continuation of Naval Science 241. Examines Navy organization, personnel administration procedures, human resource management programs, and military justice in terms of current management theory. Prerequisite: Naval Science 241 or consent of instructor. 2 hours.
291. **Evolution of Warfare.** Survey of the evolution of warfare emphasizing the philosophies and trends which have been significant in land warfare. Prerequisite: Concurrent registration in Naval Science 100, or consent of instructor. 3 hours.
293. **History of Amphibious Warfare.** Studies amphibious operations and the evolution of amphibious warfare doctrine and development. Prerequisite: Advanced undergraduate standing or consent of instructor. 3 hours.

NUCLEAR ENGINEERING

Head of Department: B. G. Jones

Department Office: 214 Nuclear Engineering Laboratory, 103 South Goodwin, Urbana

197. **Nuclear Energy and Its Uses.** Discussions and lectures to orient freshmen and sophomores to the role of nuclear engineering in society and technology. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
241. **Introduction to Radiation Protection.** Same as Environmental Studies 241. An introductory course in the elements of radiation protection and health physics, emphasizing practical applications. Prerequisite: Mathematics 120 or equivalent; and one semester of biology, chemistry, or physics, or consent of instructor. 2 hours. Seniors in nuclear engineering may not receive credit for Nuclear Engineering 241.
243. **Radiation Protection Laboratory.** A laboratory course designed to provide an understanding of radiation and to introduce various radiation detection instruments and devices used in radiation protection. Prerequisite: Credit or concurrent registration in Nuclear Engineering 241 or consent of instructor. 1 hour.
290. **Special Topics.** Considers selected areas which are of current interest to undergraduates in nuclear engineering but which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours.
295. **Special Problems.** Individual investigations or studies of any phase of nuclear engineering selected by the student and approved by the department. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours. May be repeated.
302. **Nuclear Power Engineering.** Same as Mechanical Engineering 302. Principles of release and utilization of fission energy in nuclear power engineering; includes such topics as fission processes and controlled chain reactions; nuclear reactor types, design principles, and operational characteristics; power reactor design criteria; radiation hazards and radioactive waste treatment; economics; and other applications such as propulsion and research reactors. Students who plan to take more extensive training in nuclear technology are advised to take the Physics 346 — Nuclear Engineering 347 sequence. Prerequisite: Consent of instructor.

- 3 hours or 1 unit. Credit for both Nuclear Engineering 302 and Nuclear Engineering 347 cannot be given toward the same degree.
312. **Nuclear Power Economics and Fuel Management.** A quantitative analysis of the economic impact of the nuclear power industry; nuclear fuel cycle and capital costs for thermal and fast reactors; optimization of the use of nuclear fuels to provide the lowest energy costs and highest system performance; and comparison between fossil fuel systems, fission systems, and controlled thermonuclear systems. Prerequisite: Junior standing; Mechanical Engineering 302, or Nuclear Engineering 302 or 347, or consent of instructor. 3 hours or 1 unit.
321. **Introduction to Controlled Thermonuclear Fusion.** Same as Electrical and Computer Engineering 321. Review of Maxwell's equations and introduction to plasma physics as it applies to controlled thermonuclear fusion problems; energy balance; plasma confinement and stability; and recent approaches to the fusion reactor. Prerequisite: Senior or graduate standing, or consent of instructor. 4 hours or 1 unit.
331. **Materials in Nuclear Engineering.** Develops a materials engineering background applied to nuclear systems; relates structure of metals, ceramics, glasses, and concretes to their physical and mechanical properties; develops phase formation and reaction kinetics from basic thermodynamics principles; and discusses materials performance in nuclear systems, including irradiation damage and effects. Prerequisite: Junior standing in engineering or the physical sciences. 3 hours or $\frac{3}{4}$ unit.
341. **Principles of Radiation Protection.** Sources of nuclear radiation; ionization and energy deposition in physical and biological media; principles of dosimetry; determination of protection limits for external and internal emitters; and basic shielding analysis. Prerequisite: Physics 346 or Chemistry 397, or consent of instructor. 4 hours or 1 unit.
342. **Radioactive Waste Management.** Sources and characteristics of radioactive wastes; methods of treatment; monitoring techniques; methods of hazard evaluation; special aspects of solid, liquid, and gaseous wastes; and disposal, both temporary and permanent. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 2 hours or $\frac{1}{2}$ unit.
346. **Modern Physics for Nuclear Engineers.** Same as Physics 346. See Physics 346.
347. **Introduction to Nuclear Engineering.** Energy resources and nuclear power systems; basic operational principles of fission and fusion reactors; fission reactor control and heat removal; radiation protection; shielding of reactors; safeguards, licensing, and environmental considerations. Prerequisite: Credit or concurrent registration in Physics 346, or equivalent. 4 hours or 1 unit. Credit for both Nuclear Engineering 347 and Nuclear Engineering 302 cannot be given toward the same degree.
351. **Nuclear Engineering Laboratory.** Radiation detection and instrumentation; radiation dosimetry and shielding; basic measurements in nuclear engineering; engineering applications; and micro computer data acquisition and experimental control. Prerequisite: Physics 346 or equivalent. 3 hours or $\frac{3}{4}$ unit.
352. **Advanced Nuclear Engineering Laboratory.** Students can choose experiments from the following areas: reactor experiments, fusion experiments, subcritical assemblies, and nuclear engineering applications. Three experiments and five weeks per credit hour or $\frac{1}{4}$ unit. Prerequisite: Nuclear Engineering 347 and 351 or equivalents; or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 5 hours or 1 $\frac{1}{4}$ units.
355. **Reactor Statics and Dynamics.** Intermediate-level analysis of thermal and fast reactor assemblies; reactor statics, reactor dynamics, and introductory transport theory; homogeneous and heterogeneous reactors; and multigroup diffusion theory, perturbation theory, reactivity coefficients, and control rod analysis. Prerequisite: Nuclear Engineering 347 or equivalent, or consent of instructor. 4 hours or 1 unit.
357. **Safety Analysis of Nuclear Reactor Systems.** Basic safety philosophy in nuclear reactor systems; brief review of nuclear reactor systems; regulatory processes; siting considerations; safety problems related to reactor dynamics; evaluation of postulated accidents; risks associated with nuclear fuel cycle; and methods of systems safety analysis. Prerequisite: Nuclear Engineering 302 or 347, or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
358. **Design in Nuclear Engineering.** Introduction to design in nuclear engineering systems; basic principles of definition, organization, constraints, modeling, and optimization of system design; case studies; and class design projects applying these basic principles. Prerequisite: Nuclear Engineering 347. 3 hours or $\frac{3}{4}$ unit.

390. **Intermediate Special Topics.** Considers selected areas of current interest in nuclear engineering which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
397. **Radiochemistry.** Same as Chemistry 397. See Chemistry 397.
401. **Fundamentals of Nuclear Engineering.** A lecture and problem course to provide background for further work in nuclear engineering; problems in materials, heat transfer, and fluid flow; and special emphasis on basic ideas and the mathematical similarity of problems in heat transfer, fluid flow, and neutron diffusion. Prerequisite: Mathematics 345 or equivalent; credit or concurrent registration in Chemistry 397 or Physics 382, or equivalent. 1 unit.
411. **Nuclear Reactor Heat Transfer.** Selected topics in nuclear reactor heat transfer: thermal analysis of fuel elements under steady and transient operation; convective energy transport from reactor cores; two-phase flow and boiling in reactor cores; and liquid metal coolant systems. Prerequisite: Nuclear Engineering 401 or consent of instructor. 1 unit.
421. **Interaction of Radiation with Matter.** Topics in the interaction of radiation with matter of interest to the nuclear engineering field: the kinematics, kinetics, and cross sections involved in the interaction of charged particles, electromagnetic radiation, and neutrons. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 1 unit.
422. **Controlled Fusion Systems, I.** Same as Electrical and Computer Engineering 422. Development of plasma models for fusion analysis; treatment of plasma heating and confinement with applications to current experiments; energy balances; and energy extraction. Prerequisite: Nuclear Engineering 321 or consent of instructor. 1 unit.
423. **Controlled Fusion Systems, II.** Development of plasma models for high-beta pulsed-fusion systems and for pellet fusion systems; heating and confinement mechanisms; energy balances and energy extraction; and applications to current experiments. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
424. **Stability Problems in Fusion Systems.** Survey of instabilities of interest in controlled thermonuclear fusion; overall system instabilities in fusion power reactors and applications; macro-instabilities and micro-instabilities of interest in CTR devices, and practical implications for proposed fusion reactor designs; and instabilities resulting from refueling and heating. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
425. **Nuclear-Electrical Energy Conversion.** Same as Electrical Engineering 425. Advanced concepts in nuclear radiation energy conversion of importance in both power production and radiation detection; analysis and applications of direct collection of charged particles; and theory and applications of radiation-induced ionization and excitation. 1 unit.
431. **Nuclear Metallurgy.** Metallurgical principles applied to materials problems in nuclear engineering; includes topics in production of uranium, corrosion, radiation damage, fuel element fabrication, and fuel reprocessing. Prerequisite: Consent of instructor. 1 unit.
441. **Nuclear Radiation Shielding.** Basic concepts, radiation sources, elementary gamma ray and neutron shielding, geometry factors in shielding, advanced techniques (such as Monte Carlo and discrete ordinates), special topics (such as shield heating, duct streaming, and albedo theory), and practical aspects. Prerequisite: Nuclear Engineering 341 or consent of instructor. 1 unit.
454. **Nuclear Engineering Laboratory Investigations.** Individual investigation in nuclear engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
455. **Reactor Theory, I.** Same as Physics 455. Advanced development of neutron transport theory; neutron slowing-down and resonance absorption; approximations to the transport equation; direct numerical methods and other techniques of approximation theory applied to the neutron transport equation; and advanced topics. Prerequisite: Nuclear Engineering 355, graduate standing in physics, or consent of instructor. 1 unit.
456. **Reactor Theory, II.** Same as Physics 456. Advanced treatment of the theory of slow-neutron scattering, neutron thermalization, Doppler broadening, fuel depletion and fuel loadings, properties of neutron migration operators, and mathematical neutron transport theory; interpretation of related experiments; and advanced topics. Prerequisite: Nuclear Engineering 421 or 455, graduate standing in physics, or consent of instructor. 1 unit.
457. **Advanced Reactor Analysis.** Forms of the multigroup neutron transport and diffusion equations; analysis of heterogeneous reactors; direct numerical solution of the transport and diffusion equations; integral and coarse mesh methods; iterative solutions, convergence, and

acceleration; synthesis methods; Monte Carlo methods for particle transport; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.

458. **Advanced Nuclear Engineering Design.** A classroom exercise in the conceptual design of a nuclear engineering system involving a synthesis of previous learning in the field of nuclear engineering and related disciplines; the design includes all necessary ingredients for the system, such as core, thermal-hydraulics, shielding, material selection, and control. Prerequisite: Five 300- and/or 400-level nuclear engineering courses including Nuclear Engineering 347 and 401, or equivalent; or consent of instructor. 1 unit.
459. **Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Physics, and Theoretical and Applied Mechanics 459. See Mathematics 459.
460. **Reactor Kinetics and Dynamics.** Diffusion and transport neutron balances with delayed neutrons; formal development of the point reactor kinetics equations; analytic and numerical solutions of the point reactor kinetics equations; space-dependent, multigroup reactor kinetics; reactivity measurements; reactor noise analysis; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
490. **Special Topics.** Considers selected areas of current interest in research which are not adequately covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
495. **Nuclear Engineering Problems.** Individual study in areas of nuclear engineering and closely related fields not covered by regular course offerings. The work is carried out under the supervision of a member of the faculty. Prerequisite: At least 3 units of graduate work; consent of instructor. $\frac{1}{4}$ to 2 units.
497. **Seminar in Nuclear Science and Engineering.** Lectures and discussions on current work in research and development in nuclear engineering and related fields by staff, advanced students, and visiting lecturers. 0 or $\frac{1}{4}$ unit.
499. **Thesis Research.** 0 to 4 units.

NURSING

(Including General Nursing, Maternal-Child Nursing, Medical-Surgical Nursing, Psychiatric Nursing, Public Health Nursing, and Administrative Studies)

Assistant Dean: Nancy S. Creason

Office: 1115½ West Oregon, Urbana

The following courses are among the first to be offered in the College of Nursing R.N. Baccalaureate Completion and Adult Health Nursing Graduate Programs on the Urbana-Champaign campus. Although these courses are part of the undergraduate and graduate offerings of the College of Nursing at the Chicago campus, which has ultimate responsibility for them, under a cooperative arrangement they are being offered on the Urbana-Champaign campus as well. The graduate offerings are a part of the Graduate College at the Chicago campus.

NOTE: In the following courses with the exception of NF 210, enrollment is limited to students who have senior standing in the College of Nursing R.N. Baccalaureate Completion Program, or who are admitted to the Graduate College of the Health Sciences Center. NF 210 is open to non-nursing and nursing students.

General Nursing

200. **Long-Term Nursing Care.** Care of individuals with chronic, recurring and long-term health problems and impact of physical and mental disability: promotion, maintenance and restoration of health and the adaptation to long-term, chronic health problems in a variety of health care settings. Prerequisites: Nursing Administrative Studies 210, Medical-Surgical Nursing 224. 3 hours.

203. **Nursing Concepts III.** Examines concepts related to organizational, management, and leadership theories and related processes applied to the health care and nursing care delivery systems. Prerequisite: Senior standing.
299. **Independent Study.** 1 to 5 hours.
300. **Principles of Nursing Administration.** Overviews the principles, objectives, and methods of managing nursing services in a division of a health services institution or agency and skill training in applying this knowledge. Prerequisite: Graduate standing in nursing. 2 hours.
360. **Nursing Research.** Application of scientific research method to nursing issues; emphasis on research design, measurement, nursing theory, and ethical-legal issues in research. Prerequisite: Any introductory statistics course. 3 hours.
400. **Theoretical Basis of Adult Health Nursing.** The first in a sequence of graduate courses in adult health nursing. Examines selected adult development theories, the interaction of major postulates of those theories with the individual adult's health status and the relevance to nursing process in the nursing care of the adult. Prerequisite: Graduate standing in nursing or consent of instructor. 3 hours.
401. **Concepts in Adult Health Nursing.** Follows in sequence of General Nursing 400. Critical analysis of selected theories of and concepts useful in the practice of adult health nursing; considers nursing behaviors essential to effective intervention. Emphasizes current research. Prerequisite: General Nursing 400, graduate standing in nursing, or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
402. **Methods in Adult Health Nursing.** Provides concentrated field practice in adult health nursing in a variety of health care agencies (clinics, hospitals, public health agencies, etc.). Prerequisite: Graduate standing in nursing, and concurrent registration in General Nursing 400 and 401 or consent of instructor. 1 to 4 hours.
405. **Theoretical Basis for Nursing.** Reviews several schemes for evaluating theory; evaluates selected theories using the above schemes. Pays particular attention to the historical development of nursing theory and the use of theory in nursing. Prerequisite: Graduate standing in nursing or consent of instructor. 2 hours.
410. **Nursing Research Design.** Critically examines common research designs; presents a variety of data collection procedures; discusses concepts of reliability and validity; explores methods of analysis appropriate to the data; and investigates ethical issues associated with each stage of research. Prerequisite: Graduate standing in nursing or consent of instructor. 2 hours.
420. **Methods of Teaching in Nursing.** Field experience in teaching nursing in classroom and clinical settings. Students have the opportunity to develop and teach content in their own nursing specialty; includes supervising, counseling, and evaluating students in clinical practice settings. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing; consent of instructor. 1 to 4 hours.
429. **Methods of Management in Clinical Nursing.** Guided experience in planning, organizing, and managing a division of nursing service in the student's clinical specialty; includes opportunity to observe and participate in the supervisory role, planning a supervisory program, and designing strategy for effective change and for evaluating outcomes. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing, General Nursing 300, or consent of instructor. 3 or 4 hours.
440. **Special Topics in Nursing.** Selected topics of current interest; offered if there is sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing and consent of instructor. 1 to 3 hours.
480. **Independent Study in Nursing.** Investigation of special selected problems in nursing under direction of a graduate faculty member; the nature of the selected nursing problem determines the modes of investigation. Prerequisite: Graduate standing in nursing and consent of instructor. 0 to 4 hours.
491. **Seminar in Nursing.** Identifies and analyzes a broad range of issues related to modern nursing and nursing research. Topics will vary according to student interest. Prerequisite: Graduate standing in nursing and consent of instructor. 1 hour.
493. **Research in Nursing.** Prerequisite: Credit or concurrent registration in General Nursing 410; graduate standing in nursing. 1 to 5 hours.
499. **Thesis Research.** 0 hours.

Maternal-Child Nursing

241. **Selected Focus: Nursing Care of Parents, Children, and Families.** Advanced knowledge and clinical experience emphasizing management of nursing practice for care of parents and children experiencing complex multi-system health problems. Prerequisite: Consent of instructor. 5 hours.

Medical-Surgical Nursing

224. **Concepts of Professional Nursing Practice.** Introduction to nursing process, nursing diagnosis, clinical decision making, and basic skill development; emphasis on gathering and utilizing data within a holistic perspective. Prerequisite: Credit or concurrent registration in Nursing Administrative Studies 210 and Medical-Surgical Nursing 225. 4 hours.
225. **Clinical Physiology in Nursing Practice.** Cellular, organ, system physiology as a basis for understanding dynamic deviations from baseline state associated with human life processes and their relevance to nursing practice. Prerequisite: Approved biology course. 4 hours.
243. **Selected Focus: Nursing Care of the Aged and Disabled.** Advanced knowledge and clinical experience emphasizing management of medical-surgical nursing practice for care of aging and disabled individuals experiencing complex multi-system health problems. Prerequisite: Consent of instructor. 5 hours.

Psychiatric Nursing

242. **Selected Focus: Psychiatric-Mental Health Nursing for the Aged.** Advanced knowledge and clinical experience emphasizing management of psychiatric-mental health nursing practice for the care of aging clients experiencing complex mental health problems. Prerequisite: Consent of instructor. 5 hours.

Public Health Nursing

230. **Family and Community Centered Nursing.** Nursing and public health concepts related to care of individuals, families, and aggregates: epidemiology, health promotion, community diagnosis, and family case management. Prerequisite: Nursing Administrative Studies 210 and Medical-Surgical Nursing 225. 6 hours.
240. **Selected Focus: Family and Community Centered Nursing.** Advanced knowledge and clinical experience in public health nursing practice; care of groups of clients emphasizing nurse leadership, caseload management, health promotion, and ethical issues. Prerequisite: Consent of instructor. 5 hours.

Administrative Studies

210. **Introduction to Professional Nursing.** Examination of current issues and trends in relation to historical events, future of nursing, ethics; emphasis on professionalism, role development, and theories of nursing. 3 hours.
340. **Public Policy: Nursing and Health Care.** Major policy issues relevant to the health care delivery system emphasizing the interrelationship between the policy process, the role of the nurse, and the delivery of health care. 2 hours.

351. **Nursing Management and Leadership in Health Care Systems.** Theoretical principles and processes of leadership, change, management, communication, and decision making for the delivery of nursing services in selected health care systems. Prerequisite: Consent of instructor. 3 hours.

NUTRITIONAL SCIENCES

Interim Director: J. W. Erdman, Jr.

Program Office: 451 Bevier Hall, 905 South Goodwin, Urbana

320. **Nutritional Aspects of Disease.** Same as Foods and Nutrition 320. See Foods and Nutrition 320.
324. **Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Foods and Nutrition 324. See Food Science 324.
400. **Nutritional Sciences Seminar.** Discussions of current problems in nutritional sciences. Required of all graduate students in the nutritional sciences program. Prerequisite: Nutritional Sciences 410 and consent of instructor. 0 or $\frac{1}{4}$ unit.
410. **Current Topics in Nutritional Research.** Same as Animal Sciences 410 and Food Science 410. Discussion of current research problems in experimental nutrition. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. $\frac{3}{4}$ unit.
411. **Chemistry of Nutritional Processes.** Same as Animal Sciences 411 and Food Science 411. Biochemical aspects of nutrition with emphasis on the function, regulation, and metabolism of nutrients in man. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. 1 unit.
450. **Problems in Clinical Nutrition.** Students meet weekly with University faculty and hospital clinical staff for rounds and tutorial-type discussions which evaluate the nutritional status of hospitalized patients and suggest appropriate nutritional management. Students write research proposals on specific problems or, by arrangement with the instructor, term papers on the nutritional management of a clinical problem. Prerequisite: Nutritional Sciences 410 and 411, or consent of instructor. $\frac{1}{2}$ unit.
461. **Advanced Clinical Nutrition, I.** Same as Medical Sciences 461. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; reviews the theory behind nutritional treatment of disease states. Prerequisite: Credit or concurrent registration in Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 461.
462. **Advanced Clinical Nutrition, II.** Same as Medical Sciences 462. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; incorporates the nutritional assessment and treatments learned in the first semester into nutritional care of hospitalized patients. Prerequisite: Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 462.
493. **Individual Topics in Nutrition.** For students majoring in nutritional sciences who wish to undertake individual studies of a nonthesis nature in problems or topics not covered in other courses; may be taken under the direction of any member of the nutritional sciences faculty, with the exception of the student's own thesis adviser. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

PAINTING

(See Art and Design)

PHILOSOPHY

Chair of Department: Professor R. Schacht

Department Office: 105 Gregory Hall, 810 South Wright, Urbana

NOTE: Students are urged to consult the detailed descriptions of all philosophy courses to be offered in particular semesters. These descriptions may be obtained in the department office at any time beginning one week prior to advance enrollment.

101. **Introduction to Philosophy.** Consideration of some main problems of philosophy concerning, for example, knowledge, God, mind and body, and human freedom. 3 hours.
102. **Logic and Reasoning.** A practical study of logical reasoning; techniques for analyzing and criticizing arguments, with emphasis on assessing the logical coherence of what we read and write. 3 hours.
103. **Scientific Reasoning.** Practical study of scientific reasoning; methods for evaluating scientific evidence and for using scientific information in making decisions. 3 hours.
105. **Introduction to Ethics.** Some basic questions of ethics, discussed in the light of influential ethical theories and with reference to specific moral problems, such as: what makes an action morally right? are moral standards absolute or relative? what is the relation between personal morality and social morality, and between social morality and law? 3 hours. Credit is not given for both Philosophy 105 and 106.
106. **Ethics and Social Policy.** An examination of the moral aspects of social problems, and a survey of ethical principles formulated to validate social policy. 3 hours. Credit is not given for both Philosophy 106 and 105.
107. **Introduction to Political Philosophy.** An examination of the philosophical bases of democracy and some alternative political forms. 3 hours.
110. **World Religions.** Same as Religious Studies 110. Survey of the leading living religions, including Hinduism, Buddhism, Taoism, Mohammedanism, Judaism, and Christianity; examination of basic texts and of philosophic theological elaborations of each religion. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Investigation of selected fundamental topics of philosophical inquiry. See *Timetable* for current topics. Prerequisite: Freshman James Scholar. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Philosophy in Literature.** A consideration of the philosophical themes implicit in a variety of important literary works, both classical and modern; includes such authors as Sophocles, Shakespeare, Goethe, Dostoevsky, and Sartre. 3 hours.
202. **Symbolic Logic.** An introduction to the techniques of formal logic, dealing primarily with truth-functional logic and quantification theory. 3 hours.
203. **Ancient Philosophy.** An introduction to ancient philosophy, concentrating on Plato and Aristotle, dealing with such topics as metaphysics, ethics, and the theory of knowledge. 4 hours.
206. **Early Modern Philosophy.** The history of philosophy from Descartes to Kant. 4 hours.
207. **Early Modern Philosophy, I.** Bacon, Hobbes, Locke, Berkeley, and Hume. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
208. **Early Modern Philosophy, II.** Descartes, Spinoza, Leibniz, and Kant. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
210. **Ethics.** Problems in ethical theory; the nature of right and wrong, justice, conscience, moral feelings, etc. 3 hours.

214. **Moral Problems in Medicine and Biology.** A philosophical study of selected moral and social problems concerning medicine and biology, such as euthanasia, abortion, allocation of scarce medical resources, health care and rights, and genetic engineering. 3 hours.
225. **Recent European Philosophy.** Introduction to the major recent philosophical movements in Europe, such as phenomenology, existentialism, philosophical anthropology, and neo-Marxism. 3 hours.
230. **Philosophy of Religion: Introduction.** Same as Religious Studies 230. Introduction to philosophical analysis of religious thought and experience. 3 hours.
250. **Conceptions of Human Nature.** A comparative examination of important historical and contemporary conceptions of human nature. 3 hours.
270. **Philosophy of Science.** Investigation of the nature of scientific knowledge by examining archetypal examples from physical science (e.g., Ptolemaic and Copernican astronomy); nature of scientific truth, validation of theories, nature of scientific theories, evolution of theories, experimental procedure, role of presuppositions, scientific revolutions, etc. 3 hours.
275. **Technology and Human Values.** Same as Science, Technology, and Society 201. See Science, Technology, and Society 201.
280. **Current Controversies.** Philosophical examination of positions taken on some issue of current concern, e.g., human sexuality, death and dying, feminism, race, intelligence, war, and sociobiology. See *Timetable* for current topics. 3 hours. May be repeated with consent of department Chair.
290. **Individual Study.** Readings in selected philosophical topics. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to juniors and seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the Chair of the department. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
292. **Thesis.** Special training in philosophical investigation. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the chair of the department. 2 to 4 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
298. **Advanced Undergraduate Seminar.** Seminar on selected philosophical topics; intended primarily for advanced undergraduate philosophy majors. Prerequisite: A grade-point average of 4.0 and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
301. **Philosophy and Film.** Study of procedures for interpreting narrative films and evaluating specific interpretations, as well as an examination of philosophical issues raised in selected films. Prerequisite: One course in philosophy or in cinema studies. 4 hours or 1 unit.
304. **Medieval Philosophy.** The history of philosophy from St. Augustine to William of Ockham. Prerequisite: Philosophy 101 or 203. 3 hours, or $\frac{3}{4}$ or 1 unit.
310. **Classical Ancient Philosophers.** An intensive study of one ancient philosopher or the intensive study of a major philosophical problem through the consideration of a number of ancient philosophers; chief emphasis on Plato and/or Aristotle. Prerequisite: One course in philosophy, preferably Philosophy 203. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit with the consent of the Chair of the Department.
311. **Nineteenth Century Philosophy.** Examination of the thought of such major figures as Hegel, Marx, and Nietzsche. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **Classical Modern Philosophers.** Intensive study of one, or in special cases, two major philosophers of the period 1600-1900, e.g., Descartes, Hume, Kant, or Hegel. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
313. **American Philosophy.** Examination of American philosophers from colonial to recent times, for example, Edwards, Peirce, James, Dewey. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
314. **Major Recent Philosophers.** Intensive study of one or two important philosophers of the present century, e.g., Wittgenstein, Dewey, Heidegger, or Quine. Topic varies; see *Timetable*. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit with consent of the department Chair.

316. **Anglo-American Philosophy Since 1900.** Introduction to the major philosophical developments in England and America in the present century, focusing on such writers as G. E. Moore, Bertrand Russell, A. J. Ayer, Ludwig Wittgenstein, and W. V. Quine. Prerequisite: One course in philosophy. 3 hours or 1 unit.
317. **Scientific Thought, I.** Same as History 339 and Sociology 305. A historical and critical survey of the development of science and its philosophical interpretation to the death of Newton. 3 hours or 1 unit.
318. **Scientific Thought, II.** Same as History 340 and Sociology 306. A historical and critical survey of the development of science and its philosophical interpretation from the death of Newton to the early twentieth century. Prerequisite: Philosophy 317. 3 hours or 1 unit.
319. **Space, Time, and Matter.** Same as Physics 319. See Physics 319.
321. **Ethics and Value Theory.** A systematic study of selected classics in moral philosophy by such philosophers as Aristotle, Hume, and Kant. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
322. **Recent Developments in Ethics.** Intensive treatment of issues in contemporary ethical theory. Prerequisite: One course in ethics. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit once with consent of the department Chair.
323. **Philosophy of Art.** Examination of philosophical interpretations of art and aesthetic experience by influential classical and recent writers. 3 hours, or $\frac{3}{4}$ or 1 unit.
324. **Philosophy of Religion.** Same as Religious Studies 362. Considers central issues in the philosophy of religion, e.g., the justification of religious belief, the nature of God, religious experience, etc. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Philosophy of Mind.** Philosophical problems arising in connection with mental phenomena; the relation of mind and body; free will and determinism; our knowledge of other minds; and the self and personal identity. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
326. **Metaphysics.** Investigation of various metaphysical issues concerning, for example, existence, substance, particulars and universals, and space and time. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
330. **Theory of Knowledge.** Investigation of issues concerning, for example, the nature and possibility of knowledge; its forms and limits; its relation to belief, truth, and justification; and the nature of truth. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
331. **Analytic Philosophy.** Intensive study of works of important analytic philosophers, such as Wittgenstein, Austin, and Quine, on problems of knowledge, method, and other selected topics. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Social Philosophy.** Selected topics from the nature of social organization, nature and convention, utility, justice, equality, liberty, rights, and duties. Prerequisite: Philosophy 105, 106, or 321, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
336. **Philosophy of Law and of the State.** Examination of issues in the philosophy of law, such as the nature of law, law and morality, justice, liberty and authority, punishment, and legal responsibility. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
337. **Semantics.** An investigation of semantical concepts such as denoting and truth; a study of the functions of language; definition, meaning and verification, and semantical paradoxes. Prerequisite: A course in logic. 3 hours, or $\frac{3}{4}$ or 1 unit.
338. **Philosophy of Language.** Same as Linguistics 338. A historical or comparative study of the philosophy of language. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
339. **Philosophy of Mathematics.** Same as Mathematics 339. Introduction to some of the main philosophical problems and contemporary viewpoints concerning mathematical concepts, mathematical methods, and the nature of mathematical truths. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Existential Philosophy.** Study of a selection of the major writings of the more important existential philosophers, e.g., Heidegger, Jaspers, and Sartre. Prerequisite: One course in philosophy (preferably Philosophy 225 or 311), or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
343. **Phenomenology.** Study of the development of phenomenology from Husserl to the present. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.

344. **Topics in Phenomenology.** Examination of phenomenological treatments of selected phenomena, such as interpersonal relationships, emotions, the body, and perception; see *Timetable* for current topics. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Marxist Philosophy.** Examination of the philosophical writings of a number of Marxist writers, from Marx himself to such neo-Marxists as Schaff, Petrovic, Sartre, and Marcuse. 3 hours, or $\frac{3}{4}$ or 1 unit.
347. **Post-Structuralist French Philosophy.** Intensive study of a selection of the major writings of recent French philosophers, such as Foucault and Derrida. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
353. **Formal Logic and Philosophy.** Techniques and results of symbolic logic, with special attention to topics of philosophical importance. Prerequisite: Philosophy 202, graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
354. **Advanced Symbolic Logic.** Completeness, compactness, and Lowenheim-Skolem theorems for first-order logic; incompleteness and undecidability of formal systems; and additional material on proof theory, model theory, or axiomatic set theory as time permits. Prerequisite: Philosophy 202 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
371. **Philosophy of Science: Contemporary Issues.** Examines important developments and controversies in recent philosophy of science. Prerequisite: Philosophy 270 or consent of instructor. 3 hours or 1 unit.
375. **The Philosophy of Social Science.** Same as Anthropology 329 and Sociology 325. A survey of philosophical problems encountered in the disciplines concerned with man and society, with particular emphasis on the extent to which questions and subject matter in these fields are amenable to scientific treatment. 3 hours or 1 unit.
377. **Philosophy of Psychology.** A philosophical examination of the aims, methods, and structure of psychology, with special attention to such issues as the nature of explanations of behavior, the adequacy of behaviorism as a philosophy of psychology, and the place of the mind in psychological investigation. Prerequisite: Two courses in psychology, or consent of instructor. 3 hours or 1 unit.
401. **Seminar in the History of Philosophy.** Study of selected major philosophers, movements, problems, or topics in the history of philosophy; see *Timetable* for current topics. 1 unit. May be repeated.
411. **Seminar in Ethical Theory.** 1 unit. May be repeated.
412. **Seminar in Social Philosophy.** A seminar designed to study special problems in social philosophy. See *Timetable* for current topics. 1 unit. May be repeated.
413. **Logical Theory.** Logical syntax and semantics. Prerequisite: A course in logic or consent of instructor. 1 unit. May be repeated.
417. **Seminar in the Philosophy of Science.** Various problems arising from specific studies in philosophy pertaining to science and vice versa. To be offered with varying topics. 1 unit. May be repeated.
420. **Seminar in Semantics.** Same as Communications 420. Intensive study of important contemporary contributions in the fields of semantics, analytic philosophy, and the philosophy of language. Prerequisite: Graduate standing in philosophy or equivalent. 1 unit. May be repeated.
421. **Seminar in Contemporary Problems.** Intensive study of selected problems or topics in contemporary philosophy. 1 unit. May be repeated.
423. **Seminar in the Theory of Knowledge.** Selected topics and writings of major importance in the contemporary philosophy of knowledge. 1 unit. May be repeated.
425. **Seminar in the Philosophy of Mind.** Selected topics from major writings in the philosophy of mind. 1 unit. May be repeated.
483. **Individual Topics.** Individual study and oral and written reports on topics not covered in other courses. Topics and plan of study must be approved by the candidate's adviser and by the staff member who directs the work. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ to 2 units).
490. **Directed Research.** Restricted to students satisfying requirements for the master's degree by writing a substantial essay. Normally taken for two units credit but may be taken for three units credit with consent of department Chair. 0 to 3 units.
499. **Thesis Research.** 0 to 4 units.

PHOTOGRAPHY

(See Art and Design)

PHYSICS

Head of Department: A. C. Anderson

Department Office: 211 Loomis Laboratory of Physics, 1110 West Green, Urbana

101. **General Physics (Mechanics, Heat, and Sound).** Noncalculus-based course for students in the life sciences, preprofessional health programs, agriculture, and veterinary medicine. Prerequisite: Trigonometry. 5 hours.
102. **General Physics (Light, Electricity, Magnetism, and Modern Physics).** Noncalculus-based course for students in life sciences, preprofessional health programs, agriculture, and veterinary medicine. Prerequisite: Physics 101. 5 hours.
106. **General Physics (Mechanics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Mathematics 120; credit or concurrent registration in Mathematics 132. 4 hours.
107. **General Physics (Heat, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 106; credit or concurrent registration in Mathematics 242. 4 hours.
108. **General Physics (Wave Motion, Sound, Light, and Modern Physics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 107; credit or concurrent registration in Mathematics 242. 4 hours.
140. **Practical Physics: How Things Work—A Course for Nonscientists.** A nonmathematical lecture-demonstration course for nonscience students, underscoring the generality and ubiquity of basic physical laws in understanding commonplace phenomena: musical instruments, photography, electric and electronic circuits, television, motors, engines, etc. 3 hours. No credit for students in the College of Engineering.
141. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 140. Prerequisite: Credit or concurrent registration in Physics 140. 1 hour.
150. **Physics and the Modern World: A Course for Nonscientists.** A nonmathematical lecture course attempting to bridge the two-culture gap; takes examples from modern physics: relativity, elementary particles, quantum theory, statistics, etc., and covers basic philosophical concepts in physics which pervade all human disciplines: model-making, dynamics, ensemble behavior, and symmetry. 3 hours.
151. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 150. Prerequisite: Credit or concurrent registration in Physics 150. 1 hour.
180. **Nuclear Weapons, Nuclear War, and Arms Control.** Same as Science, Technology, and Society 180. A beginner's course on the physics of nuclear weapons, nuclear weapon effects, delivery systems, and defenses against nuclear attack; nontechnical, but about technology. Designed to assist students in making informed judgments about nuclear armaments and arms control; includes presentation of current issues. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
210. **Introductory Relativity.** Examines the consequences of Einstein's postulates for space and time; relativistic momentum and energy: $E=mc^2$; the equivalence principle, gravity, and the spacetime viewpoint of general relativity; the relativistic unity of electric and magnetic fields. Prerequisite: Concurrent registration in Physics 102 or 107. 2 hours.
302. **Principles of Atmospheric Dynamics.** Same as Atmospheric Sciences 302. See Atmospheric Sciences 302.
303. **Modern Experimental Physics, I.** Techniques and experiments in the physics of atoms, atomic nuclei, molecules, the solid state, and other areas of modern physical research. Prerequisite: Physics 333; concurrent registration in Physics 386. 3 to 5 hours, or $\frac{1}{2}$ to 1 unit. Students

taking the course for the first time must register for 5 hours or 1 unit. Those repeating the course may do so for variable credit of 3 to 5 hours, or $\frac{1}{2}$ to 1 unit.

319. **Space, Time, and Matter.** Same as Philosophy 319. A philosophical examination of some fundamental concepts and theories of the physical world, such as time, matter, causation, space, and geometry; interpretation of quantum theory. Graduate students write an additional paper. Prerequisite: Junior standing, one physical science course, and one of the following: Physics 108 or Philosophy 101, 270, or 317; alternatively, consent of instructor. 3 hours or 1 unit.
331. **Intermediate Electricity and Mechanics.** Studies linear systems: electrostatics, electric circuits, mechanical oscillators; free and driven motion, a-c and transient behavior, linear response theory; filters, one-dimensional lattices, transition from discrete to continuous systems, strings, and transmission lines. Involves lectures, problems, and laboratory. Prerequisite: Two semesters of general physics, concurrent registration in Mathematics 341 or 285, and in Physics 108; or consent of instructor. 5 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without laboratory). No graduate credit given to physics majors.
332. **Classical Mechanics.** Examines particle motion in two and three dimensions including planets and satellites, conservation laws for systems of particles, accelerated reference frames, rigid bodies in three dimensions, Newtonian gravitation, fluid flow, generalized coordinates, Lagrange's equations, normal modes, and phase space. Prerequisite: Physics 331, Mathematics 341 or 285, and concurrent registration in Mathematics 280; or consent of instructor. 4 hours or 1 unit.
333. **Electromagnetic Fields.** Electrostatics, magnetostatics (including slowly varying currents); electromagnetic induction; energy and forces; Maxwell's equations; electromagnetic wave propagation, reflection and transmission; waveguides and cavities; radiation from dipoles and slow particles. Lectures, problems and laboratory. Prerequisite: Physics 331, Mathematics 341 or 285, and Mathematics 280. 5 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without laboratory).
343. **Electronic Circuits, I.** The physics of semiconductor devices; theory and application of discrete and integrated devices in linear circuits; use of operational amplifiers and feedback; regulation, oscillators, and modulation; emphasizes practical experience. Lectures, problems, and laboratory. Prerequisite: Physics 331 or consent of instructor. 5 hours or 1 unit.
344. **Electronic Circuits, II.** Continuation of Physics 343 with particular emphasis on nonlinear devices, switching circuits, digital logic, analog to digital and digital to analog conversion, and individual projects. Lectures, problems, and laboratory. Prerequisite: Physics 343 or consent of instructor. 5 hours or 1 unit.
346. **Modern Physics for Nuclear Engineers.** Same as Nuclear Engineering 346. Those fundamentals of quantum theory, atomic structure, and nuclear behavior needed by students before taking advanced courses in nuclear engineering; basic information on radiation types, properties, and interactions. Prerequisite: Physics 108; and Mathematics 341 or 285; or equivalents. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit to nuclear engineering students.
361. **Thermodynamics and Statistical Mechanics.** A course in statistical and thermal physics designed primarily for advanced undergraduates; topics include equilibrium thermodynamics, statistical mechanics, and kinetic theory of gases. A unified treatment is used in that the principles of heat and thermodynamics are discussed along with statistical postulates and the microscopic approach of introductory quantum mechanics. Prerequisite: Two 300-level courses in physics or consent of instructor. 4 hours or 1 unit. Credit may not be earned in both Physics 361 and Mechanical Engineering 301, Chemistry 342 and 344, and Metallurgical Engineering 420.
365. **Introduction to Plasma Physics.** Physical concepts underlying the description of ionized gases; individual particle and continuum models; collision processes in plasmas; charged particle motion in electromagnetic fields; waves in cold plasmas; elementary treatment of collective plasma behavior; simple plasma instabilities; selected topics of current interest. Prerequisite: Electrical Engineering 350 or Physics 333, or consent of instructor. 4 hours or 1 unit.
371. **Light.** Wave kinematics; geometrical optics: basic concepts, ray-tracing and matrix formalism, Gaussian imaging by thick lenses, stops, and apertures, and intensity relations; interference; interference spectroscopy and coherence; diffraction: Fresnel-Kirchhoff formulation, Fraunhofer case, Fresnel case, and holography; polarized light. Lectures, laboratory, and problems. Prerequisite: Physics 101 and 102, or Physics 106, 107, and 108; Mathematics 285; or consent of instructor. 4 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without lab).

382. **Subatomic Physics.** A lecture and problem course surveying subatomic physics; includes the nature and properties of nuclei and elementary particles, symmetries, interactions, nuclear models, tools and techniques of experimental subatomic physics, and applications to power generation, astrophysics, chemistry, medicine, and biology. Prerequisite: Physics 383 or 386, or consent of instructor. 4 hours or 1 unit.
383. **Atomic Physics and Quantum Theory.** Introduction to the basic concepts of quantum theory which underlie modern theories of the properties of materials; topics covered include elements of atomic and nuclear theory; kinetic theory and statistical mechanics; quantum theory and simple applications; atomic spectra and atomic structure; molecular structure and chemical binding. Lectures and problems. Prerequisite: General physics; general chemistry; Mathematics 285 or equivalent. 3 hours or $\frac{3}{4}$ unit.
386. **Atomic Physics and Quantum Mechanics, I.** Studies atomic phenomena integrated with an introduction to quantum theory; discussion of topics includes evidence for the atomic nature of matter and the properties of the Schrodinger equation, single particle solutions in one dimension, the hydrogen atom, perturbation theory, external fields, and atomic spectroscopy of outer electrons. Prerequisite: General physics; Mathematics 280 or 285, or consent of instructor. 4 hours or 1 unit.
387. **Atomic Physics and Quantum Mechanics, II.** Continuation of Physics 386. Topics treated include identical particles, spectral hyperfine structure, magnetic properties of matter, atomic spectroscopy of inner electrons, high-energy photon effects, molecular binding and spectra, emission and absorption of light, and symmetry principles. Prerequisite: Physics 386. 4 hours or 1 unit.
389. **Introduction to Solid State Physics.** Bonding and structure of crystals; energy bands in insulators, semiconductors, and metals; electrical conductivity; optical properties; lattice vibrations; elasticity; point defects; dislocations. Prerequisite: Junior standing in science or engineering, or equivalent. 4 hours or 1 unit.
397. **Individual Study.** Individual study at an advanced level in a subject not covered by course offerings. Prerequisite: Upperclassman; consent of adviser and staff member who supervises the work. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
398. **Seminar on Special Topics in Modern Physics.** Lecture course on topics of current interest in physics. For advanced undergraduates or graduates. Subjects and prerequisites to be announced in the *Timetable*. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
402. **Theoretical Astrophysics.** Same as Astronomy 402. Application of physical principles to a broad selection of topics in astrophysics: fluid dynamics in an astrophysical context; equilibria and collapse of interstellar clouds; star formation; shock waves, ionization fronts, winds, and accretion and jets; stellar structure, evolution, and nucleosynthesis; white dwarfs, neutron stars, pulsars, and compact x-ray sources; dynamics of stellar systems and spiral structure; cosmic electrodynamics, including continuum radiation mechanisms, cosmic rays, and radio galaxies; cosmology; galaxy formation; and quasars. Emphasis on the underlying physics rather than on detailed factual description. Prerequisite: Physics 332, 333, 361, and 386; or consent of instructor. 1 unit.
404. **Stellar Structure and Evolution.** Same as Astronomy 404. See Astronomy 404.
405. **Diffuse Matter Astrophysics.** Same as Astronomy 405. See Astronomy 405.
406. **High Energy Astrophysics.** Same as Astronomy 406. See Astronomy 406.
411. **Special Functions and Boundary Value Problems in Physics.** Use of special functions in solving homogeneous partial differential equations of physics; emphasis on applications to topics such as electrostatics, wave guides and resonant cavities, vibrations of membranes, heat flow, and potential flow in fluids. Prerequisite: Mathematics 280 and 285, or equivalent. This course may be taken concurrently with Physics 413 or 414. $\frac{1}{2}$ unit.
412. **Additional Techniques of Mathematical Physics.** Solution of inhomogeneous differential equations with particular emphasis on problems in electromagnetism; additional topics such as perturbation theory, variational methods, and integral equations; emphasis on application of the techniques to nonquantum physics problems. Prerequisite: Physics 411 or equivalent. This course may be taken concurrently with Physics 413 or Physics 414. $\frac{1}{2}$ unit.
413. **Uses of Complex Variables in Physics.** A review of complex variable theory, with emphasis on calculations useful to physicists; integration, conformal mapping, Laplace and Fourier transforms, and additional topics of use in theoretical physics. Prerequisite: Undergraduate

mathematics at the level of Mathematics 280 and 285; some previous exposure to complex variables helpful, but not required. $\frac{1}{2}$ unit.

414. **Basics of Advanced Mechanics.** Fundamentals of classical Lagrangian and Hamiltonian mechanics, with emphasis on the relation between dynamical symmetries and constants of the motion; use of conservation laws to derive basic equations of fluid dynamics; discussion of some applications. Prerequisite: Mechanics at the level of Physics 332 or consent of instructor. $\frac{1}{2}$ unit.
415. **Introduction to Continuum Mechanics.** Basic information on stress, strain, and waves in an elastic solid, the Euler and Navier Stokes equations, potential flow, vortex theory, viscous flows, gas dynamics, characteristics, and shock waves. Prerequisite: Concurrent registration in Physics 411 and 412, or equivalent. $\frac{1}{2}$ unit.
420. **Nonlinear Dynamics.** A broad introduction to nonlinear dynamics of physical systems with varying degrees of complexity; surveys a variety of concepts associated with bifurcation phenomena, mappings, nonlinear oscillations, chaotic behavior, strange attractors, solitons, and topics of current interest. Prerequisite: Mathematics 280 or 285 or equivalent; Physics 332 or equivalent; or consent of instructor. 1 unit.
421. **Advanced Nonlinear Dynamics.** Analysis of the dynamics of spatially extended and other complex physical systems using analytical, experimental, computational, topological, and symbolic methods; examples may involve mechanical, electrical, optical, solid state, fluid, chemical, biological, and network systems. Prerequisite: Physics 420. 1 unit.
424. **General Relativity and Cosmology.** Same as Astronomy 424 and Mathematics 460. Foundations of general relativity and applications to problems of astrophysics; includes gravitation as geometry, mathematical tools, Einstein's equations, relativistic stellar structure, black holes and gravitational collapse, cosmology, gravitational radiation, and experimental tests. Prerequisite: Physics 332, 411, 412, and 442, or equivalent; or consent of instructor. 1 unit.
430. **Surface Physics.** Same as Metallurgical Engineering 430. See Metallurgical Engineering 430.
435. **Theory of Semiconductors and Semiconductor Devices.** Same as Electrical and Computer Engineering 435. See Electrical and Computer Engineering 435.
442. **Classical Electromagnetic Radiation.** A review of Maxwell's equations followed by a relativistic formulation of the electromagnetic field and the motion of charged particles; plane and guided waves; retarded potentials; radiation from simple antennas; radiation from accelerated charged particles; synchrotron radiation, bremsstrahlung, scattering, and further topics. Prerequisite: Physics 411 and 412, or equivalent; electromagnetism at the level of Physics 333; special relativity at the level of Physics 210. 1 unit.
450. **Biomolecular Physics.** Same as Biochemistry 450 and Biophysics 450. Physical concepts governing the structure and function of biological macromolecules; general properties, spatial structure, energy levels, dynamics and functions, and relation to other complex physical systems such as glasses; recent research in biomolecular physics; physical techniques and concepts from theoretical physics emphasized. Designed for students without appreciable background in biology and chemistry. Prerequisite: Chemistry 102 or equivalent, Physics 383 or 387 or equivalent, or consent of instructor. 1 unit.
455. **Reactor Theory, I.** Same as Nuclear Engineering 455. See Nuclear Engineering 455.
456. **Reactor Theory, II.** Same as Nuclear Engineering 456. See Nuclear Engineering 456.
459. **Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Theoretical and Applied Mechanics 459. See Mathematics 459.
462. **Statistical Mechanics and Kinetic Theory.** Single-particle distribution functions; classical and quantum mechanical systems, Boltzmann equation, virial theorem, and equations of state for gases; formal theory: ensembles, identical particles, thermodynamics of simple systems, and distribution functions; nonequilibrium problems; conservation laws and hydrodynamic equations, sound waves, and transport coefficients; plasmas, normal Fermi fluid, superfluids, and systems with internal degrees of freedom. Prerequisite: Physics 361 and elementary quantum mechanics, or consent of instructor. 1 unit.
463. **Liquid Helium and Superconductivity.** Emphasizes fundamental physical phenomena rather than detailed microscopic theory; normal Fermi liquids and normal liquid ^3He : equilibrium properties, kinetic equation, collective modes, and finite temperature effects; superfluid ^4He : equilibrium properties, two fluid model, Bogoliubov's microscopic model, condensates, and vortex lines; superconductivity: electrodynamic properties, Landau-Ginzburg theory, BCS

- theory, tunneling, Josephson effect, and superfluid ^3He . Prerequisite: Physics 462 and 481, or consent of instructor. 1 unit.
464. **Phase Transitions.** Phenomenology of phase transitions, scaling, critical behavior, and multicriticality; Landau theory of phase transitions; renormalization group methods, including lattice models and epsilon-expansion; numerical methods; critical dynamics; and selected additional topics. Prerequisite: Physics 462 or consent of instructor. 1 unit.
465. **Plasma Physics.** Survey of plasma phenomena in nature and in the laboratory; physical description of plasma phenomena by the independent particle model, one- and two-fluid models, magnetohydrodynamic equations, and kinetic equations; applications to quantum plasmas; nonlinear effects and turbulence in plasmas; astrophysical and thermonuclear plasmas. Prerequisite: Physics 333 or equivalent, or consent of instructor. 1 unit.
470. **Introduction to Nuclear and Particle Physics.** Nuclear systematics, nucleon-nucleon interaction, shell model, and single particle and collective excitations; hadron spectroscopy, hadronic quantum numbers, quark-parton model, and hadron dynamics; weak interactions. Prerequisite: Physics 480 and concurrent registration in Physics 481. 1 unit.
471. **Nuclear Reactions and Structure.** Experimental information on nuclear forces; the basis of the independent-particle model; the nuclear shell model; the nuclear ground state; nuclear giant resonances; deformed nuclei; direct nuclear reactions; large-amplitude nuclear motion; statistical description of the nucleus. Prerequisite: Physics 470. 1 unit.
472. **Special Topics in Nuclear Physics.** Current research in nuclear physics; topics include one or more of: photon physics, electron-nucleus scattering and nucleon structure, Few-nucleon systems and nuclear and neutron matter, nuclear astrophysics, Meson physics, Relativistic nuclear physics, heavy-ion physics, Quarks in the nucleon and in nuclei. Prerequisite: Physics 471 or consent of instructor. 1 unit. May be repeated for credit.
475. **Particle Physics, I.** Basic calculations in elementary particle theory. Quantum electrodynamics, quantum chromodynamics, and the Glashow-Weinberg-Salam theory of weak and electromagnetic interactions as applied to the phenomenology of particle decays and high energy reactions. (Offered fall semester only.) Prerequisite: Physics 470; credit or concurrent registration in Physics 483 strongly recommended. In exceptional circumstances, Physics 470 may be taken concurrently. 1 unit.
476. **Particle Physics, II.** Continuation of Physics 475. Current topics in particle theory; topics change from year to year. Typically treats three or four different subjects in depth. (Offered spring semester only.) Prerequisite: Physics 475, or consent of instructor. 1 unit. May be repeated as topics vary.
480. **Quantum Mechanics, I.** A second course in quantum mechanics for students with a good background in wave mechanics and atomic and molecular structure. Operators, state vectors, and the formal structure of quantum theory; operator treatments of simple systems; angular momentum and vector addition coefficients; stationary state perturbation theory; introduction to scattering theory for particles without spin, partial wave analysis, and Born approximation; examples taken from atomic, nuclear, and elementary particle physics. Prerequisite: Senior-level atomic physics and quantum mechanics, or consent of instructor. 1 unit.
481. **Quantum Mechanics, II.** Spin and identical particles, simple many-particle systems and elements of second-quantization theory; time-dependent processes, radiative transitions, and quantization of the electromagnetic field; scattering of particles with spin; polarization; introduction to the Klein-Gordon and Dirac equations, and properties of simple relativistic systems. Prerequisite: Physics 480 or consent of instructor. 1 unit.
483. **General Field Theory.** Covers standard techniques of field theory as used by experimenters and theorists; relativistic quantum mechanics of a single particle; Lagrangian field theories, perturbation theory, and calculation of lowest-order processes; introduction to Feynman diagrams and higher order processes; examples taken from quantum electrodynamics, solid-state and elementary particle physics, and many-body theory. Prerequisite: Physics 481 or consent of instructor. 1 unit.
485. **Advanced Field Theory.** Quantization and Feynman path integral; gauge theories and renormalization; renormalization group with applications to particle physics and critical phenomena; approximation methods and recent developments. Prerequisite: Physics 483 or consent of instructor. 1 unit.

486. **The Constitution and Behavior of the Upper Atmosphere.** Same as Electrical Engineering 486. See Electrical Engineering 486.
489. **Solid State Physics, I.** Crystalline perfection, free electron gas, screening, plasma oscillations, and dielectric response; Bloch electrons, Brillouin zones, and band structure; semiconductors, intrinsic and extrinsic, with applications; phonons, elasticity, and anharmonicity; ferromagnetism and second-order phase transitions; superconductivity. Prerequisite: Physics 361 or consent of instructor; and Physics 480. 1 unit.
490. **Solid State Physics, II.** Hartree-Fock theory and electron-electron interactions; electron-phonon interactions; electron dynamics and transport; BCS theory of superconductivity; elastic properties; thermal properties due to anharmonicity; defects in solids. Prerequisite: Physics 481 and 489. 1 unit.
497. **Individual Study.** Individual study in a subject not covered in course offerings may be arranged for credit by registration under this number. $\frac{1}{2}$ to 4 units.
498. **Seminar on Special Topics in Modern Physics.** Lecture course in topics of current interest. Several subjects are announced in each *Timetable*. Among them are semiconductor physics, magnetic resonance, surface physics, lattice dynamics, band theory of solids, crystal imperfections, nuclear structure, field theory, elementary particle physics, advanced statistical mechanics, plasma theory, astrophysics, atmospheric physics, group theory and applications. Prerequisite: Determined for each offering. See *Timetable*. $\frac{1}{4}$ to 1 unit.
499. **Thesis Research.** 0 to 4 units.

PHYSIOLOGY AND BIOPHYSICS

Head of Department: John E. Zehr

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Biophysics

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Reading and Individual Topics.** Reading or laboratory work chosen in consultation with a departmental faculty sponsor. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics, Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
301. **Introduction to Biophysics.** Review of the field of biophysics designed to introduce the student to types of biological problems currently under investigation. Prerequisite: 8 hours of physics. 3 hours or $\frac{3}{4}$ unit.
302. **Fundamentals of Nervous Activity.** The quantitative basis of the generation and transmission of electrical signals within and between nerve cells; develops and discusses, with examples, the physical relationships describing resting potential, core conduction, excitation, and synaptic transmission. Meets during the first half of the spring semester. Prerequisite: One year of calculus and one year of college physics. 2 hours or $\frac{1}{2}$ unit.
312. **Introduction to Radiobiology.** Nature and mechanisms of the biological consequences of low dose and chronic irradiation. Intended primarily for students in engineering and physical sciences. Prerequisite: Mathematics 242 or 245; 8 hours of physics; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
320. **Molecular Biophysics.** Same as Biochemistry 320. Examines structure and function of biological macromolecules and supramolecular assemblies; uses various display techniques to describe the three dimensional nature of biological structure. Specific topics include: diffraction methods, protein structure and the molecular basis of enzyme catalysis, antibody structure and function, virus structure and assembly; membrane proteins, microtubules and other

- supramolecular assemblies, nucleic acid structure, protein-nucleic acid interactions. Prerequisite: Biochemistry 352 or Chemistry 346 or Physics 350, or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
332. **Photosynthesis.** Same as Plant Biology 332. A comprehensive description of photosynthesis; topics include: the photosynthetic membranes, light absorption, electron and proton transfer, photophosphorylation, water oxidation, RUBP carboxylase/oxygenase, photorespiration, whole plant photosynthesis, translocation and herbicide action. Prerequisite: Plant Biology 330, Biochemistry 350, Biophysics 301, or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
354. **Biological Energy Conversion.** Introduces and explores the major mechanisms of energy conversion in biology, with particular emphasis on respiratory and photosynthetic bioenergetics, and the physico-chemical tools required to describe these processes. Prerequisite: Biochemistry 350, and Chemistry 340 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
404. **Physiological Measurements.** Same as Physiology 404. See Physiology 404.
406. **Principles of Biophysical Measurements.** Lecture course designed to acquaint the student with physical methods useful in the solution of biological problems; topics covered include bioelectric measurements, including basic electronics; optical methods, including microscopy, spectrophotometry, and measurement of action spectra; use of high-energy radiations; tracer techniques; and acoustical techniques. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
410. **Special Topics in Biophysics.** Advanced course/tutorials on topics of interest in biophysics, such as electrophysiology, radiation biology, bioenergetics, bioacoustics, protein structure, or the physics of muscular contraction. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
411. **Seminar.** Survey of literature in one area of biophysics, with special emphasis on student reports. Prerequisite: Enrollment in the biophysics program or consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit.
414. **Sensory Biophysics.** Advanced treatment of sensory systems which are approachable in detailed quantitative terms, with emphasis on the visual system; lectures scheduled during the first quarter of the spring semester. Normally carries $\frac{1}{4}$ unit credit; however, students may develop a particular topic introduced in the lectures into a term paper for an extra $\frac{1}{4}$ unit credit. Prerequisite: Biophysics 301, Physiology 301 or 403, or consent of instructor. $\frac{1}{4}$ or $\frac{1}{2}$ unit. Students must consult the instructor before enrolling for $\frac{1}{2}$ unit.
415. **Radiation Biophysics.** Consideration in quantitative terms of the mechanisms of the responses of molecules and cells to ionizing radiation; meets during the second quarter of the spring semester. Prerequisite: Graduate standing in biophysics, one year of physics beyond introductory physics, and Biophysics 301 or 312, or consent of instructor. $\frac{1}{4}$ unit.
424. **Ultrasonic Biophysics.** Same as Bioengineering 424. Ultrasonic propagation in, and interaction with, biological media at macromolecular, cellular, and organismic levels of structure; meets during the first quarter of the spring semester in alternate years. Prerequisite: Graduate standing in biophysics or consent of instructor. $\frac{1}{4}$ unit.
428. **Cell Membranes.** Isolation and biochemical analysis; experimental membrane models Gouy-Chapman-Stern layers; equations of transport (diffusional, mediated, and active); phospholipid bilayers and protein subunits; and cell membrane synthesis (in vivo and in vitro). Meets during the second half of the spring semester in alternate years. Prerequisite: Biophysics 301 or Physiology 402; Biochemistry 350 or equivalent. $\frac{1}{2}$ unit.
436. **Plant Biophysics.** Same as Plant Biology 436. See Plant Biology 436.
438. **Bioenergetics of Photosynthesis.** Same as Plant Biology 438. Biophysical and biochemical mechanisms of green plant and/or bacterial photosynthesis; includes the role of membranes; and emphasizes energetic aspects of photosynthesis. Meets during the last half of the fall semester in alternate years. Prerequisite: One year each of college-level physics, chemistry, and biology; Biochemistry 350 or Biophysics 301; or consent of instructor. $\frac{1}{2}$ unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biochemistry and Chemistry 440. See Chemistry 440.
442. **Biomedical Magnetic Resonance.** Principles of magnetic resonance and its application to biology and medicine; includes discussion of magnetic resonance imaging and spectroscopy of living systems. Meets in the fall semester of alternate years. Prerequisites: Introductory biology and physical chemistry. $\frac{3}{4}$ unit.

446. **Bacterial Energetics.** Same as Microbiology 446. Describes and analyzes the principles of biological energy transduction using diverse examples from prokaryotic metabolism; includes fermentations, aerobic and anaerobic respiration, photosynthesis. Meets during the last half of the spring semester. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. $\frac{1}{2}$ unit.
450. **Biomolecular Physics.** Same as Biochemistry 450 and Physics 450. See Physics 450.
463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Veterinary Biosciences and Animal Science 463. See Veterinary Biosciences 463.
475. **Biophysics of Muscle.** Description and analysis of the fundamental physical processes underlying motility and contraction in living systems; surveys recent advances and assesses current status of relevant problems; meets during the second quarter of the fall semester in alternate years. Prerequisite: Chemistry 340 or 342, and Biochemistry 350. $\frac{1}{4}$ unit.
490. **Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Topics covered include bioacoustics, electrophysiology, bioenergetics, cellular biophysics, dynamics of macromolecules, fluorescence spectroscopy, kinetics, mathematical biophysics, membrane biophysics, molecular biophysics, muscle biophysics, nervous activity, photosynthesis, protein-lipid interactions, radiation biophysics and oncology, senescence, thermoregulation, vision, macromolecular structure, cerebral energy metabolism. Prerequisite: Consent of department. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Research may be conducted in one of the areas listed below, subject to approval of the staff member concerned and the department in which the research is to be done: (a) bioacoustics; (b) electrophysiology; (c) bioenergetics; (d) cellular biophysics; (e) dynamics of macromolecules; (f) fluorescence spectroscopy; (g) kinetics; (h) mathematical biophysics; (i) membrane biophysics; (j) molecular biophysics; (k) muscle biophysics; (l) nervous activity; (m) photosynthesis; (n) protein-lipid interactions; (n) radiation biophysics and oncology; (o) senescence; (p) thermoregulation; (q) vision; (r) macromolecular structure; (s) cerebral energy metabolism. 0 to 4 units.

Physiology

101. **Introduction to Human Physiology: Physical and Chemical Bases of Cell Function, Principles of Physiological Control Systems, Coordinated Body Functions.** Emphasizes those aspects especially illustrative of general principles of biology; designed for biological sciences general education requirement; especially suitable for coupling with an anthropology or psychology course. Prerequisite: High school chemistry strongly recommended. 3 hours. Credit will not be given for both Physiology 101 and 103.
103. **Introduction to Human Physiology: The Physical and Chemical Bases of Cellular Function, Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Prerequisite: High school chemistry strongly recommended. 4 hours. Credit will not be given for both Physiology 103 and Physiology 101.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Reading and Individual Topics Course.** Readings or laboratory work in fields chosen in consultation with a departmental faculty sponsor. Must be taken in partial fulfillment of departmental honors requirements. Prerequisite: A course in physiology; consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
292. **Senior Thesis.** Research in physiology under the direction of a faculty sponsor in the Department of Physiology and Biophysics. A thesis, based on the research, must be submitted by the student and approved by the Physiology Undergraduate Honors Committee in order for him/her to be considered a candidate for graduation with distinction in physiology. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 8 hours. Majors in any School of Life Sciences option may count toward graduation no more than a com-

bined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.

295. **Special Topics in General Physiology.** Selected topics in general physiology. Prerequisite: Credit or concurrent registration in Physiology 301; consent of instructor. 2 hours.
296. **Special Topics in Animal Physiology.** Selected topics in animal physiology. Prerequisite: Credit or concurrent registration in Physiology 302; consent of instructor. 2 hours.
301. **Cell and Membrane Physiology.** The cellular and molecular basis of physiological processes; emphasis on chemical, physical, and mathematical principles of membrane structure and permeability, nerve conduction, and cell motility. Prerequisite: Biology 111 or 251, or equivalent; one year each of college-level mathematics and physics; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
302. **Systems and Integrative Physiology.** Examines organ physiology of animals; primary emphasis is on the control systems underlying regulation of homeostasis in mammals, including human beings. Prerequisite: Biology 111 or 251, or equivalent; one year college physics; Mathematics 120; chemistry through organic. 3 hours or $\frac{3}{4}$ unit.
303. **Cell and Membrane Physiology Laboratory.** An introduction to experimentation with cellular functions common to most eukaryotic cells; emphasis on biochemical, radioactive tracer, electrical, and mechanical recording techniques. Prerequisite: Credit or concurrent registration in Physiology 301. 2 hours or $\frac{1}{4}$ unit.
304. **Systems and Integrative Physiology Laboratory.** Introduction to problems and techniques for studying the physiology of organ systems. Prerequisite: Credit or concurrent registration in Physiology 302. 2 hours or $\frac{1}{4}$ unit.
305. **Principles of Ergonomics.** Same as Industrial Engineering and Kinesiology 305. See Industrial Engineering 305.
312. **Endocrinology.** Physiology and biochemistry of the endocrine system and its hormones with special reference to vertebrates and to human endocrine disorders. Prerequisite: Physiology 301, Biology 111 or 251, or a course in biochemistry, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
316. **Integrative Neurophysiology.** Advanced studies of mechanisms of neuron network function in behavior; topics include: neural coding, motor pattern generation, mechanisms of plasticity in neural function, epilepsy, and neural models of motivation, habituation and arousal, choice, and learning. Prerequisite: Biophysics 302, Physiology 302, or Biology 303; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
331. **General Radiobiology.** Response of multicellular organisms, cells, and macromolecules to ionizing radiations. Lectures, student reports, and discussions. Prerequisite: One year each of mathematics, physics, chemistry, and biology. 4 hours or 1 unit.
341. **Comparative Physiology of Animals.** Emphasizes comparative aspects of the nervous system and nervous integration; ionic and osmotic regulation in fresh water and marine environments; gas exchange mechanisms; temperature adaptation and endocrine systems in both invertebrates and vertebrates. Prerequisite: Biology 111 or 251, or equivalent; one year of college-level physics; Math 120; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
401. **Physiology of Systems and Organs.** Analysis of organization and function of vertebrate systems, which combines the viewpoints of traditional cellular, comparative, mammalian, and human physiology; nervous, circulatory, digestive, and excretory systems; and gross metabolism. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
402. **Comparative and Adaptational Physiology.** The first half of the course deals with comparative mechanisms of adaptation to the environment, including homeostatic theory, osmotic and ionic regulation, respiration and metabolism, nutrition and digestion, and temperature relations; the second half concerns comparative behavioral physiology, including sense organs, mechanisms of motility (especially muscles), and central nervous integration. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.

403. **Cellular and Molecular Physiology.** Physicochemical and molecular analysis of cellular function and structure; consideration of the implications of the properties of cells for the physiology of multicellular animals. Students may enroll for the lecture series on physiology of cytoplasm and the nucleus, and cellular regulatory mechanisms, and/or for the lecture series on physiology of cell membranes, bioelectrics, and motility. Prerequisite: One year of college-level physics; chemistry including biochemistry; an upper-division course in physiology; physical chemistry recommended for lectures on membranes, etc; knowledge of calculus presumed. $\frac{1}{2}$ or 1 unit.
404. **Physiological Measurements.** Same as Biophysics 404. Laboratories concerned with introducing at a graduate level current research techniques in the physiological and biophysical sciences; problem-oriented laboratories; students select up to four special topics representing different areas of physiology and biophysics, such as mammalian and human, molecular, cellular and radiation biology, comparative physiology, and biophysical measurements. Emphasis placed on ability to work independently, and students give written reports of their experiments. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
405. **Neurochemistry.** Same as Psychology 405. See Psychology 405.
409. **Faculty Research Topics.** Advanced seminars by the faculty on their current research activities. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May not be repeated for credit.
410. **Special Topics in Physiology.** Advanced seminars on current topics of interest in physiology. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
412. **Advanced Endocrinology.** Same as Animal Sciences and Veterinary Biosciences 412. Seminar, lectures, student reports, and discussions of recent advances in endocrinology. Prerequisite: Physiology 312; consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
413. **Cardiovascular Physiology.** Same as Veterinary Biosciences 413. See Veterinary Biosciences 413.
416. **Neurophysiology Laboratory.** Neurophysiological techniques and experiments illustrating nerve membrane properties, synaptic action and plasticity, organization and pattern generation in motor systems, and sensory coding in visual and acoustic systems. Prerequisite: Credit or concurrent registration in Physiology 316 or consent of instructor. $\frac{1}{2}$ unit.
418. **Neuroendocrinology.** Advanced studies on central nervous system/hormone interaction in vertebrates. Neuroanatomy and maturation of neuroendocrine control systems; production, biochemistry, and physiological effects of neurohormones; and neuroendocrine techniques. Prerequisite: Physiology 312 and one of the following: Physiology 316, 401, or 402; consent of instructor. $\frac{3}{4}$ unit.
419. **Neural Control of Cardiorespiratory and Autonomic Function.** Same as Veterinary Biosciences 419. See Veterinary Biosciences 419.
420. **Mammalian Physiology Seminar.** Current trends in mammalian physiology. Prerequisite: Physiology 401 and 402, or equivalent; consent of instructor. $\frac{1}{2}$ unit.
430. **Reproductive Physiology Seminar.** Presentation and discussion of current literature as well as graduate student and staff research proposals and findings in reproductive physiology. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
431. **Advanced Reproductive Endocrinology.** Same as Animal Sciences 431 and Veterinary Biosciences 431. See Animal Sciences 431.
433. **Laboratory Methods in Reproductive Physiology.** Same as Animal Sciences 433 and Veterinary Biosciences 433. See Animal Sciences 433.
441. **Advanced Comparative Physiology.** Seminar, lectures, student reports, and discussions. Topics rotate in three-year cycle: adaptational physiology, comparative neurophysiology, and comparative physiology of motile mechanisms. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
451. **Advanced Cellular Physiology.** Seminar, lectures, student reports, and discussions. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
460. **Human Pharmacology, I.** Studies the general principles of drug action and analyzes the actions of the major drug groups on biochemical and physiological processes. Prerequisite: Physiology 401; Biochemistry 350; consent of instructor. 1 unit.

461. **Human Pharmacology, II.** Continuation of Physiology 460. Prerequisite: Physiology 460. 1 unit.
472. **Human Physiology Seminar.** Topics of current emphasis in human physiology. Prerequisite: Two semesters of advanced physiology; one semester of biochemistry; consent of instructor. $\frac{1}{2}$ unit.
490. **Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Prerequisite: Approval of department. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Research may be conducted under supervision of the thesis advisor in the following areas: (a) cellular and molecular physiology; (b) comparative physiology; (c) mammalian physiology; (d) human anatomy and human physiology; (e) endocrinology; (f) neurophysiology; (g) radiobiology; and (h) environmental and stress physiology. 0 to 4 units.

PLANT BIOLOGY

Head of Department: David S. Seigler

Department Office: 289 Morrill Hall, 505 South Goodwin, Urbana

100. **Plant Biology.** Basic principles of growth and form, physiology, genetics, evolution, and ecology in plant biology. 4 hours. Students may not receive credit for both Plant Biology 100 and 102.
102. **Plants, Environment, and Man.** Designed primarily to give the nonscience student an introduction to plants, their role in the environment, and their relation to man. Discussions and demonstrations emphasize practical aspects of plant biology and science as they relate to man. 3 hours. Students may not receive credit for both Plant Biology 100 and 102.
234. **Form and Function in Flowering Plants.** Lecture course on the physiological and morphological attributes that underlie the biosynthesis, growth, and reproduction of flowering plants in relation to the environment. Prerequisite: Plant Biology 100 or 102, or a year of biology; Chemistry 102. 3 hours. (Counts for advanced hours in LAS.)
260. **Systematics of Flowering Plants.** Introduces the principles and methods of the identification, naming, classification, systematics, and evolution of flowering plants; includes a survey of selected flowering plant families with information on their interrelationships. Field trips are given as part of the laboratories. Prerequisite: Plant Biology 100; or Biology 100, 101, or 111; or consent of the instructor. 4 hours. (Counts for advanced hours in LAS.)
263. **Plants and Their Uses by Man.** A consideration of the plants which are useful or harmful to man: their origins and history, botanical relationships, chemical constituents which make them economically important, and their roles in prehistoric and modern cultures and civilizations. Prerequisite: Plant Biology 100 or 102, or Biology 110. 3 hours.
290. **Individual Topics.** For juniors and seniors who wish to study individual problems and topics not assigned in other courses. Prerequisite: Ten hours of advanced work in plant biology or another biological science; junior or senior standing. 2 to 5 hours. May be repeated to a maximum of 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
292. **Senior Thesis.** Independent research for seniors in plant biology; prerequisite for graduation with distinction in plant biology and recommended for students intending graduate study. A thesis must be submitted for credit to be received, but graduation with distinction is not an automatic result of enrollment in Plant Biology 292. Will substitute for Plant Biology 290 in fulfilling independent study requirement. Prerequisite: Candidacy for degree with distinction in plant biology. 2 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and

Structural Biology; Ecology, Ethology, and Evolution; Entomology; Genetics and Development; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.

304. **Evolutionary Survey of the Plant Kingdom.** Lecture and laboratory course dealing with the structure, reproduction, and evolution of representative algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. Prerequisite: Plant Biology 100; or Biology 101, 111, or 251; or consent of instructor. 4 hours or 1 unit.
320. **The Biology of Bryophytes.** Study of mosses, liverworts, and hornworts with emphasis on problems unique to bryophytes and the use of bryophytes as experimental systems for broader botanical problems; topics include the systematics, anatomy, development, physiology, genetics, ecology, and evolution of bryophytes; and lecture, laboratory, and two or three field trips. Offered in alternate years. Prerequisite: One year of plant biology, or one year of biology plus consent of instructor. 4 hours or 1 unit.
325. **Paleobotany.** Same as Geology 325. Structure, phylogeny, and geological distribution of representative fossil plants. Two or three field trips. Prerequisite: Plant Biology 100, or Biology 100 or 101; Geology 101 or 107; or consent of instructor. 5 hours or 1 unit.
330. **Plant Physiology.** Same as Agronomy 330. General course concerned with plant functions, including water relations, mineral nutrition, metabolism, growth, and reproduction. Prerequisite: Chemistry 131; Plant Biology 100 or Biology 103, 111, or 251. 3 hours or $\frac{3}{4}$ unit.
332. **Photosynthesis.** Same as Biophysics 332. See Biophysics 332.
333. **Plant Physiology Laboratory.** Same as Agronomy 333 and Horticulture 333. A laboratory course in plant physiology; a supplement to Plant Biology 330 which serves the needs of those interested in acquiring familiarity with techniques of experimental plant physiology. Prerequisite: Credit or concurrent registration in Plant Biology 330 or equivalent. 4 hours or 1 unit.
335. **Plant Development.** Mechanisms underlying plant development: cytodifferentiation and the cell cycle, regulation of gene expression, induction, determination, morphogenesis, and pattern formation. Prerequisite: Introductory courses in biochemistry, biology, or plant biology, and calculus. 4 hours or 1 unit. Offered in alternate years.
338. **Plant Molecular Biology.** Same as Biochemistry 338. Presents the basic concepts of plant gene expression, the structure and expression of the three plant genomes, and special topics on plant vectors, plant viruses, and transposable elements. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
339. **Experimental Techniques in Plant Molecular Biology.** A laboratory course in plant molecular biology supplementing Plant Biology 338 with techniques of plant organelle isolation, DNA extraction, cell culture and recombinant DNA techniques. Prerequisite: Plant Biology 338 or equivalent; or consent of instructor. 4 hours or 1 unit.
341. **Field Ecology.** Study of plant communities in various sections of North America during spring vacation or intersession. Trips rotate on a three- to five-year basis. Outdoor cooking and camping; transportation in University cars. Prerequisite: One of the following: Plant Biology 260, 366, or 381; consent of instructor. 1 hour or $\frac{1}{4}$ unit. May be repeated to a maximum of 3 hours or $\frac{3}{4}$ unit.
345. **Plant Anatomy.** Lecture and laboratory course dealing with the structural characteristics of mature and developing cells, tissues, and organs of vascular plants, with special emphasis on the vegetative part of flowering plants. Prerequisite: One year of plant biology or equivalent, or consent of instructor. 4 hours or 1 unit.
351. **Viruses.** Same as Microbiology 351. See Microbiology 351.
363. **Plant Products.** Lectures on the natural products of plants, with emphasis on relevant compounds of ecological, pharmacological, toxicological, and economic interest. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
366. **Field Botany.** Identification and classification of native and naturalized flowering plants of eastern North America. Prerequisite: Plant Biology 100 or consent of instructor. 5 hours or 1 unit. Offered in the summer session only.
372. **General Mycology.** Structure, classification, and identification of fungi, including those of economic importance. Prerequisite: One year of plant biology, entomology, microbiology, or biology; or consent of instructor. 4 hours or 1 unit.

381. **Plant Ecology.** Principles of ecology exemplified by vegetation and environments of Illinois. Prerequisite: Plant Biology 260 or equivalent. 5 hours or 1 unit.
410. **Discussions in Plant Biology.** All graduate students in plant biology, except those with conflicting teaching assignments, are required to register in and attend the general seminar. No credit given except to those students presenting the results of their Ph.D. thesis research. 0 or $\frac{1}{4}$ unit.
413. **Discussions in Plant Physiology.** $\frac{1}{4}$ unit.
414. **Discussions in Plant Morphology and Taxonomy.** $\frac{1}{4}$ unit.
418. **Discussions in Plant Ecology and Plant Geography.** Developments in ecology and plant geography, with emphasis on one special division. Prerequisite: Graduate standing in plant biology, entomology, geography, or biology. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
419. **Discussions in Photosynthesis and Related Topics.** Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 $\frac{1}{2}$ units.
424. **Plant Biochemistry.** Same as Agronomy and Horticulture 424. See Agronomy 424.
425. **Membrane Transport and Mineral Nutrition in Plants.** Same as Agronomy and Horticulture 425. See Agronomy 425.
436. **Plant Biophysics.** Same as Biophysics 436. Biophysical processes in higher and lower plants; emphasizes a quantitative approach to the cellular and subcellular phenomena underlying the structure/function relationships and energetic requirements of plants. Half semester only. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. $\frac{1}{2}$ unit.
438. **Bioenergetics of Photosynthesis.** Same as Biophysics 438. See Biophysics 438.
442. **Environmental Plant Physiology.** Same as Agronomy 442. Lecture course dealing with the interaction of plants and environment at the level of the whole organism, extending to the cell and the community; emphasis on heat and mass transfer, plant and soil potentials, and effects of light on growth. Prerequisite: Chemistry 131; general physics; general or plant physiology; consent of instructor. 1 unit.
462. **Origin of Variation in Plants.** Same as Agronomy 462. See Agronomy 462.
471. **Advanced Mycology: Special Groups.** The several classes of fungi and their activities are considered in successive semesters. Special groups within these classes may be selected for concentrated study, depending upon the student's interest in mycology. Prerequisite: Plant Biology 372 or consent of instructor. $\frac{1}{2}$ unit.
472. **Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Pathology 472. See Plant Pathology 472.
488. **Plant Pigments.** Same as Horticulture 488. See Horticulture 488.
490. **Advanced Studies in Plant Biology.** Not more than 2 units may be applied toward the Graduate College master's degree requirement of 3 units of course work at the 400-level. Work may be taken in the following areas: (a) ecology; (b) evolution and systematics; (c) molecular biology and genetics; (d) physiology; and (e) ultrastructure. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Individual work under supervision of members of the staff in their respective fields. 0 to 4 units.

PLANT PATHOLOGY

Head of Department: R. E. Ford

Department Office: N-519 Turner Hall, 1102 South Goodwin, Urbana

204. **Introductory Plant Pathology.** Concepts relating to causal agents of representative plant diseases, symptoms, and diagnosis, modes of infection and spread, effects of environment on disease development, and methods of control; designed for students in other departments which require or recommend an introductory plant pathology course; lecture and laboratory-discussion. Prerequisite: Plant Biology 100 or equivalent. 3 hours.

300. **Special Problems.** For students desiring to study specific problems not assigned in other courses. Prerequisite: For undergraduates only, a minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. Specific approval of the associate dean in advance of registration is required for a second and/or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
301. **Principles of Plant Pathology.** Basic principles concerning the nature, cause, development and control of plant diseases; intensive study of important diseases and their causal agents; designed for graduate students in plant pathology; lecture and discussion. Prerequisite: An introductory course in plant biology and consent of instructor. 4 hours or 1 unit. Students may not receive credit for both Plant Pathology 204 and 301.
305. **Principles of Plant Disease Control.** Basic concepts of chemical, cultural, physical, regulatory, and biological methods for the management of plant diseases. Prerequisite: Plant Pathology 204 or 301; a course in organic chemistry. 3 hours or $\frac{3}{4}$ unit.
308. **Plant Disease Diagnosis.** Field and laboratory techniques in plant disease diagnosis and appraisal; identification of diseases of small grains, turf, corn, soybeans, forage crops, vegetables, fruit, forest and shade trees, and ornamentals, both on field trips and in laboratory exercises. Prerequisite: Plant Pathology 204, or equivalent. 2 hours or $\frac{1}{2}$ unit. Offered during summer session only.
377. **Diseases of Field Crops.** Same as Agronomy 377. Studies the symptoms of major field crop diseases, life histories of causal organisms, and methods of control. Lecture and laboratory. Prerequisite: Plant Pathology 204 or 301. 3 hours or $\frac{3}{4}$ unit.
401. **Plant Pathogenic Fungi.** Studies pathogenic fungi and their roles in disease cycles in vascular plants; morphology, classification, life histories, ecology and evolution; methods for identification. Prerequisite: Plant Biology 372. 1 unit. Offered in alternate years.
402. **Phylobacteriology.** Studies pathogenic bacteria and their role in plant disease; history, morphology, reproduction, identification, and classification; emphasizes arrival, invasion, symptoms, and control. Prerequisite: Plant Pathology 301. $\frac{3}{4}$ unit. Offered in alternate years.
403. **Plant Nematology.** Comprehensive study of plant-feeding nematodes with emphasis on economically important groups; nematode morphology, identification, classification, developmental biology, ecology, and host-parasite relationships; interaction with fungi, bacteria, and viruses in plant disease development; experimental and diagnostic techniques; symptomatology and control. Prerequisite: Plant Pathology 204 or 301; an introductory course in animal biology. 1 unit. Offered in alternate years.
404. **Plant Virology.** Comprehensive study of plant viruses and virus diseases; includes symptomatology, structure, transmission, characterization, purification, classification, assay methods, replication, genome organization and expression, epidemiology, and control. Prerequisite: Plant Pathology 301 and Biochemistry 350. 1 unit. Offered in alternate years.
406. **Genetics of Plant-Pathogen Interactions.** The genetics and expression of resistance in plants to fungi, bacteria, viruses, nematodes, and other pathogens; variation and genetic systems in pathogens with particular emphasis on pathogenicity; complementary genetic systems; and theory and practice of breeding disease-resistant plants. Lecture and discussion. Prerequisite: Plant Pathology 204 or 301; and Agronomy 323 or Genetics and Development 210; or equivalent. 1 unit. Offered in alternate years.
407. **Physiology and Biochemistry of Plant-Microorganism Interactions.** Current concepts on physiological and biochemical bases of plant-microorganism interactions; mechanisms of infection, disease and nodule development; theories of resistance and susceptibility; and interrelationships of physiological and biochemical activities that occur during the interaction of plants and microorganisms. Prerequisite: One course each in plant pathology, biochemistry, and plant physiology, or consent of instructor. $\frac{1}{2}$ unit. Offered in alternate years.
408. **Plant Disease Epidemiology.** Fundamental concepts and principles of plant disease epidemics; includes pathometry, crop loss assessment, pathogen and host dynamics, quantification of pathosystem components, pathosystem management, disease forecasting, and decision analysis.

Prerequisite: Plant Pathology 301 and Agronomy 440, or equivalent. 1 unit. Offered in alternate years.

- 417. **Plant Pathology Seminar.** Current research, literature, and other topics pertaining to plant pathology and related fields. $\frac{1}{4}$ unit.
- 431. **Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Horticulture 431. See Biology 431.
- 432. **Plant Cell Energetics.** Same as Agronomy, Biology, Forestry, and Horticulture 432. See Biology 432.
- 433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Horticulture 433. See Biology 433.
- 472. **Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Biology 472. Identifies and classifies ascomycetes and fungi imperfecti emphasizing relationships between sexual and asexual forms; laboratory provides experience in collection, culturing and isolation, and identification. Prerequisite: Plant Biology 372 or equivalent. $\frac{1}{2}$ unit.
- 499. **Thesis Research.** Individual study and basic and/or applied research related to plant disease; required of all students working toward the Master of Science or Doctor of Philosophy in plant pathology. 0 to 4 units.

POLITICAL SCIENCE

Head of Department: George T. Yu

Department Office: 361 Lincoln Hall, 702 South Wright, Urbana

- 100. **Introduction to Political Science.** Survey of major concepts and approaches employed in political science. 3 hours.
- 102. **Political Science Orientation.** Lectures designed to acquaint the political science concentrator/major with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to political science students. Recommended for freshmen in political science. No credit.
- 150. **American Government: Organization and Powers.** Historical development and organization of national, state, and local governments; the federal system; national and state constitutions; civil and political rights; party system; and nature, structure, powers, and procedure of legislative, executive, and judicial departments in state and nation. 3 hours.
- 198. **Freshman Seminar.** Current topics in political science in the context of the scope and method of political science. Participants are required to do independent library research and present a report on a topic of their choice which is related to the subject of the seminar. Prerequisite: Consent of instructor. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 222. **Introduction to Modern Africa.** Same as African Studies, Anthropology, and Sociology 222. See African Studies 222.
- 235. **Women in Politics.** Same as Women's Studies 235. An introduction to the political status and roles of women. Topics include women's political socialization, voting behavior, and political participation; feminist and anti-feminist politics; and contemporary legislative and public policy issues, such as educational equity, equal rights legislation, and health care delivery for women. 3 hours.
- 240. **Introduction to Comparative Politics.** Basic concepts and principles of political analysis from a comparative perspective. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 241. **The Emerging Nations.** An introductory comparative consideration of the patterns of political development and of the policies and problems of the emerging nations of Asia, Africa, and Latin America; emphasis on the special characteristics of countries beginning their independent nationhood and the effects of these characteristics on the political systems of these lands and their role in the community of nations. Prerequisite: Three hours of political science or consent of instructor. 3 hours.

250. **Introduction to Public Policy.** Surveys the policy process including adoption, implementation, and evaluation; each student prepares a research paper; topics include reviews of substantive policy issues such as crime, energy, environment, poverty, foreign policy, civil liberties, or economic regulation. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
260. **Introduction to Political Theory.** The nature, structure, and purposes of political theory; uses major works on the problems of political order, obedience, justice, liberty, and representation to distinguish and clarify different theoretical approaches; designed to be an introduction to ideas, not a historical survey. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
270. **Introduction to Political Research.** Principles of empirical research in political science; emphasizes definition of research problems, principles and practices of measurement, use of data as evidence, and data analysis; data-based analysis is conducted in the Social Science Quantitative Laboratory. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
280. **Introduction to International Relations.** The structure and processes of international relations, trends in international politics, and the future of the international system in a setting of conflict and crisis. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
281. **Introduction to International Security and Arms Control.** An introduction designed for all students to major issues of arms control, disarmament and international security. The military, socio-economic, and political effects of nuclear and conventional weapons, military strategy, the ethics of modern warfare, nuclear proliferation, and regional security issues will be studied. 3 hours.
290. **Individual Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of faculty member supervising the work; and approval of the department head. 1 to 4 hours. May be repeated. (Counts for advanced hours in LAS).
292. **Senior Thesis in International Relations.** Prerequisite: Written consent of instructor; senior standing; major in Political Science, studying international relations. 3 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Prerequisite: Written consent of instructor; open only to seniors whose major is political science and who have a general University average of at least 4.0. 2 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
295. **Special Topics in Contemporary Issues and Problems.** Study of a contemporary problem in public policy, domestic or international. See *Timetable* for current topics. Prerequisite: Sophomore standing, 3 hours of political science, or consent of instructor. 3 hours. May be repeated for credit.
296. **Special Topics in Political Science.** Selected reading and research in political science. See *Timetable* for current topics. Prerequisite: Junior or senior standing; 6 hours of political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 297. (Counts for advanced hours in LAS.)
297. **Honors Seminar.** Research, reading, and discussion in selected topics and works in literature of political science. Prerequisite: Senior standing; 18 hours of political science; 4.5 grade point average in political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 296. Counts for advanced hours in LAS.
299. **Government Internship.** Selected Government Internship participants together with faculty sponsor develop a program of study and research related to internship assignment. Consult departmental undergraduate advisor. Prerequisite: Junior standing; 4.0 grade average for most internships; Political Science 150 and one 300-level political science course appropriate to internship program; acceptance by faculty sponsor. 0 to 6 hours. May be repeated to a maximum of 12 hours.
300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Social Science 300. Examination of performance-oriented approaches to administration of public sector organizations; private sector accountability principles applied to governmental agencies; means of improving the performance of governmental agencies; corporate social responsibility; public policy implications of computer usage and individual privacy; and actual cases reviewed and discussed. Prerequisite: Consent of instructor. 3 hours or 1 unit.

305. **Municipal Government.** Growth of cities; their legal status; and municipal politics and organization in the United States. 3 hours, or $\frac{1}{2}$ or 1 unit.
306. **Municipal Problems.** Municipal administration in the United States; administrative organization; personnel problems; financial problems; city planning and housing; police and fire administration; public health; and public utilities. Prerequisite: Senior standing, or junior standing with Political Science 305 or Economics 101, or 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
312. **State Government.** The states in the federal system; state constitutions and problems of revision; organization, powers, and functions of the legislative, administrative, and judicial branches of state government; state functions; reorganization problems in the states; state-local relations; and state finance, trends, and prospects. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
314. **The Presidency.** Determinants and growth of presidential influence; presidential decision making; the president's role in the formulation and implementation of public policy; the president and constituencies; and the president's roles as legislator, party leader, and chief executive. Prerequisite: Political Science 100 or 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
315. **Legislatures and Legislation.** The legislative function in government; structure and organization of American legislatures (national, state, and local); party organization in legislatures; legislative procedure; pressure groups and lobbying; relation of legislature to other branches of government; and problems of legislative reorganization. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
317. **The American Federal System.** The nature, justification, and problems of federalism; coordination of governmental efforts by contract, subsidies, and grants; and comparison of federal systems. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
321. **Government and the Economic Order.** Interplay of political and economic phenomena at various domestic, foreign, and international levels and applicability of certain generalized models. Prerequisite: Any two courses in political science or a combination of political science and economics. 3 hours, or $\frac{1}{2}$ or 1 unit.
322. **Politics and the Media.** Same as Communications 322. See Communications 322.
326. **American Political Parties.** Organization and operation of the American party system; relations between national, state, and local organizations; state and national committees; the convention systems; the primary; and campaign methods and finance. Prerequisite: Political Science 150 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
327. **Black Political Participation in the American Political Process.** Same as Afro-American Studies 327. The role of race in stimulating change in American political life; types of strategies employed in the civil rights struggle; how race affects Black electoral participation and the broader political and economic conditions of Black Americans. Prerequisite: Political Science 150, or 6 hours of social science, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
328. **An Introduction to the Study of Political Behavior.** An analysis of the interrelations of political attitudes and public formation; special attention to the substantive areas of voting behavior, political leadership, and the rise of political mass movements; and also a review of the literature on democratic and authoritarian personality types. Prerequisite: Political Science 150 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
329. **Electoral Behavior.** Study of the social and psychological motivations behind the individual voting decision, with special emphasis on the relationships between the voting decision and social stability. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
331. **British Government.** Nature of the British Constitution: the Crown, Ministry, and Cabinet; Parliament and elections; the party system; law and the courts; local government; and the British Commonwealth. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
332. **African Independence and Underdevelopment: 1945 to the Present.** Same as History 385. See History 385.
333. **Southern Africa: Race and Power.** Same as African Studies 325 and History 325. See African Studies 325.
335. **Government and Politics of the Soviet Union.** Evolution, structure, and functioning of the Soviet system of government; the theories, structure, and functioning of the Communist

- party of the Soviet Union. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
336. **Governments and Politics in Western Continental Europe.** An analysis of the major governmental systems of continental Europe; the evolution, structure, and functioning of the political institutions of France, Germany, Italy, Spain, Switzerland, and the Scandinavian countries. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
337. **Government and Politics of China.** Same as Asian Studies 337. An introduction to the government and politics of modern China. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
338. **Governments and Politics in the Middle East.** Same as Asian Studies 338. An analysis of the transformation of Middle Eastern society from Morocco to Iran, as case studies in political modernization; study of politics of the area with special reference to causes and character of modernization, role of leadership, ideologies and institutions, methods and theories for analyzing political systems undergoing fundamental transformation, and implications for U.S. policy. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
339. **Islam and Society in the Modern Middle East and North Africa.** Same as Religious Studies 308. See Religious Studies 308.
340. **The German Political System.** Structures and processes of postwar German politics, with primary emphasis on West Germany; special attention to foreign policy formulation and problems (particularly defense), the Berlin issue, reunification, and relations with Eastern Europe. Knowledge of German helpful but not necessary. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
342. **Government and Politics in Latin America.** A survey of the origin and development of Latin American political institutions; systems of government; public administrative systems; party government; and international policies of Latin American governments. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
343. **Political Systems and Structures of Latin American Countries.** The political process, generally of selected Latin American countries at different levels of political development; stress on the interaction between political infrastructure and more formal agencies of government; and may include cross-national comparison of the function of such factors as political culture, party system, bureaucracy, or the military establishment. Prerequisite: Political Science 342 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
346. **Comparative Communist Systems: Eastern Europe.** Analysis of the origins of modern communism and the development of its doctrines; applications of these doctrines in the practices of ruling Communist parties; emphasis on alternates between European and non-European Communist systems, depending on course instructor. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
347. **Governments and Politics of Southeast Asia.** Same as Asian Studies 347. Comparative analysis of the political development of the countries of Southeast Asia, the lands to the east of India and south of China; emphasis on differing approaches to the governance and formation of public policy in these countries; and consideration of economic, social, historical, and cultural influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
348. **Government and Politics of Japan.** Same as Asian Studies 348. Introduction to the government and politics of modern Japan. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
349. **Governments and Politics of South Asia.** Same as Asian Studies 349. A comparative analysis of the political development of India, Pakistan, Sri Lanka, and the lesser lands of South Asia; emphasis on the differing approaches to governance and formation of public policy in these countries; and consideration of economic, social, historical, geographical and cultural influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
350. **Law and Society.** An introductory study from a social science perspective of the nature of law, law makers, and law appliers; the causes or inputs determining law; and the effects or outputs which law in general produces. Prerequisite: Junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 351. American Constitutional System.** Judicial interpretation of constitution; separation of governmental powers; relation of state and national governments; control of interstate commerce; and jurisdiction of courts. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. The Judicial Process.** A systematic analysis of legal, evidentiary, environmental, and personal factors that influence judicial decision making, with particular emphasis on the application of the scientific method to the study of judicial behavior. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 355. The Constitution and Civil Liberties.** Study of free speech, loyalty in a democratic state, citizenship, freedom of religion, rights of persons accused of crime, and government's responsibility to protect persons from racial and religious discrimination; and special attention to the role of law and judges. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. Human Rights.** Same as Sociology 357. See Sociology 357.
- 358. Politics of Crime and the Criminal Process.** Same as Sociology 358. Examination of crime as a political issue and as a social problem; includes political aspects of law enforcement, the nature of the judicial process in criminal cases, and criminal justice reform; and emphasizes the legal system at the local level. Prerequisite: Political Science 150 and junior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 359. Contemporary Supreme Court Policy Making.** Studies how the modern Supreme Court has resolved major issues in American constitutional politics. Prerequisite: Consent of instructor; Political Science 351 or 355 or 358. 3 hours or 1 unit.
- 361. Introduction to Public Administration.** Development of administrative organization; administration and the executive, legislature, and judiciary; principles of organization, including line and staff relationships; the staff services of finance and personnel; and formal and informal control. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 362. Administrative Organization and Policy Development.** Dynamics of policy formulation in public administrative agencies; current developments in organizational theory and their significance for public administration; origin of public administrative organizations; interpersonal behavior; large-scale organizations and centralization; external support and opposition; and policy formation and problems of compliance. Prerequisite: Six hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 370. Selected Topics on Women and Politics.** Same as Women's Studies 370. Variable topics relating to the political roles and status of women, emphasizing the areas of comparative politics, political theory, political behavior, and international politics. See *Timetable* for current topics. Prerequisite: Political Science 235 or consent of instructor. 3 hours or 1 unit. May be repeated once for credit.
- 371. World International Organization.** General development and basic principles of world organization; principles, structure, methods, and actual operation of international governmental institutions; and special attention to the United Nations and related agencies and to their evolution from the League of Nations system. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 372. Issues in West European Foreign and Security Policy, I.** Examines the ways in which the West European political system is being structured, the major foreign and security issues that face it, and the collective efforts of the European states to solve them. Prerequisite: Junior standing. Political Science 280 is desirable, but not required. 3 hours or 1 unit.
- 373. Issues in West European Foreign and Security Policy, II.** Examines the ways in which the West European political system is being structured, the major foreign and security issues that face it, and the collective efforts of the European states to solve them. Course is conducted in one of the West European languages (e.g., French, German) and supplements Political Science 372. Prerequisite: Concurrent registration in Political Science 372; junior standing; ability to use the relevant European language for coursework (completion of three years of college level foreign language or equivalent competency). Completion of Political Science 280 is desirable, but not required. 2 hours or $\frac{1}{2}$ unit.
- 375. Politics of the Global Economy.** Examines the interaction between politics and economics; locates ideologies and practices in the context of international economic relations. Considers such topics as international trade, the global monetary order, multi-national corporations, economic aid relationships, and food and energy politics. Prerequisite: Political Science 240 or 280. 3 hours or 1 unit.

377. **International Communications.** Same as Communications 377. An interdisciplinary approach to international communications; its structure and content; the role of international communications in conflict and conflict resolution; the semantics of international communication; the technical and economic aspects of international mass communications; and government-industry relations in communications. Prerequisite: Political Science 280 or 6 hours of social science, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
380. **Comparative Foreign Policies.** An analysis of the formulation and substance of the foreign policies of select nations of the world. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
381. **American Foreign Relations.** Participation in international affairs; presidential initiative; development and organization of the Department of State; diplomatic intercourse; consular service; treaty-making power; and development of foreign policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
382. **Contemporary American Foreign Policies.** Study of the major foreign policy decisions currently confronting the United States government: analysis of background, principal issues, and alternative actions; formulation of policies. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
383. **Soviet Foreign Policy.** Survey of Soviet foreign policy from 1917 to the present, with emphasis upon the forces shaping this policy; special attention to the interplay of ideology and national interest in policy formulation. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **International Relations.** Examination of contemporary international systems in terms of the types of actors and their goals, various structures of power, and the mechanisms of allocating resources and containing conflict. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
387. **National Security Policy.** Examination of the organization and formulation of current American defense policy; the theory and practice of deterrence, with special reference to American and Soviet military strategy; and the problems of disarmament and arms control. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
388. **The Military and Politics.** The role of the military in national and international policies, with special attention given to theories of war and peace, civil-military relations, the military and the political development of Western and non-Western states, and the nonmilitary uses of the military. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
389. **Chinese Foreign Policy.** Same as Asian Studies 385. An analysis of the formulation, substance, and conduct of Chinese foreign policy, with emphasis on the period since 1949; special attention to the forces shaping Chinese policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
390. **Methods of Political Analysis.** Presentation of the analytic processes in the development of concepts, hypotheses, and theories; discussion of the derivation, formulation, and specification of research problems to be related to basic methodologies and modes of analysis; and applications to political science. Prerequisite: Political Science 270, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
391. **Topics in non-Western Political Thought.** Considers political thought outside of the Greco-Roman, European, and North American tradition; each semester focuses on the political thought of a specific region. 3 hours or 1 unit. May be repeated as topics vary.
392. **Socialist Political Theory.** Origins, development, and recent modifications of socialist theory from the late eighteenth century to the present; examination of each contribution in terms of its goals, efficacy, and subsequent influence; and discussion including Rousseau, Hegel, the Utopians, Marx and Engels, Anarcho-syndicalists, Lenin, Luxemburg, Trotsky, Mao, Guevara, and Garaudy. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
393. **Classical Political Theory.** A consideration of major works of Greek and Roman political theory, and especially of their relevance to modern political analysis and action. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
395. **Modern Political Theory.** A critical analysis of political theories from the sixteenth century to the present; focus on the development of conceptions of human nature the role of the

- state, justice, legitimacy, obligation, individual rights, equality, and mechanisms of maintenance and change. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
396. **Contemporary Political Theory.** Major tendencies in Western political theory since 1850; conservatism and constitutionalism; the religious interpretation of the state and economic institutions; Marxism, socialism, and communism; and antidemocratic thought and totalitarian regimes. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
397. **American Political Theory.** Survey of American political thought from colonial times to the present. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
398. **Theory and Practice of Democratic Government.** Theories of the nature and conditions of democracy; comparison and analysis of contemporary democratic institutions. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
400. **Selected Topics in Political Theory.** Reading, analysis, and discussion of selected topics of political theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
401. **History of Political Theories.** Reading and analysis of the leading political thinkers from the Greeks to the middle of the seventeenth century. 1 unit.
402. **History of Political Theories.** Readings and analysis of the leading political thinkers from the middle of the seventeenth century to the present. 1 unit.
427. **Introduction to Quantitative Political Analysis.** Introduction to problems of research design, data collection, data analysis and interpretation, sampling, and some simple measures of statistical association and significance. 1 unit.
428. **Multivariate Analysis for Political Scientists.** Applied use of extended analysis of variance; multiple classification analysis, factor and small-space analysis, causal analysis, multiple regression, and selected topics for research. Prerequisite: Sociology 387 and Political Science 427, or consent of instructor. 1 unit.
430. **Proseminar in Comparative Politics.** Comparative political analysis in the context of the evolution of the social sciences and modern political science, with emphasis on theories of political action and their function in contemporary comparative studies. This course is designed as an introduction to area-oriented seminars and generally is a prerequisite for them. 1 unit.
440. **Comparative Politics and the Political Process.** The comparative study of selected national political systems or of specific institutional forces that influence the making and application of public policy in several countries. The countries studied and the legal and extralegal political agencies considered vary according to the person conducting the seminar. 1 unit. May be repeated to a maximum of 3 units.
450. **Proseminar in American Politics.** An intensive analysis of major institutions and processes of American politics (national, state, and local); research on selected topics in American government. 1 unit.
451. **Seminar on the U.S. Presidency.** Introduction to the literature and research topics on the American Presidency; includes presidential relations with the public and mass media, other governmental institutions and elites, and decision processes in the White House. Prerequisite: Graduate standing. 1 unit. May not receive credit for both Political Science 314 and 451.
452. **Seminar on the U.S. Congress.** Traces the development of Congress as an institution with special attention to the role of norms; considers intra-institutional aspects of Congress including committee decision-making, floor voting, and leadership; examines congressional relationships with other actors including the presidency and Supreme Court, interest groups, and constituents. Prerequisite: Graduate standing. 1 unit. May not receive graduate credit for both Political Science 452 and 315.
453. **Seminar on Law and Politics.** Legal institutions, legal decision-making, and constitutional politics in the American setting; includes both theoretical and methodological aspects of the law and politics literature. Prerequisite: Graduate standing. 1 unit. May not receive graduate credit for Political Science 453 and Political Science 351 and/or 354.
454. **Seminar on Sub-National Politics.** Political interactions among and within the levels of government in the American national, state, and urban political systems; analytical approaches include empirical theories (e.g., macro-analytic, exchange, public choice, institutionalism) and value theories (e.g., democracy, representation, pluralism, federalism); methodologies range from historical to quantitative with emphasis on combinations. Prerequisite: Gradu-

- ate standing. 1 unit. May not receive graduate credit for Political Science 454 and Political Science 306, 312, and/or 317.
455. **Seminar on Political Parties and Elections.** The role of political parties and elections in the political process; traces the evolution of American parties as a political institution, assesses their impact upon the policy-making processes, and considers macro-level influences upon the electoral process. Prerequisite: Graduate standing. May not receive graduate credit for Political Science 455 and Political Science 326 and/or 329. 1 unit.
456. **Seminar on Mass Political Behavior.** Covers the scholarly literature on, and the research techniques used to study, political participation, electoral behavior, political socialization, and public opinion. Prerequisite: Graduate standing. 1 unit. May not receive graduate credit for Political Science 328 and/or 329 and/or 456.
457. **Collective Action and Interest Groups.** Broad analysis of collective action, interest groups, and politics; examines the meaning of political interests and the forms they take; reviews various approaches to the study of interest groups; analyzes the formation and operation of interest groups; reviews research in the policy areas of housing, agriculture, race, and gender at a variety of institutional levels; examines innovation and change in interest group politics and research. Prerequisite: Graduate standing. 1 unit. May not receive graduate credit for both Political Science 457 and 326.
459. **Contemporary Governmental Problems.** Special problems of current importance designed especially for students majoring in political science. 1 unit. May be repeated to a maximum of 3 units.
460. **Organizational Sciences, I.** Same as Business Administration 410, Psychology 453, and Sociology 456. See Business Administration 410.
461. **Formation of Public Policy.** Same as Labor and Industrial Relations 420. An examination of the institutional and dynamic forces that shape the making of policy and its administration in the United States; separation of powers, pressure groups, administrative and legislative procedures, and judicial activity. 1 unit.
465. **Problems in Administrative Management.** Analysis of methods of applying administrative principles and procedures to operating problems in government agencies, such as methods of administrative coordination and control, intergovernmental cooperation, legislative-administrative relations, the organization of regulatory functions, and review of administrative decisions. Prerequisite: Political Science 361 or consent of instructor. 1 unit.
466. **Current Administrative Theory.** A discussion of some recent trends in administrative opinion and practice on such questions as agency structure and functional activities; field and regional organization and relations; the role and functions of the executive; the process of decision making; the relations of line and staff activities; the communication and execution of policies and programs; and employee relations. 1 unit.
469. **Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations, Social Work, and Administration, Higher, and Continuing Education 497. See Labor and Industrial Relations 497.
480. **Scope and Theory in International Relations.** Deals with the field of international relations, its relationship to political science and the other social sciences; treats the development of the field by examining major theories and approaches that have characterized it in the past, but with emphasis on contemporary theories and concepts. 1 unit.
481. **Methodology in International Relations.** Deals with major research methodologies in contemporary international relations; includes case studies, aggregate data, content analysis, survey research, gaming and simulations, and causal modelling; and presumes knowledge of basic international relations theory. Prerequisite: Political Science 480. 1 unit.
484. **International Relations: Special Problems in Theory and Research.** Advanced seminar on special topics in international relations. Prerequisite: Political Science 480 or 481, or consent of instructor. 1 unit. May be repeated under different instructors for a maximum of 3 units.
490. **Proseminar in Political Behavior, I.** Interdisciplinary approaches to the analysis of political behavior; formation of opinions, interests, roles, and personality; applications of organization theory to political institutions; applications of conflict and bargaining theory to political processes; and systematic studies of the distribution of values. 1 unit.
491. **Proseminar in Political Behavior, II.** Continuation of Political Science 490. Prerequisite: Political Science 490. 1 unit.

492. **Problems of Explanation in Social Science.** Special topics in the methodology of social sciences, especially theory formation and theory testing. 1 unit.
493. **Research in Selected Topics.** Research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 3 units.
494. **Dissertation Design Seminar.** Addresses the basic steps involved in the development of a dissertation proposal; aims to facilitate the completion of the dissertation proposal for students who have passed the qualifying examinations. Prerequisite: Successful completion of required qualifying examinations. 0 units.
495. **Philosophical Bases of Political Inquiry.** Definitions of the scope and subject matter of political science; methodological issues in political science; major conceptions of methodology as embodied in current leading studies of politics; and the present state of research in political science. 1 unit.
496. **Research Design and Techniques.** Indicates the relevance of certain research techniques for answering questions of concern in political science; indicates the range of tools available to the student; and includes discussion of problems in concept formation. Presents current methods of concept measurement in the context of political research problems. Prerequisite: Political Science 495 or consent of instructor. 1 unit.
498. **The Logic of Political Inquiry: Selected Topics.** Application of analytic principles and procedures developed in Political Science 495 to such topics as patterns of explanation; current theoretical perspectives; group theory, functionalism, systems theory, decision making, simulation, etc; the logic of judicial decisions; and justifications of political ideologies. This list is not exhaustive, nor will all of these topics be included each semester. Prerequisite: Political Science 495. 1 unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units.

PRINTMAKING

(See Art and Design)

PSYCHOLOGY

Head of Department: Emanuel Donchin

Department Office: 308 Psychology Building, 603 East Daniel, Champaign

100. **Introduction to Psychology.** Study of human behavior with special reference to perception, learning, memory, thinking, emotional life, and individual differences in intelligence, aptitude, and personality; emphasis on the scientific nature of psychological investigations; and discussion of research methods and the relation of their results to daily life and everyday problems. Lectures, discussions, and five hours of participation as a subject in psychological experiments. Not open to students electing Psychology 103 or 105. 4 hours.
102. **Psychology Orientation.** Lectures designed to acquaint the psychology concentrator with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to psychology students. Recommended for freshmen in psychology. No credit.
103. **Introduction to Experimental Psychology.** Surveys basic topics in experimental psychology; emphasizes perception, learning, memory, motivation, emotion, cognition, language development, and decision-making. Uses simple laboratory experiments to investigate these topics. Not open to students electing Psychology 100 or 105. 4 hours.
105. **Elements of Psychology.** Description and explanation of the psychological principles of everyday living, with emphasis on how behavior is motivated, how individuals learn intelligent behavior, personality, and applications of psychology to various social issues. Lectures, discussions, and five hours of participation as a subject in psychological experiments. This course may be substituted for Psychology 100 when the latter is listed as a prerequisite or a recom-

- mended elective. For placement purposes, enrollment is limited to students whose ACT composite score is 21 and below. Not open to students electing Psychology 100 or 103. 4 hours.
158. **Personal and Social Implications of Machines.** Examines human interaction with modern machines; topics include a comparison of the capabilities of humans and machines, effects of automation, characteristics of good machines and workplaces, selection and training of effective users of machines, and research, including new machines, for handicapped populations. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Introduction to Social Psychology.** Systematic study of social factors in individual and group behavior; attention to social perception, motivation, and learning; attitudes, norms, and social influence processes; the development and dynamics of groups; and the effects of social and cultural factors on the individual. Credit is not given for both Psychology 201 and Sociology 201. Prerequisite: Psychology 100, 103, or 105. 3 hours.
205. **Individual Differences in Intelligence.** Discussion of the nature of psychological tests; theories of intelligence; the nature-nurture problem in human abilities; sex, socioeconomic, and race differences; testing and social policies; and policy implications of individual and group differences. Lecture and discussion. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
210. **The Brain and the Mind.** A survey of current knowledge and speculation regarding the brain's role in perception, motivation, sexual behavior, thinking, memory, and learning, based upon human clinical data and research in animal models. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
211. **Techniques of Biological Psychology.** Introduction to research techniques used in the physiological study of mental processes; includes recording "brain waves," behavioral analysis of drug and lesion effects, anatomy of the brain, hormones and behavior, and related topics. Prerequisite: Credit or concurrent registration in Psychology 210, or consent of instructor. 2 or 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Leisure Studies, and Rehabilitation Education 214. See Human Development and Family Studies 214.
216. **Child Psychology.** Study of the psychological development of the child. Prerequisite: Psychology 100, 103, or 105. 3 hours.
217. **Comparative Development.** Survey of phylogenetic and ontogenetic development of behavior. The first part of the course considers the comparative psychology of representative phyla, with special emphasis on the development of sensorimotor coordination, motivation, and learning. The second half of the course is concerned with development of behavior in the individual organism, with most attention devoted to behavioral changes during the life span of vertebrate organisms. Prerequisite: Psychology 100, 103, or 105. 3 hours.
219. **Developmental Child Care: Methods and Issues.** Introduction to current child care programs for children under five; historical philosophical foundations, application of research and theory to program practices for children birth to five with emphasis on full day programs. Prerequisite: Psychology 216, Human Development and Family Ecology 105, or Educational Psychology 236. 3 hours.
224. **Cognitive Psychology.** Introduction to the psychological study of human information processing and memory; acquisition, retrieval, and forgetting; and general knowledge, concepts, reasoning, and related issues in cognition. Prerequisite: Psychology 100, 103, or 105. 3 hours.
230. **Perception and Sensory Processes.** Survey of the experimental psychology of sensory and perceptual processes and behavior; emphasis on the contribution of behavior science to understanding subjective experience of the physical and social environment. Prerequisite: An introductory course in psychology, physiology, or animal biology. 3 hours.
231. **Research Methods in Experimental Psychology.** Studies experimental laboratory methods as related to applied and basic psychological questions; material includes: research methodology, scientific problem solving, literature search, scientific writing, experimental design, basic data analysis, and research laboratory experience. Prerequisite: Psychology 100, 103, or 105. 4 hours.
233. **Descriptive Statistics.** Descriptive statistics, including measures of central tendency and dispersion, correlation, probability, transformations, and basic distribution theory; basic prin-

ciples of sampling and research design. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 3 hours. Students may not receive credit for Psychology 233 and Psychology 235, Economics 171 or 172, Sociology 185 or 385, Statistics 100 or 210 or Educational Psychology 390. (Offered by correspondence only.)

234. **Inferential Statistics.** Inferential statistics, including sampling distributions estimation, hypothesis testing, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 233. 2 or 3 hours. Students who have earned credit in Economics 171 or 173, Statistics 100 or 210, Sociology 185, or Educational Psychology 390 receive 2 hours credit in Psychology 234. Students may not receive credit for both Psychology 234 and 235. (Offered by correspondence only.)
235. **Introduction to Statistics.** Development of skill and understanding in the application of statistical methods to problems in psychological research; topics include descriptive statistics, probability, estimation, basic inferential methods, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 2 or 5 hours. Students who have earned credit in Economics 171, 172, or 173, Statistics 100 or 210, Sociology 185 or 385, or Educational Psychology 390 receive 2 hours credit in Psychology 235. Students may not receive credit for both Psychology 235 and either Psychology 233 or 234.
238. **Abnormal Psychology.** Conceptions and facts about disordered behavior, including psychoses, neuroses, and other patterns of psychological disturbance. Prerequisite: Psychology 100, 103, or 105. 3 hours.
239. **Community Psychology.** Redefines human and social problems and the implications for social programs and policies; reviews the historical antecedents, conceptual models, strategies and tactics of social and community programs; and employs examples from selected social systems (e.g., criminal justice, education, employment, and mental health). Prerequisite: Psychology 100, 103, or 105. 3 hours.
245. **Industrial Organizational Psychology.** A systematic study of the application of psychological methods and principles in business and industry; emphasis on personnel selection and factors influencing efficiency. Prerequisite: Psychology 100, 103, or 105; credit or concurrent registration in a statistics course. 3 hours.
246. **Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Sociology 246. See Ecology, Ethology, and Evolution 246.
248. **Psychology of Learning and Memory.** Survey of basic phenomena in learning and memory emphasizing experimental data from animal and human research. Prerequisite: Psychology 100, 103, or 105. 3 hours.
250. **Psychology of Personality.** The study of personality from various points of view: biological, experimental, social, and humanistic; surveys theory and empirical research in the study of personality. Prerequisite: Psychology 100, 103, or 105. 3 hours.
258. **Human Factors in Human-Machine Systems.** Same as Industrial Engineering 248. Examines equipment and training variables that influence the human operator in human-machine systems; includes the nature of human-machine systems, the capabilities of humans and machines, and simulation for design decision; and research and principles for the design and use of symbolic and pictorial displays, control systems, and simulators for training. Prerequisite: Psychology 100, 103, or 105; or junior standing. 3 hours.
260. **American Sign Language.** Same as Linguistics and Speech and Hearing Science 260. A beginning course in American Sign Language (ASL), the language developed and used by the deaf community of North America; consists of a preparatory phase to attune students to communication in the manual-visual mode, followed by instruction and extensive practice in basic sign vocabulary, sentence structure, elementary conversation, and the literature of the ASL community. 3 hours.
290. **Special Topics.** Supervised participation in research and scholarly activities usually as an assistant to an investigator. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours.

291. **Honors Individual Study.** Prerequisite: Junior standing; admission to psychology honors program. 2 to 4 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS).
293. **Honors Senior Thesis.** Planning, researching, and writing of an undergraduate honors thesis, under supervision of a faculty member, on a problem of appropriate scope and character. Prerequisite: Psychology 297. 2 to 4 hours. (Counts for advanced hours in LAS.)
294. **Individual Topics.** Supervised independent investigation of special topics in psychology; requires a written report with a final copy submitted for departmental records. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours. (Counts for advanced hours in LAS.)
297. **Junior Honors Seminar.** Seminar on experimental methods and contemporary psychological research. Prerequisite: Junior standing and admission to departmental honors program. 0 to 4 hours. (Counts for advanced hours in LAS.)
298. **Senior Honors Seminar.** Continuation of Psychology 297. Prerequisite: Psychology 297. 0 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
300. **Psychology for Medical Students and Health Professionals.** An advanced treatment of psychological concepts with an emphasis on their interaction with medicine. Topics include: perception, learning, memory, thinking, emotions, and individual differences; psychological theories and data relevant to the analysis of illness and disease; decision making and medical problem solving. Prerequisite: 12 hours of psychology and a 4.0 grade point average; and senior, graduate, or professional standing; or consent of instructor. 3 hours or 1 unit.
301. **The Computer as a Laboratory Instrument.** The computer as a control device in bio-behavioral experiments; data acquisition using computer-controlled devices; and includes introduction to computer architecture and application language programming, study of recent experimental literature for which the computer was an indispensable tool, and practicum utilizing laboratory computers available at the Department of Psychology. Prerequisite: Computer Science 103 or equivalent; two 200-level psychology courses or consent of instructor. 4 hours or 1 unit.
306. **Statistical Methods, I.** Techniques in applied statistics used in psychological research, including simple linear regression, partial and multiple correlation, and nonparametric methods; thorough review of statistical estimation and significance tests; emphasizes applied statistics and statistical computing. Introduces experimental design; one-way ANOVA. Prerequisite: Twelve hours in psychology and Psychology 235, or equivalent. 4 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
307. **Statistical Methods, II.** Continuation of Psychology 306. Experimental design, including Latin Squares, factorials, and nested designs; expected Mean Squares, Analysis of Covariance; emphasizes the general linear model; introduces multivariate methods, such as factor analysis, scaling, classification, and clustering. Discrete multivariate analysis—multiway contingency tables. Prerequisite: Psychology 306. 4 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
311. **Laboratory in Physiological Psychology.** Research on classical and current problems; emphasis on the nervous and endocrine systems in information processing and in the regulation of behavioral adaptation; and examples from sensation, perception, motivation, emotion, and learning. Laboratory. Prerequisite: Psychology 211 and consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
313. **Drugs and Behavior.** Behavioral and physiological effects of chemicals either used therapeutically to treat psychological disorders or that may be abused for their psychotropic effects; emphasizes mechanisms and models for the study of drug action. Prerequisite: Psychology 210, Ecology, Ethology, and Evolution 353, or Biology 303; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
314. **Brain, Learning, and Memory.** Conveys a knowledge of current research on the physiological bases of learning and memory; considers a wide range of topics from molecular (e.g., cellular morphological and functional plasticity) to relatively molar (e.g., effects of clinical and experimental brain damage on learning and memory processes). Prerequisite: Psychology 210 or Biology 303; or Psychology 248 or 348; or consent of instructor. 3 hours or 1 unit.
315. **Human Neuropsychology.** Surveys how the neurological substrate of the human brain governs and influences cognition; biological bases of language, memory, spatial processing, and emotion; principles of brain organization, localization of function and individual differences;

includes developmental and clinical issues. Prerequisite: Psychology 210 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 318. Psychology of the Infant.** Early infant behavior, emphasizing critical evaluation of the various research techniques; prenatal and perinatal influences, ontogeny of psychological processes, environmental determinants, and infant assessment. Prerequisite: Psychology 216. 3 hours or 1 unit.
- 319. Day Care Practicum.** Same as Human Development and Family Ecology 319. Application of psychological theory in day care settings; supervised experiences focusing on the relation between aspects of child development and the planning and carrying out of effective day care programs. Typical sections offered include experience with infants, preschool, handicapped, hospitalized, and maltreated children. Prerequisite: Psychology 216 or Human Development and Family Ecology 105; Human Development and Family Ecology 202; acceptance into the Development Child Care Program; consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated.
- 320. Principles of Psychophysiology.** Theoretical and practical aspects of human psychophysiology; measurement techniques and the application of psychophysiological principles to problems in developmental, clinical, social, and experimental psychology. Prerequisite: Psychology 234 or 235, 6 hours of psychology, and an introductory course in physiology. 3 hours or 1 unit.
- 322. Introduction to Mental Retardation.** Same as Social Work 322 and Special Education 322. See Special Education 322.
- 323. Language Acquisition.** Same as Linguistics 323 and Communications 323. Survey of theory and research on the acquisition of language, concentrating on the acquisition of a first language by the young child. Prerequisite: 6 hours of psychology or linguistics above the 100-level, or consent of instructor. 3 hours or 1 unit.
- 324. Psychology of Thinking.** Survey of problems, experimental methods, and research findings in human thinking; emphasis on concept formation, problem solving and decision making, and creativity. Prerequisite: Psychology 235. 3 hours or 1 unit.
- 325. Psychology of Language.** Survey of theory and research in the psychology of language; topics include relation of linguistics and psychology, language development, and influence of language on perception, memory, and thought. Prerequisite: 6 hours of psychology or consent of instructor. 3 hours or 1 unit. Credit not given for both Psychology 325 and Linguistics 325.
- 326. Motivation and Emotion.** The nature and development of emotion, attitude, and motive, and the role of these processes in social adjustment. Prerequisite: 6 hours of psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 329. Human-Computer Interaction Laboratory.** Same as Industrial Engineering 329. Examines basic concepts, methodology, and critical skills needed in conducting research, evaluating and designing human-computer interfaces. Laboratory includes performing experiments in human-computer interaction. Prerequisite: Psychology 224, 258, or 356; and a course in computer science; or consent of instructor. 4 hours or 1 unit.
- 330. Current Topics in Experimental Psychology.** Discusses current research problems in experimental psychology; students perform a detailed research project on a current research problem in experimental psychology. Prerequisite: Psychology 231 and 235, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 331. Advanced Experimental Laboratory Methods.** A lecture-laboratory course concentrating on perception, cognition, learning, and performance; includes psychophysical procedures, workload assessment, reaction time measurement, skill acquisition, problem solving, computerized testing, statistical evaluation, and scientific writing. Prerequisite: Psychology 231 and 235, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 332. Research Methods in Social Psychology: Laboratory Methods.** Same as Sociology 332. Lecture and laboratory in the methods and techniques of social psychological research in laboratory settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235 or Sociology 185. 4 hours, or $\frac{1}{2}$ or 1 unit.
- 333. Research Methods in Social Psychology: Natural Settings.** Methods and techniques of social psychological research in natural settings. Students formulate and carry out research problems using procedures appropriate for research in natural settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235, or Sociology 185. 4 hours or 1 unit.

335. **Mathematical Formulations in Psychological Theory.** Illustration of mathematical formulations by studying quantitative treatments of various psychological processes; emphasis on learning theory, psychophysical laws, and other selected topics; and the development of simple mathematical tools as required. Prerequisite: Elementary statistics of probability, elementary calculus, and 6 hours of psychology, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
336. **Clinical Psychology.** Survey of methods in clinical psychology; description, demonstration, and critical review of procedures used by clinical psychologists in the analysis and modification of disordered behavior. Prerequisite: Psychology 238. 3 hours, or $\frac{1}{2}$ or 1 unit.
337. **Behavior Modification.** Introduction to the principles and application of behavior modification; includes methods of behavioral assessment, positive and negative reinforcement, punishment and extinction, token economics, programmed instruction, and desensitization; and emphasizes establishing behavioral objectives in the modification of child and adult clinical problems. Prerequisite: Psychology 248. 3 hours or 1 unit.
340. **Community Projects.** Principles of psychology applied to service problems in the community; students serve as nonprofessional mental health workers in supervised experiences in schools, hospitals, and other nontraditional settings. Prerequisite: Psychology 100 and 239; junior or senior standing; and consent of instructor. 4 hours or 1 unit.
341. **Advanced Community Projects.** Advanced discussion and practicum on principles of psychology which may supplement mental health and other human services in a community. Students serve as nonprofessional mental health workers in supervised experiences in school hospitals and other nontraditional settings. Prerequisite: Psychology 340 and consent of instructor. 4 hours or 1 unit.
342. **Behavior-Genetic Analysis.** Same as Anthropology 342 and Ecology, Ethology, and Evolution 350. Concepts, methods, and problems in the analysis of relations between genetic systems and animal behavior. Prerequisite: Anthropology 240 or Biology 106 or 210. 3 hours or $\frac{3}{4}$ unit.
343. **Hormones and Behavior.** Same as Ecology, Ethology, and Evolution 353. See Ecology, Ethology, and Evolution 353.
345. **Laboratory in Comparative Psychology.** Animal behavior with particular reference to the behavior of vertebrates. Prerequisite: 6 hours of psychology and an introductory course in biology, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
347. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Ecology, Ethology, and Evolution 352. Examination of the relations between genetic mechanisms, population structure, and individual differences in behavior; laboratory work on techniques of behavior study and genetic analysis. Prerequisite: Concurrent registration in Psychology 342. 2 hours or $\frac{1}{2}$ unit.
348. **Theories of Learning.** A critical analysis of selected theories of learning; consideration of problems of theory construction in the context of past controversies in learning as well as recent theories of animal and human learning. Prerequisite: Psychology 248 or Educational Psychology 211. 3 hours, or $\frac{1}{2}$ or 1 unit.
349. **Social Psychology of Sport.** Same as Kinesiology 347. See Kinesiology 347.
350. **Laboratory in Personality.** The study of personality emphasizing active participation in designing, conducting, analyzing, and presenting of research; lectures concern the practical aspects of research methodology and the philosophy of personality research; and laboratory involves conducting original research in small groups. Prerequisite: Psychology 235 or equivalent; and Psychology 250 or consent of instructor. 4 hours or 1 unit.
352. **Attitude Theory and Change.** Same as Communications 352 and Sociology 352. Comprehensive analysis of theories of attitude acquisition, organization, and change; emphasis on attitude change through communication and effects of persuasive communication on public opinion. Prerequisite: Psychology 201 or Sociology 201, or a comparable course of introduction to social psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
353. **Social Perception.** Analysis of theory and research on problems related to the manner in which persons judge themselves and others on the basis of information received; topics include impression formation integration, determinants of interpersonal attractions, and attribution processes. Prerequisite: Psychology 201 and 235, or graduate standing, or consent of instructor. 3 hours or 1 unit.

354. **Small Group Behavior.** The nature of interpersonal transactions; theories and methods for their investigation; and consideration of both individual and social determinants of such transactions. Prerequisite: Psychology 201. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **Industrial Social Psychology.** Same as Labor and Industrial Relations 355. Social psychological research and theory applied to industrial problems; emphasis on interaction and communication theory, role theory, leadership theory, motivational and perceptual theory, and group structure theory as an aid in understanding and analyzing industrial problems. Prerequisite: Psychology 201 or 357. 3 hours, or $\frac{1}{2}$ or 1 unit.
356. **Human Performance and Engineering Psychology.** Same as Industrial Engineering 346. Human capabilities and limitations in processing information; models and theories of signal detection, stimulus analysis, short-term memory, choice reaction time, decision-making, attention, and motor performance are evaluated with respect to experimental data; emphasizes theory, although implications for design of man-machine systems are considered. Prerequisite: Psychology 100, 103, or 105 or consent of instructor. 3 hours or 1 unit.
357. **Psychology of Industrial Relations.** Same as Labor and Industrial Relations 357. An analysis, in terms of the behavior of individuals, of the causes and possible solutions of industrial conflict. Offered in the special interest of industrial relations, commerce, and engineering students. Prerequisite: Psychology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
358. **Psychology and Law: Social and Cognitive Factors.** Surveys topics in psychology and law with particular emphasis on contributions from social and cognitive psychology; reviews research and theory on behavior in the courtroom and other legal settings. Prerequisite: 6 hours of psychology, including Psychology 201 or its equivalent; or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
359. **The Social Psychology of Organization.** Same as Sociology 359. Analysis of the interrelationships between social and psychological factors, and organizational structure and process; emphasis on sources, consequences, and modes of resolution of intraindividual, intraorganizational, and interorganizational conflict. Prerequisite: Psychology 201. 3 hours or 1 unit.
360. **Modern Viewpoints in Psychology.** Examines modern behaviorism, psychoanalysis, and cognitive psychology, viewed as conceptions of man, styles of theorizing and investigative strategies; critically evaluates the more influential theories and research. Prerequisite: 6 hours of psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
362. **Cognitive Development.** Survey of theory and research on the development of problem-solving skills, memorial and metamemorial processes, logical thinking, and language. Prerequisite: Psychology 216 and 235. 3 hours or 1 unit.
363. **Laboratory in Developmental Psychology.** Experience in designing, carrying out, and reporting an original research project. Prerequisite: Psychology 216 and 235, or equivalent. 4 hours or 1 unit.
365. **Personality and Social Development.** Same as Educational Psychology 315. Major theories of personality and social development, with attention to processes of social learning, individual differences in personality development, and outcomes of social development; applications to school, home, and other field settings. Prerequisite: Psychology 216 or Educational Psychology 236, or equivalent. 3 hours or 1 unit.
368. **Psychology and Law: Civil Liberties and Constitutional Issues in the Mental Health, Educational, and Criminal Justice Systems.** Examines relationship of the administrative, civil, and criminal justice systems to educational and mental health institutions; individual rights, social issues, and psychological well being. Prerequisite: 6 hours of social science. 3 hours, or $\frac{1}{2}$ to 1 unit.
371. **The Psychology of Voting Behavior.** An application of psychological methods and theories to the study of political behavior; attention to research methods and to content problems in voting behavior and national security policy. Prerequisite: 6 hours beyond 100-level courses in psychology, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
372. **Environmental Psychology.** Same as Environmental Studies 372. See Environmental Studies 372.
373. **Theory and Method in the Cross-Cultural Study of Individual Social Behavior.** Same as Anthropology 373. Centers on cross-cultural study of substantive areas such as personality, motivation, socialization, interpersonal behavior, psychological environments, cognition and

cognitive development, ethnocentrism and stereotypes, and visual perception; emphasis on methodological limitations and contributions of cross-cultural study; and discussion of current problems and research. Prerequisite: 6 hours of psychology or anthropology, or consent of instructor. 3 hours or 1 unit.

375. **Personnel Psychology.** Introduces problems and research relevant to personnel issues in organizations. Topics include: individual differences; selection of personnel; test theory; performance appraisal; equal employment opportunity legislation, regulation, and litigation; assessing bias in selection. Prerequisite: Psychology 235 or equivalent, and either Psychology 245 or Business Administration 351. 3 hours, or $\frac{3}{4}$ or 1 unit.
380. **Introduction to Mental Health Programs.** Historical foundations, schema for classification of mental health delivery systems, contemporary treatment strategies, ethical and legal issues, and alternatives to institutional treatment; includes field trips to a variety of treatment facilities. Prerequisite: Credit or concurrent registration in Psychology 336 and 337. 3 hours or 1 unit.
381. **Beginning Practicum in Mental Health.** Didactic instruction and supervised practicum experience in a community treatment agency; self-report, observational, and physiological approaches to client assessment; and lecture-discussion and direct agency experience each week. Prerequisite: Psychology 380. 4 hours or 1 unit.
382. **Issues in Mental Health Work, I.** Basic behavioral principles useful in formulating, carrying out, and evaluating a treatment plan; focuses on the training of nonprofessionals (e.g., parents) or staff members in treatment roles. Prerequisite: Psychology 381 and concurrent registration in Psychology 383. 2 hours or $\frac{1}{2}$ unit.
383. **Advanced Practicum in Mental Health, I.** Supervised practicum experiences in a community agency which correspond to didactic material presented in the companion course, Psychology 382. Prerequisite: Concurrent registration in Psychology 382. 4 hours or 1 unit.
384. **Issues in Mental Health Work, II.** Procedural alternatives to the operant approaches presented in Psychology 382 and 383; students are encouraged to focus their interests on a particular client population; and lecture-discussion with individualized reading programs. Prerequisite: Concurrent registration in Psychology 385. 2 hours or $\frac{1}{2}$ unit.
385. **Advanced Practicum in Mental Health, II.** Supervised practicum experiences in a community agency corresponding to didactic material presented in the companion course, Psychology 384; twelve-hour-per-week assignments reflect student interests in specific population. Prerequisite: Psychology 382 and 383, and concurrent registration in Psychology 384. 4 hours or 1 unit.
390. **Laboratory in Psychological Measurement and Test Development.** The measurement of human behavior in psychological studies; the construction and use of psychological tests; introduction to tests of intelligence, achievement, personality, and interest; and practice in test construction, administration, and validation. Lectures and laboratory. Prerequisite: A knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1 unit.
396. **Seminar in Psychology.** Special topics in the field of psychology. Prerequisite: Junior standing and consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 12 hours or 3 units.

Note: The prerequisites stated below apply to graduate majors in psychology. Graduate students minoring in psychology may, by special permission of instructors, enroll in certain of these courses without having met all the prerequisites.

402. **Systematic Psychology.** Analysis of methodological problems, including forms and roles of models and theories, status of unobservable organismic events, validation of measures and manipulations, possible forms of laws, forms of data language, and status of private reports; evaluation of the approaches to these problems provided by several varieties of behaviorism, standard and omnitheoretic views in the philosophy of science, and network methods. Prerequisite: 12 hours of psychology. 1 unit.
405. **Neurochemistry.** Same as Physiology 405. The fundamentals of neurochemistry and topics of current interest; detailed study of chemical transmission, including metabolism, neuroanatomical distribution, pharmacology, and functions of neurotransmitters. Lecture-seminar. Prerequisite: Biochemistry 350, Psychology 210 or 407, or consent of instructor. $\frac{3}{4}$ unit.

406. **Psychological Scaling: Unidimensional Methods.** Same as Sociology 406. Measurement of psychological values; centrally concerned with how subjective values of multiple physical dimensions combine to produce unidimensional subjective values; and includes conjoint and functional measurement theory and methods, theoretical models of judgment and the analysis of empirical structures, and applications of scaling models to problems in social, personality, perception, and cognitive psychology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. 1 unit.
408. **Design of Experiments in Psychology.** Advanced experimental designs in psychological research; special methods of data analysis. Prerequisite: Psychology 307. 1 unit.
409. **Psychological Scaling: Multidimensional Methods.** Same as Sociology 409. Basic scaling theory; metric, non-metric, and individual differences multidimensional scaling models and methodology, emphasizing underlying assumptions and interpretation; and applications of scaling methods to measurement problems in social and personality psychology, perception, cognition, and sociology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. Psychology 406 is recommended but not required. 1 unit.
410. **Advances in Psychobiology: Introduction for Graduate Students.** Deals with the relevance of biological psychology to the subdisciplines of psychology; topics include current theory and treatment of psychosis, neuropsychology of movement disorders, human memory models and the brain, hormones and sexuality, biorhythms in normal and abnormal behavior, physiology of sensing and perceiving, selective attention, and others. Prerequisite: Psychology 210 or consent of instructor. $\frac{1}{2}$ to 1 unit. Consent of instructor is required for more than $\frac{1}{2}$ unit (e.g., $\frac{3}{4}$ or 1 unit).
411. **Advanced Physiological Psychology.** Detailed examination of the physiological mechanisms in behavior; emphasis on research methodology and contemporary literature in the physiology of motivation, learning, perception, and emotion; and includes laboratory demonstrations and problems. Prerequisite: 12 hours of psychology, including Psychology 311 or equivalent. $\frac{1}{2}$ or 1 unit.
414. **Neurotoxicology.** Same as Environmental Studies 414 and Veterinary Biosciences 414. See Veterinary Biosciences 414.
415. **Experimental Sensory Psychology.** A systematic study of sensory processes, including vision, audition, gustation, olfaction, and somesthesia; emphasis on experimental methods, research findings, and theory. Prerequisite: 12 hours of psychology, including a laboratory course in experimental psychology. 1 unit.
416. **Perception.** Systematic study of methods and research findings in the field of human perception, together with an evaluation of theoretical interpretations. Prerequisite: 12 hours of psychology. 1 unit.
417. **Experimental Psychology of Learning, I: Basic Processes.** Study of experimental investigation of basic learning processes; emphasis on the nature of the problems, experimental procedures, and theoretical significance. Prerequisite: 12 hours of psychology. 1 unit.
418. **Experimental Psychology of Learning, II: Human Learning.** Data and theories of verbal learning; verbal mediators and their functions in learning and retention; transfer of training; short-term and long-term memory; and conceptualizations of the forgetting process. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
422. **Models of Human Memory.** Detailed examination and comparison of human memory models. Emphasis on understanding the central aspects of 5-8 recent models and their similarities and differences. Prerequisite: Psychology 224, 324, and 418, or consent of instructor. 1 unit.
423. **Problem Solving and Cognitive Skill Acquisition.** Selected topics in how people solve problems and learn cognitive skills. A broad range of empirical findings will be discussed, along with psychological and computational accounts. Prerequisite: Psychology 324 or consent of instructor. 1 unit.
424. **Developmental Psycholinguistics.** Same as Communications and Linguistics 424. Examination of empirical and theoretical literature on the acquisition of language; emphasis on universal patterns in the acquisition of a first language and on a consideration of explanations, both psychological and linguistic, for these patterns. Prerequisite: Linguistics 325, Psychology 325 or 362, or consent of instructor. 1 unit.
425. **Psycholinguistics.** Same as Communications 425 and Linguistics 425. A critical survey of methods and theories in the psychological study of the communication process; emphasis

- on linguistic, information-theory, and learning-theory approaches; psycholinguistic analysis of language decoding and encoding; and the development and measurement of symbolic processes including meaning. Prerequisite: Consent of instructor. 1 unit.
426. Psychology of Reading. Same as Educational Psychology 416. See Educational Psychology 416.
427. Engineering Psychology. Experimental psychology applied to the study of man-machine systems; considers research issues, methodological matters, and principles of design and training in terms of contemporary aircraft, highway, industrial, and health-care systems. Prerequisite: Psychology 256 or 356, or consent of instructor. 1 unit.
428. Cognitive Determinants of Behavior. Theoretical and experimental analyses of the role of decision processes and causal attributions in the control of behavior; examines a variety of subparadigms from several areas of psychology. Prerequisite: 12 hours of psychology. 1 unit.
429. Second Language Acquisition and Bilingualism. Same as Linguistics 429. See Linguistics 429.
430. Foundations of Industrial-Organizational Psychology. Same as Labor and Industrial Relations 430. Theoretical and empirical foundations of various content areas in industrial-organizational psychology; sample topics include employee selection and placement, training, human factors engineering, work motivation, employee attitudes, leadership, and organizational theory. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
431. Psychological Measurement in Industry. Application of psychometric methods and the finding of differential psychology to the selection, classification, and performance evaluation of industrial personnel. Prerequisite: Psychology 307 or equivalent. 1 unit.
432. Introduction to Clinical Psychology Practicum. Supervised practice in mental health delivery services; includes assessment and modification of problem behaviors in short-term treatment programs and beginning experience in school and community consultation; and emphasizes the development of skills in interviewing, conceptualization of problem behaviors, report writing, and effective staff interactions. Prerequisite: First-year graduate standing in clinical psychology and credit or concurrent registration in Psychology 438. 1 unit.
433. Internship in Industrial Organization Psychology. Supervised practice in organizational practice and research, implementation of programs, evaluation, feedback of survey results, applied assessments, assistance in EAP programs, and development of personnel guidelines; emphasizes applications of principles and procedures. Offered in special interest of graduate students in I/O psychology program. Prerequisite: Graduate standing in Psychology, credit or concurrent registration in Psychology 430, and consent of instructor. 1 unit.
434. Models of Decision and Choice. Same as Accountancy 495. Survey of mathematical and other formal models of human judgment and decision processes. Emphasizes differences between normative and descriptive models. Prerequisite: Psychology 307. 1 unit.
435. Motivation and Morale in Industry. Same as Labor and Industrial Relations 435. Concepts and methods in the study of motivation of employees; determinants of employee attitudes and job satisfaction; and modification of attitudes and morale. Prerequisite: 4 units of graduate credit in psychology or consent of instructor. 1 unit.
436. Mathematical Models in Psychology. Recent developments in mathematical models in psychology; special emphasis on human learning, higher processes, and modern psychophysics. Prerequisite: One year of calculus and Psychology 306 and 307, or consent of instructor. ½ or 1 unit.
438. Introduction to Clinical Psychology, I. Introduction to clinical psychology as a science and profession. Considers psychodynamic, behavioral, and community perspectives; emphasizes the conceptual foundations of each approach. Required of all entering graduate students in clinical psychology. Prerequisite: Consent of instructor required for all students not admitted to graduate program in clinical psychology. 1 unit.
439. Introduction to Clinical Psychology, II. Considers critical issues in the assessment and study of psychological and social dysfunction, as manifested in adult psychopathology, childhood disorders, and community problems. Required of all entering graduate students in clinical psychology. Prerequisite: Credit or concurrent registration in Psychology 438; consent of instructor required for students not admitted to graduate program in clinical psychology. 1 unit.
440. Social Development. Same as Educational Psychology 440. See Educational Psychology 440.
441. Personality and Behavior Dynamics. Theory and research in personality, emphasizing personality as individual differences among persons and personality as attributed to persons

by others; explores the measurement, antecedents, and consequences of such differences and attributions. Prerequisite: 12 hours of psychology. $\frac{1}{2}$ or 1 unit.

443. **Clinical Assessment.** Instruction and practice in the administration and interpretation of individual tests of general intelligence, special abilities, and achievement. Prerequisite: 12 hours of psychology, including Psychology 390 or equivalent; Psychology 432 and 439. 1 unit.
445. **Strategies of Clinical Intervention.** A critical survey of issues, principles, practice, and research related to modifying human behavior; covers psychotherapeutic and somatic approaches; symptomatic relief and personality-restructuring; goal-orientations; and individual family, group, milieu, and preventive community intervention. Prerequisite: Concurrent registration in Psychology 447 strongly recommended. 1 unit.
446. **Laboratories in Clinical Psychology.** Intensive practice in techniques of clinical assessment and behavior modification with emphasis on recent innovations; small sections of the course formed according to the specialized interests of students and staff. Prerequisite: Psychology 432 and 445, or consent of instructor. $\frac{1}{2}$ to 1 unit.
447. **Internship.** Supervised field experience in clinical psychology. Prerequisite: Consent of instructor. 0 to 4 units.
450. **Community Psychology and Social System Change.** Intensive examination of the historical antecedents, conceptual models, strategic tactics, and evaluation methods of planned social and ecological change; focuses on the role of the community psychologist in such endeavors; and reviews interventions in several social systems, such as criminal justice education, employment, and mental health. Prerequisite: Psychology 239 or equivalent; graduate standing in psychology or consent of instructor. $\frac{1}{2}$ or 1 unit.
451. **Theory and Method in Social Psychology, I.** First of two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
452. **Theory and Method in Social Psychology, II.** Second of a two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Each student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
453. **Organizational Sciences, I.** Same as Business Administration 410. Political Science 460, and Sociology 456. See Business Administration 410.
454. **Psychology and the Legal Process.** Analyzes selected topics in the application of psychological methods and theory to legal issues and problems. Prerequisite: Graduate standing or consent of instructor. 1 unit.
456. **Attitude Measurement and Behavioral Prediction.** Same as Communications 456. Comprehensive examination of the theory and method of attitude measurement and its implications for behavioral prediction; emphasis on the attitude concept and the validity of behavioral criteria. Prerequisite: Consent of instructor. 1 unit.
457. **Theory and Research in Organizational Psychology.** Theory and research on the psychological processes involving the demands of organizations on the behavior of individuals; emphasis on the processes of power, authority, influence, leadership, communications, decision making, and organizational change. Prerequisite: Psychology 455 or consent of instructor. 1 unit.
458. **Advanced Problems in Attitude Research.** Intensive analyses of recent developments in attitude theory and research; emphasis on the attitude-behavior relationship; and examination of theories of attitude and attitude change with respect to their utility in predicting and changing social behavior. Prerequisite: Consent of instructor. 1 unit.
459. **Advanced Problems in Research on Groups.** Intensive examination of current research and theory on structure, process, and performance of groups; critical examination of recent research and theoretical literature; and development of research designs for related issues in the field. Prerequisite: Consent of instructor. 1 unit.

460. **Motivation and Personality Development in Children.** Theory, method, and research on the interaction of motivational, personality, and learning processes and development in children; emphasis on experimental studies and a social learning theory approach. Class projects involve some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
462. **Human Abilities.** Analysis of individual differences in human abilities, including historical background, measurement methodology, and functional correlates of abilities; consideration of the use of ability measures in both experimental and applied research. Prerequisite: Psychology 307 or equivalent. 1 unit.
463. **Research Methods in Clinical Psychology and Personality.** The logical analysis of clinical inferences and their role in research; problems and methods in the investigation of the development, dynamics, and structure of personality; and research in psychotherapy. Prerequisite: Psychology 306. 1 unit.
464. **Advanced Problems in the Study of Individual Social Behavior.** An intensive examination of current research into one or more of the following areas: social perception and cognition, social motivation, social learning, and environmental factors in social behavior; critical examination of recent research and theoretical literature, and development of research designs for selected current issues. Prerequisite: Consent of instructor. 1 unit.
467. **Personality Assessment.** Methods and theory in the quantitative assessment of personality; review of research findings and trends. Prerequisite: Psychology 307 or equivalent. 1 unit.
468. **Contemporary Behavior Theory.** Analysis of contemporary issues in animal and human learning; specific topics vary. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 1 unit.
469. **Cognitive Development.** Examination of laboratory investigations of cognitive development in children; emphasis on current theories of cognition and language; and class projects involving some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
470. **Principles and Methods of Teaching Psychology.** Designed for graduate students in psychology; areas considered include developing course objectives and content; developing and presenting teaching-learning situations; evaluating the attainment of course objectives; advising and counseling students; ethics in teaching; and research problems on the teaching of psychology. Prerequisite: Second-year graduate standing in psychology or consent of instructor. 0 to 1 unit.
472. **The Methodology of Eye Movements in the Study of Cognition.** Same as Educational Psychology 470. See Educational Psychology 470.
483. **Psychology of Speech and Hearing Disorders, I.** Same as Speech and Hearing Science 483. See Speech and Hearing Science 483.
484. **Psychology of Speech and Hearing Disorders, II.** Same as Speech and Hearing Science 484. See Speech and Hearing Science 484.
485. **The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Sociology 485. See Business Administration 435.
486. **Multivariate Correlational Techniques in Educational Research.** Same as Educational Psychology 485. See Educational Psychology 485.
488. **Covariance Structure and Factor Models.** Same as Educational Psychology, Sociology, and Statistics 488. Introduction to covariance structure models, linear structural equations, and factor analysis; identification and parameter estimation problems; assessing goodness-of-fit; use of computer packages LISTREL and EQS; applications to a wide variety of social and behavioral science modeling problems. Prerequisite: Psychology 494, Statistics 471, or Sociology 387. 1 unit.
489. **Doctor of Psychology Report.** Limited to students pursuing the Psy.D. degree. Prerequisite: Credit or concurrent registration in Psychology 447. 0 to 4 units (summer session, 0 to 2 units). May be repeated.
490. **Individual Research.** For graduate students who wish to conduct research on special problems not included in graduate theses. Prerequisite: Consent of instructor. 0 to 4 units.
492. **Psychology of Learning and Instruction.** Same as Educational Psychology 492. See Educational Psychology 492.

493. **Seminar.** Discussion of current topics in their historical setting, with special emphasis on research problems. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 0 to 1 unit.
494. **Multivariate Analysis in Psychology and Education.** Same as Educational Psychology 494 and Sociology 494. Examines the principal methods of descriptive and inferential statistics used in the analysis of multiple measurements, emphasizing linear transformations, multiple regression, principal components, multivariate analysis of variance, canonical correlation and variates, discriminant functions and variates, and conventional procedures of factor analysis; involves both theory and applications. Prerequisite: Psychology 307 or Educational Psychology 496; consent of instructor. 1 unit.
495. **Theories of Measurement.** Same as Educational Psychology 495. See Educational Psychology 495.
499. **Thesis Research.** 0 to 4 units.

RADIO AND TELEVISION

Acting Head of Department: J. W. Carey

Department Office: 119 Gregory Hall, 810 South Wright, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
291. **Special Problems.** Special projects, research, and independent reading in radio and television for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of department. 2 or 3 hours.
368. **Legal and Policy Issues in Telecommunications.** Same as Communications 368. See Communications 368.
450. **Special Problems in Television.** Project work for advanced students in specific areas of television, including news, advertising, directing, writing, etc. Prerequisite: A television course in the area of specialization; consent of department. $\frac{1}{2}$ to 3 units. A maximum of 3 units permitted toward degree.
462. **Seminar in Radio and Television.** Same as Communications 462. Studies the performance of radio and television in terms of content, government and industry controls, social responsibility, economic bases, and psychological and social effects. Prerequisite: Consent of department. 1 unit.
463. **World Broadcasting.** Same as Communications 463. Studies the broadcast systems used by the nations of the world; alternative and mixed systems; international organizations, agreements, exchanges, and problems; broadcasts to and from other countries; implications of such new developments as satellites; and mass and nonmass uses. Prerequisite: Consent of department. 1 unit.
490. **Special Topics in Radio and Television.** Prerequisite: Consent of department. $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Prerequisite: Graduate standing in radio and television. 1 or 2 units.

DIVISION OF REHABILITATION EDUCATION

Director of Division: R. W. Armstrong

Division Office: 105 Rehabilitation Education Center, 1207 South Oak, Champaign

151. **Prescribed Exercise.** Prescribed exercises adapted to individual needs, capacities, and interests; open to paraplegic, permanently disabled, and individuals with significant temporary disabilities who will require long term rehabilitation. 1 hour.
199. **Undergraduate Open Seminar.** 1 to 4 hours. May be repeated.

206. **Working With the Disabled, I.** Same as Biology 206. Designed primarily for a select group of students who serve as live-in student-staff aides to the severely physically disabled students living in the Beckwith Living Center. Supervised experience in identifying the individual needs of the disabled, recognizing the variance of disabilities, and administering the activities of daily living. Prerequisite: Biology 110 or Physiology 103, or consent of instructor. 3 hours.
207. **Working With the Disabled, II.** Same as Biology 207. Designed primarily for a select group of students who serve as live-in student-staff aides to the severely physically disabled students living in the Beckwith Living Center. Experience in identifying the individual needs of the disabled, recognizing the variance of disabilities, and administering the activities of daily living; a continuation of the laboratory experience in Rehabilitation 206, augmented by a paper. Prerequisite: Rehabilitation 206 or consent of instructor. 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Leisure Studies, and Psychology 214. See Human Development and Family Studies 214.
241. **Beginning Manual Communication.** Introduction to study of hearing impairment; beginning theory and practice of American Sign Language and Signed English from a rehabilitation perspective. Prerequisite: Junior standing or consent of instructor. 4 hours.
301. **Introduction to Rehabilitation.** Orientation to general field of rehabilitation; includes foundations, resources, assessment, counseling, and placement. 4 hours, or 1 unit.
302. **Medical Aspects of Disability.** Examination of the scope of medical disabilities, their implications, complications, and management. Prerequisite: Biology 111 and Anatomical Sciences 234; or consent of instructor. 4 hours, or 1 unit.
340. **Introduction to Sensory Impairments.** Introduces sensory impairments (i.e., vision and hearing) from a rehabilitation perspective. Prerequisite: Biology 111 or equivalent; Psychology 100 or equivalent; Rehabilitation Education 301. 4 hours, or 1 unit.
342. **Advanced Manual Communication.** The study of functional and philosophical issues relative to hearing impairment and deafness; advanced theory related to manual communication and its applications in rehabilitation settings, as well as experience signing and reading sign. Prerequisite: Rehabilitation Education 241, or consent of instructor. 4 hours, or 1 unit.
344. **Introduction to Adaptive Technologies for the Disabled.** Introduction and orientation to available adaptive technologies, their applications to various disability groups, and current research and field testing. Prerequisite: Rehabilitation Education 301; Rehabilitation Education 302, or consent of instructor. 4 hours, or 1 unit.
351. **Rehabilitation Biomechanics.** Study of the biological and mechanical principles of human motor performance, pathological changes, and how they relate to the field of rehabilitation. Prerequisite: Physiology 103, Anatomical Sciences 234, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
361. **Sport Programming for the Physically Disabled.** Same as Leisure Studies 361. Examines the historical, organizational, and philosophical aspects of sports programming for the physically disabled; includes coverage of principles of activity adaptation, mainstreaming, technological advancement, physiological and social psychological implications of sport participation for the physically disabled, and present research needs. Prerequisite: Rehabilitation Education 301. 3 hours or 1 unit.
381. **Rehabilitation Practicum.** Practical experience in the major areas of rehabilitation; discussion/laboratory sections cover the areas of physical therapy, occupational therapy, sensory impairment, recreational therapy, activities of daily living, counseling, and medical services. Prerequisite: Rehabilitation 301 and consent of instructor. 1 unit.
401. **Research Methods in Rehabilitation.** Examines methods and techniques of conducting and evaluating rehabilitation research; experimental and survey designs and procedures; data collection and current directions of rehabilitation research. Prerequisite: Rehabilitation 301, Educational Psychology 390, and consent of instructor. 1 unit.
420. **Social Psychology of the Handicapped.** Same as Special Education 420. Study of the social and emotional adjustment of individuals with disabilities; evaluation of effects imposed by societal attitudes; analysis of the implications for rehabilitation professionals in dealing with individuals who have a disability; review of relevant research. Prerequisite: Rehabilitation Education 301 and 302, and consent of instructor. 1 unit.

421. **Rehabilitation Administration.** Overview of rehabilitation management in the public and private sectors; emphasis on rehabilitation service delivery and the interface of rehabilitation administration, supervision, and service delivery to all disabled clients; coverage of construct areas such as the Federal Rehabilitation Services Administration, state Department of Rehabilitation Services, and private sector facilities; emphasis on the organizational role and administrative practices, management, supervision, and other relevant areas of leadership development and modeling. Prerequisite: Rehabilitation 301, 401, Special Education 410, or consent of instructor. 1 unit.
437. **Introduction to Neuropsychological Testing for Rehabilitation Counselors.** Use by rehabilitation counselors of the Halstead-Reitan Neuropsychological Test Battery and other related tests; particular emphasis on understanding test reports and useful applications for neuropsychological testing in terms of rehabilitation clients. Prerequisite: Rehabilitation 301; consent of instructor. 1 unit.
483. **Supervised Practice in Rehabilitation Counseling.** Development of individual counseling skills in a rehabilitation setting; emphasis on vocational evaluation and placement skills as developed in case management and planning experiences as well as adjustment to disability, vocational choice, and job placement techniques. Prerequisite: Rehabilitation 301, 420, 437, and consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
491. **Seminar in Rehabilitation.** Discussions, reviews, and appraisals as special topics in the field of rehabilitation. Prerequisite: Consent of instructor. 0 to $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
493. **Special Problems in Rehabilitation.** Independent research on special projects. Open only to majors. Prerequisite: Rehabilitation Education 301; consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
494. **Special Topics.** Lecture course on topics of current interest; specific subject matter announced in *Timetable*. Prerequisite: Will be determined for each topic and will be indicated in *Timetable*; Rehabilitation 301; consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** Preparation of thesis in rehabilitation. Prerequisite: Satisfactory standing in the master's program. 0 to 2 units. May be repeated to a maximum of 2 units.

RELIGIOUS STUDIES

Director of Program: G. G. Porton

Office: 3014 Foreign Languages Building, 707 South Mathews, Urbana

101. **The Bible as Literature.** Same as English 114. Themes and literary genres in the Bible, emphasizing content important in Western culture. 3 hours.
102. **Religion and Science.** Same as History 147 and Sociology 102. A study of changes brought about by the rise of modern science; focuses on historical conflicts (e.g., Copernicus and Darwin) and theological reflection regarding the significance of natural and social sciences for religious belief and practice. 3 hours.
103. **The Qur'an in Translation.** Study in English of the Qur'an, the holy Word of God for the world's Muslims; focus on its importance, literary style, major themes, and methods of interpretation. No knowledge of Arabic or Islam is necessary. 3 hours.
104. **Asian Mythology.** Same as Asian Studies 104. An introductory survey of the mythologies of India, China, and Japan. 3 hours.
106. **Archaeology and the Bible.** Examination of archaeological evidence, especially from Syria-Palestine, and discussion of its use in the interpretation of Biblical literature. 3 hours.
110. **World Religions.** Same as Philosophy 110. See Philosophy 110.
111. **Elementary Greek, I.** Same as Greek 101. See Greek 101.
112. **Elementary Greek, II.** Same as Greek 102. See Greek 102.

120. **A History of Judaism.** Examines the social, political, economic, and intellectual history of the Jews from Abraham to the present-day, with particular attention to Jewish thought and society. 3 hours.
121. **Christianity: An Introduction.** Typological and historical approaches to major forms of Christianity: Eastern Orthodoxy, Catholicism, and Protestantism. 3 hours.
122. **History of East Asian Religions.** Same as Asian Studies 122. Introduction to East Asian religious traditions from classical to modern times; emphasizes the ideas of Confucianism, Taoism, Shinto, and Buddhism in China and Japan and their historical interactions. 3 hours.
123. **Islam: An Introduction.** History of Islamic thought from the time of Muhammad to the present, including the prophethood of Muhammad, the Qur'an, theology and law, mysticism and philosophy, sectarian movements, modernism and legal reform, and contemporary resurgence. 3 hours.
125. **War, Religion, and Society.** Examines the implications of religious and secular moral theories for our views of war, including nuclear war, and nuclear deterrence; gives attention to the religious and secular underpinnings of just war theory and pacifism, to nuclear strategy, and weaponry, to the positions of contemporary religious and secular groups on the morality of current policies and to conflicts over scarce resources. Serves as an introduction to religious ethics. 3 hours.
130. **Jewish Practices: A Religio-historical Approach.** The major festivals and life-cycle rituals of Judaism; focuses on sacred time, interaction of external and internal factors producing change and conservatism, relationship of ritual and theology, and the thematic development inherent in the rituals. 3 hours.
132. **Zen.** Same as Asian Studies 132. Introduces the history, teachings, and practice of Zen Buddhism in China and Japan. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Classical and Koine Greek Prose.** Same as Greek 201. See Greek 201.
201. **Hebrew Bible in English.** Analyzes the critical issues in the interpretation of the literature of the Hebrew Bible/Old Testament; surveys the history and religion of Ancient Israel with special reference to Israel's setting in the ancient Near East. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
202. **New Testament in English.** Analyzes the literature of the New Testament in its social and religious setting, with special reference to the ministry and teaching of Jesus, the emergence of the church as a sect within ancient Judaism, and the development of Christian institutions in the Graeco-Roman world. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
204. **The Gospels.** Same as Greek 204. See Greek 204.
205. **Introduction to Classical Hebrew, I.** Same as Hebrew 205. See Hebrew 205.
206. **Introduction to Classical Hebrew, II.** Same as Hebrew 206. See Hebrew 206.
210. **Biblical Prose.** Same as Hebrew 210. See Hebrew 210.
221. **American Judaism.** Forms of Judaism in America: Reform, Conservative, Reconstructionist, Orthodox, and Hasidic Judaism; the American rabbi; Zionism in American Jewish communal life; national Jewish organizations; the American synagogue; and the secular Jew. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as History 224. See History 224.
225. **Gods and Man in Modern Japanese Drama.** Same as Asian Studies and Comparative Literature 225. See Asian Studies 225.
228. **Social Theories of Religion.** Same as Sociology 228. See Sociology 228.
229. **Sociology of Religion.** Same as Sociology 229. See Sociology 229.
230. **Philosophy of Religion: Introduction.** Same as Philosophy 230. See Philosophy 230.
232. **Ancient Greek Sanctuaries.** Same as History of Art 218 and Classical Civilization 232. See Classical Civilization 232.
237. **Ancient Greek Religion.** Same as Classical Civilization 237. See Classical Civilization 237.
242. **The Holocaust: Religious Responses.** The theoretical foundation for ideas of national and racial superiority which attended the holocaust and responses to this phenomenon by major

- Jewish and Christian thinkers, including Rubenstein, Buber, Fackenheim, Berkowits, Reuther, and Wiesel. 3 hours.
251. **Germanic Mythology.** Same as Scandinavian 251. See Scandinavian 251.
260. **Mystics and Saints in Islam.** Examines mystical concepts and practices in Islam through the ages, through the lives and writings of important mystics and Sufi holy men and women, as well as the integration of mysticism and the Sufi Orders into Muslim society and Islamic orthodoxy. No knowledge of Islam or foreign language is required. 3 hours.
268. **Religious Rebellions and Messianic Movements in History.** Same as History 268. See History 268.
283. **Jewish Sacred Literature.** Same as Comparative Literature and English 283. Literary study of the major post-biblical sacred texts of Judaism; includes readings in translation from Mishnah, Tosefta, Talmudim, midrashim, piyyutim, and mystical treatises. Emphasizes nature, history, function, and development of literary patterns and forms and the relationships between form and content in these texts. 3 hours.
284. **Jewish Experience in Literature.** Same as Comparative Literature and English 284. See English 284.
286. **Introduction to Hinduism.** Elements of Hindu thought and practice; selected topics presented in historical order and in the context of Indian cultural history (including the present). 3 hours.
287. **Introduction to Buddhism.** Same as Asian Studies 287. A thematic approach to the history of Buddhism from its origin in India to its spread throughout China and Japan; explores how the doctrinal and social development of Buddhism in East Asia is related to the process of cultural adaptation. 3 hours.
288. **Religion in Asian Society.** Same as Asian Studies 288 and Sociology 288. See Asian Studies 288.
289. **Comparative Muslim Societies.** Same as Anthropology 289 and History 289. Examination and comparison of the commonalities that unite over 800 million Muslims with special attention on the Qur'an, judgement, hajj, hijra, education, contemporary communications, and the experience of Muslim minorities in non-Muslim societies. 3 hours.
290. **Independent Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of staff member supervising the work. 2 to 6 hours. May be repeated.
293. **Honors Senior Thesis.** Two-semester research project. Prerequisite: Senior majors in religious studies who are eligible for graduating with distinction from the program. 3 hours. Must be taken for two semesters for a total of 6 hours. (Counts for advanced hours in LAS.)
294. **Topics in Religious Thought.** Topics in contemporary theological problems. 3 hours.
295. **Topics in Asian Religions.** Same as Asian Studies 295. Topics in Hinduism, Buddhism, Taoism, and other Asian religious traditions. Prerequisite: Sophomore standing or consent of instructor. 3 hours. May be repeated as topic varies to a maximum of 6 hours.
296. **Special Topics in the History of Judaism.** 3 hours. May be repeated for a maximum of 6 hours.
298. **Special Topics in Biblical Interpretation.** Detailed interpretation of selected books of the Bible. 3 hours.
301. **Introductory Coptic, I.** Same as Coptic 301 and Linguistics 314. See Coptic 301.
302. **Introductory Coptic, II.** Same as Coptic 302 and Linguistics 315. See Coptic 302.
304. **Medieval Civilization.** Same as History 304. See History 304.
305. **The Age of the Renaissance.** Same as History 305. See History 305.
306. **The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as History 306. See History 306.
307. **Islam and the Near and Middle East from Mohammed to 1258.** Same as History 307. See History 307.
308. **Islam and Society in the Modern Middle East and North Africa.** Same as Political Science 339. Examines the role of Islam in contemporary politics, the contemporary resurgence of Islam, and the articulation of Islamic approaches to the new economic order, nationalism, and the changing role of women. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Hebrew Poetry.** Same as Hebrew 311. See Hebrew 311.
312. **Readings in Sanskrit, I.** Same as Sanskrit 303. See Sanskrit 303.
313. **Readings in Sanskrit, II.** Same as Sanskrit 304. See Sanskrit 304.
328. **Sociology of Asian Religions.** Same as Asian Studies and Sociology 328. See Sociology 328.

329. **Language of Religion.** Same as Linguistics and Speech Communication 329. Introduction to the study of the language of religion; topics include: theoretical and empirical issues related to the field, methodology for the study of language of religion, analysis of religious texts, critical evaluation of the philosophical, theological, and linguistic perspectives on the nature and function of the language of religion, and analysis of diverse forms and styles of the language of religion. 3 hours or 1 unit.
340. **The Formation of Christian Thought.** Study of major developments in early Christian thought (first four centuries) through discussion of primary texts in translation. Prerequisite: Religious Studies 201 and 202, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Martin Luther.** Same as German 341. See German 341.
342. **History of Early Judaism.** The history of Judaism from Ezra to the rise of Islam: Hellenism and Judaism, varieties of Judaism, Palestinian Judaism and its documents, Babylonian Judaism, the rabbis, and popular Jewish culture. Prerequisite: Credit in one course in religious studies at the 200- or 300-level, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
343. **Ancient Near Eastern Cultures.** Examines the literature and religious practice of the great civilizations of the Near East, particularly the Sumerian, Assyro-Babylonian, Egyptian, Canaanite and Hittite cultures. Prerequisite: Religious Studies 201 or equivalent. 3 hours or $\frac{3}{4}$ unit.
362. **Philosophy of Religion.** Same as Philosophy 324. See Philosophy 324.
363. **Religion in Anthropological Perspective.** Same as Anthropology 363. See Anthropology 363.
381. **American Intellectual and Cultural History to 1865.** Same as History 371. See History 371.
382. **American Intellectual and Cultural History since 1859.** Same as History 372. See History 372.
384. **Buddhist Meditation.** Same as Asian Studies 380. Examines classical systems of Buddhist meditation and their relation to Buddhist psychology and world view. Prerequisite: Religious Studies 287, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
388. **History and Thought of Chinese Buddhism.** Survey of the history of Chinese Buddhism since its introduction; analysis of Buddhological trends and styles; and the sociocultural milieu of Chinese Buddhism and its place in the total history of ideas and lifestyles. Prerequisite: Religious Studies 287 and 288, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
400. **Contemporary Study of Religion, I.** Investigates seminal books and articles in the study of religion from a variety of disciplinary perspectives. 1 unit.
401. **Contemporary Study of Religion, II.** Investigates seminal books and articles in the study of religion from a variety of disciplinary perspectives. 1 unit.
430. **Proseminar: Religious Studies.** Systematic investigation of issues, resources, and modes of inquiry in the major areas of the study of Bible, Asian religions, or religious thought; topics vary according to the needs of the graduate students. Prerequisite: Consent of instructor. $\frac{3}{4}$ unit. May be repeated as topics vary.
440. **Seminar in Religious Studies.** Research in special problems in the study of Bible, Asian religions, or religious thought; topics vary according to the needs of the graduate students. Prerequisite: Consent of instructor. 1 unit. May be repeated as topics vary.
480. **Readings in Religious Literature.** Readings in primary texts in original languages which are relevant to Biblical studies, Asian religions, or religious thought. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
490. **Independent Study.** Special topics not treated in regularly scheduled courses; for graduates. Prerequisite: Evidence of adequate preparation for such study and consent of staff member supervising the work. $\frac{1}{2}$ to 1 $\frac{1}{2}$ units. May be repeated.

RHETORIC AND COMPOSITION

(See English)

RURAL SOCIOLOGY

(See Agricultural Economics)

SCIENCE, TECHNOLOGY, AND SOCIETY

Director of Program: Daniel Alpert

Department Office: 912½ West Illinois, Room 201, Urbana

- 150. **The Construction of Science.** Same as Sociology 150. See Sociology 150.
- 180. **Nuclear Weapons, Nuclear War, and Arms Control.** Same as Physics 180. See Physics 180.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. **Technology and Human Values.** Same as Philosophy 275. Interaction of technologies and human values, goals, and beliefs; social and individual decision making and responsibilities concerning the applications of technologies; evaluation and constructive criticism of particular technologies and the assessment of benefits and harms. Prerequisite: Rhetoric 105 or equivalent. 3 hours.
- 202. **Management and Control of Technology.** A survey of models, methods, and techniques used in the public and private sectors for the planning, assessment, and regulation of technology. Includes a semester-long project in modeling the impacts, costs, risks, and benefits of a specific technological innovation, with special attention to the role of assumptions and implicit values. 3 hours.
- 204. **Materials and Civilization.** Same as Anthropology 221. See Anthropology 221.
- 260. **Science and Technology in Contemporary Literature.** Same as Comparative Literature 260. Discusses the "Two Cultures" controversy and the literary response to the infusion of science and technology into modern life. 3 hours.
- 301. **Sociology of Scientific Knowledge.** Same as Sociology 366. See Sociology 366.

SCULPTURE

(See Art and Design)

SECONDARY EDUCATION

(See Curriculum and Instruction)

SLAVIC LANGUAGES AND LITERATURES

(Including Bulgarian, Czech, Polish, Russian, Serbo-Croatian, Slavic, and Ukrainian)

Head of Department: Maurice Friedberg

Department Office: 3092 Foreign Languages Building, 707 South Mathews, Urbana

Bulgarian

- 381. **Structure of Modern Bulgarian.** Analysis of the sound system and grammar of the contemporary Bulgarian language. Prerequisite: Russian 212 or 214, or equivalent. 3 hours or ¾ unit.

382. **Readings in Bulgarian Literature.** Reading, analysis, and discussion of selected excerpts from Bulgarian literature, scientific prose, and the press. Prerequisite: Bulgarian 381 or consent of department. 3 hours or $\frac{3}{4}$ unit.
383. **Bulgarian Literature in Translation.** Critical survey, in translation, of Bulgarian literature from its beginning to the present day. Particular attention to the cultural-historical context of these works, and study of parallels between developments in Bulgarian literature and Russian literature. Prerequisite: Bulgarian 381 and Bulgarian 382 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Czech

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
383. **The Structure of Modern Czech.** Analysis of the sound system and grammar of the contemporary Czech language with some reference to its historical development. Prerequisite: Knowledge of another Slavic language, preferably Russian, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
384. **Readings in Czech.** Reading and analysis of selected texts. Prerequisite: Czech 383 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Polish

101. **Elementary Polish, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no prior work in Polish. 4 hours.
102. **Elementary Polish, II.** Continuation of Polish 101. Prerequisite: Polish 101. 4 hours.
103. **Intermediate Polish, I.** Grammar review, conversation practice, written exercises, and selected readings. Prerequisite: Polish 102 or equivalent. 4 hours.
104. **Intermediate Polish, II.** Continuation of Polish 103. Prerequisite: Polish 103. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
345. **Polish Literature in Translation, I.** Same as Comparative Literature 335. A critical survey, in translation, of Polish literature from the Middle Ages to the end of the nineteenth century; special attention given to the works in their cultural context. 3 hours or 1 unit.
346. **Polish Literature in Translation, II.** Same as Comparative Literature 336. A critical study, in translation, of modern Polish fiction, drama, poetry and essay, from Young Poland to the "New Wave"; their contribution to literary styles and genres in Poland and abroad; special emphasis on Wyspianski, Witkiewicz, and Gombrowicz. 3 hours or 1 unit.
385. **The Structure of Modern Polish.** Analysis of the sound system and grammar of the contemporary Polish language. Prerequisite: Knowledge of another Slavic language or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
386. **Readings in Polish.** Reading and analysis of selected texts. Prerequisite: Polish 385 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

Russian

Courses taught in Russian are 211, 212, 213, 214, 215, 216, 303, 304, 313, and 314.

101. **First-Year Russian, I.** Oral-aural practice and elements of grammar, reading, and writing. For students who have no credit in Russian. 4 hours. Students may not receive credit for both Russian 101 and 121.
102. **First-Year Russian, II.** Continuation of Russian 101. Oral-aural practice and elements of grammar, reading, and writing. Prerequisite: Russian 101. 4 hours.
103. **Second-Year Russian, I.** Oral-aural practice, systematic functional grammar, reading, and writing. Prerequisite: Russian 102 or equivalent. 4 hours.

104. **Second-Year Russian, II.** Systematic review of the structure of Russian covered in Russian 101-103 through class lectures, drills, and homework exercises. Prerequisite: Russian 103. 4 hours.
111. **Intensive First-Year Russian.** Accelerated course; covers material of Russian 101 and 102 in one semester. Allows for more efficient scheduling, more effective drilling, and quicker mastery of basic grammar and vocabulary. 8 hours.
112. **Intensive Second-Year Russian.** Accelerated course; covers material of Russian 103 and 104 in one semester. Allows for more efficient scheduling, more effective drilling, and quicker mastery of intermediate grammar and vocabulary. Prerequisite: Russian 102 or 111. 8 hours.
113. **Russian Civilization Through Literature.** The civilization of pre-Soviet Russia as reflected in Russian literature of the time. 3 hours.
114. **Soviet Society Through Literature.** The political, cultural, social and economic realities of the Soviet Union as reflected in Soviet literature. 3 hours.
115. **Russian Masterpieces in Translation, I.** Introduction to major works from the medieval period to 1880 in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
116. **Russian Masterpieces in Translation, II.** Introduction to major works from 1880 to the present in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
119. **Introduction to Russian and Soviet Film.** Survey of major films, film makers, and trends from Tolstoi adaptations through the revolutionary Eisenstein to current satire. Weekly film screenings. No knowledge of Russian required. 2 hours.
121. **Beginning Russian for Reading.** Survey of all grammar and basic vocabulary in one semester, in preparation for the reading of Russian prose in Russian 200. No emphasis on speaking or writing; all exercises and tests are from Russian to English. 3 hours. Students may not receive credit for both Russian 121 and 101.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Intermediate Reading and Translation.** Development of rapidreading comprehension and vocabulary acquisition; includes unadapted non-fiction texts in various humanities and science fields. Class discussion entirely in English. Prerequisite: Russian 104 or 121. 3 hours.
211. **Russian Conversation, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 104 or consent of instructor. 3 hours.
212. **Russian Conversation, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 211 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
213. **Russian Composition, I.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 104 or consent of instructor. 3 hours.
214. **Russian Composition, II.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 213 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
215. **Introduction to Russian Literature, I.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours.
216. **Introduction to Russian Literature, II.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Two years of college Russian or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
222. **Dostoevsky and Tolstoy.** Same as Comparative Literature 248. The art and thought of Russia's two greatest novelists; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
225. **Soviet Russian Literature.** Same as Comparative Literature 249. Major works since 1917 by Mayakovsky, Babel, Olesha, Bulgakov, Sholokhov, and others; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
270. **Parateaching.** Same as French, German, Latin, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Spanish 279. See Humanities 279.

280. **Teachers Course.** An introduction to the problems of the teaching of Russian and a study of textbooks. Prerequisite: Three years of college Russian or equivalent. 4 hours.
290. **Readings in Russian.** Individual topics or projects chosen in consultation with a Slavic Department representative. Prerequisite: Russian 104 or equivalent proficiency. 1 to 4 hours. May be repeated to a maximum of 8 hours.
293. **Honors Senior Thesis.** Intended primarily for candidates for honors in Russian but open to other seniors. Prerequisite: Senior standing. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
303. **Advanced Reading and Conversation, I.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Three years of college-level Russian. 3 hours or $\frac{1}{2}$ unit.
304. **Advanced Reading and Conversation, II.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Russian 303 or equivalent. 3 hours or $\frac{1}{2}$ unit.
307. **Structure of Russian.** The syntax and morphology of modern Russian. Prerequisite: 3 years of Russian or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
308. **Russian Phonetics and Pronunciation.** Study of the Russian sound system; training in the improvement of pronunciation and intonation. Prerequisite: 3 years of Russian or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Advanced Composition and Usage, I.** Practice in advanced composition and study of advanced problems of grammatical structure; emphasis on morphological categories in Russian grammar. Prerequisite: Three years of college Russian, including Russian 214, or consent of department. 3 hours or $\frac{1}{2}$ unit.
314. **Advanced Composition and Usage, II.** Further practice in advanced composition and study of advanced problems of grammatical structure; emphasis on syntax, usage, and style. Prerequisite: Russian 313 or consent of department. 3 hours or $\frac{1}{2}$ unit.
315. **Nineteenth-Century Literature in Translation.** Same as Comparative Literature 337. A study of major Russian writers from Pushkin through Chekhov; no knowledge of Russian required. 3 hours or $\frac{3}{4}$ unit.
317. **Twentieth-Century Literature in Translation.** Same as Comparative Literature 338. A study of major Russian writers from 1900 to the present; no knowledge of Russian required. 3 hours or $\frac{3}{4}$ unit.
324. **Russian Modernism.** Same as Comparative Literature 357. Representative works of the period 1880 to 1917, with emphasis on Chekhov, Gorky, and Blok; readings for nonmajors and class discussions in English. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
335. **Russian Drama.** Same as Comparative Literature 368. Historical survey of Russian dramatists and their works, from the origins in folk and liturgical playlets through classicism, Gogol, Ostrovsky, Chekhov, and Stanislavsky to Meierhold and the Soviet drama. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
337. **Nineteenth Century Russian Poetry.** A study of major Russian poets and their works from Zhukovsky through the end of the nineteenth century. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
338. **Twentieth Century Russian Poetry.** A study of major Russian poets and their works from Blok to the present. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
360. **Studies in Russian Literature and Society.** Same as Comparative Literature 340. The role of Russian literature in the social, political, and intellectual life of Russia from the 1840s to the present. Prerequisite: Junior standing. 3 hours or $\frac{3}{4}$ unit.
370. **Nabokov and Emigre Literature.** Same as Comparative Literature 370. Twentieth-century non-Soviet Russian authors, including Nabokov, Bunin, Tsvetaeva, Gippius, and Adamovich; no knowledge of Russian required. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
375. **Russian Literary Translation.** Theory and practice of literary translation in Russia from the eighteenth century to the present; "literal" versus "creative" translation; and practical work in translation into English of various Russian literary texts. Prerequisite: Russian 214 or 216, or equivalent. 3 hours or $\frac{3}{4}$ unit.

400. **Beginning Russian for Graduate Students.** Basic grammar and vocabulary; introduction to the reading of Russian texts in the sciences and the humanities. Designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. 4 hours. No graduate credit.
401. **Readings in Russian for Graduate Students.** Reading and translation of general and individually specialized materials, to increase speed, accuracy, and vocabulary; designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. Prerequisite: Russian 400 or equivalent. 3 hours. No graduate credit.
406. **Russian Morphology.** Survey of the various parts of speech of modern standard literary Russian with special emphasis on the nominal and verbal systems. Prerequisite: Russian 307 or equivalent. 1 unit.
408. **Russian Phonology.** Same as Linguistics 408. The sound pattern of Russian in its synchronic and diachronic aspects. Prerequisite: Russian 308 or equivalent. 1 unit.
410. **Old Russian Literature.** Reading and analysis of texts with historical and literary commentary. Prerequisite: Slavic 405 or equivalent. 1 unit.
412. **Literature of the Eighteenth Century.** Reading of texts; historical and literary background of the period. 1 unit.
414. **Pushkin.** The age of Pushkin; Pushkin's works in historical and comparative perspective; textual criticism, linguistic and structural analysis, intellectual interpretation, and aesthetic evaluation. 1 unit.
415. **Dostoevsky.** Same as Comparative Literature 415. Dostoevsky: historical background, textual analysis, structure, philosophy, artistic evaluation, and influence on French, English, American, and German literatures. 1 unit.
416. **The Early Realists: Turgenev, Aksakov and Goncharov.** Intensive study of the three representative nineteenth century Russian novelists; aspects considered include historical perspective, textual criticism, structural analysis, and aesthetic evolution. 1 unit.
417. **History of the Russian Language.** Historical grammar, origin, and development of the literary language. Prerequisite: Slavic 380 or 405 or equivalent. 1 unit.
419. **Tolstoy.** Same as Comparative Literature 419. Tolstoy: historical background, textual analysis, structure, philosophy, aesthetic evaluation, and influence on French, English, American, and German literatures. 1 unit.
420. **Chekhov.** Same as Comparative Literature 420. Chekhov: historical background, textual criticism, structural analysis, philosophy, artistic evaluation, and interrelationship with English, French, German, Scandinavian, and American literatures. 1 unit.
424. **Gogol.** Historical background, textual criticism, structural analysis, philosophy and ideology, and aesthetic evaluation. 1 unit.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Italian, Portuguese, and Spanish 463. See French 463.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Portuguese, and Spanish 481. See French 481.

Serbo-Croatian

101. **Basic Serbo-Croatian, I.** Oral and written work on pronunciation, grammar, and vocabulary. For students with no previous study of Serbo-Croatian. 4 hours.
102. **Basic Serbo-Croatian, II.** Continuation of Serbo-Croatian 101. Prerequisite: Serbo-Croatian 101 or equivalent proficiency. 4 hours.
103. **Intermediate Serbo-Croatian, I.** Completion of Grammar; written and oral exercises aimed at active command of the language. Prerequisite: Serbo-Croatian 102 or equivalent proficiency. 4 hours.
104. **Intermediate Serbo-Croatian, II.** Selected readings in Serbo-Croatian literature and culture. Prerequisite: Serbo-Croatian 103 or equivalent proficiency. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

392. **Structure of Modern Serbo-Croatian.** Analysis of the sound system and grammar of the contemporary Serbo-Croatian language. Prerequisite: Knowledge of another Slavic language or consent of department. 3 hours or $\frac{3}{4}$ unit.
393. **Readings in Serbo-Croatian.** Reading and analysis of selected texts. Prerequisite: Serbo-Croatian 392 or consent of department. 3 hours or $\frac{3}{4}$ unit.

Slavic

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
319. **Studies in Russian and East European Cinema.** Same as Communications and Speech Communication 319. Study and analysis of major film-makers, genres, trends, and theories, including the 1920's Soviet avant-grade and the Polish and Czech "New Wave" since 1953; lectures, discussions, screenings, term paper. No reading knowledge of Russian required, except for majors in Slavic Languages and Literature. 3 hours or $\frac{3}{4}$ unit.
380. **Introduction to Slavic Linguistics.** Same as Linguistics 380. The development of Common Slavic from Indo-European and its relationship to contemporary Slavic languages. Prerequisite: Knowledge of a Slavic language. 3 hours or $\frac{3}{4}$ unit.
381. **Introduction to Study and Research in Slavic Languages and Literatures.** Introduction to methods and resources for study and research in Slavic languages, Russian literature, and Russian language teaching. 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Portuguese, and Spanish 382, and Linguistics 386. See Humanities 382.
387. **Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Speech Communication 387. See English 387.
405. **Old Church Slavonic.** Analysis of grammar and reading of texts. Prerequisite: Knowledge of a Slavic language. 1 unit.
425. **Seminar in Slavic Literature.** Selected subjects in Russian and Slavic prose, poetry, drama, and literary criticism. Topics vary. 1 unit. May be repeated to a maximum of 3 units.
460. **Seminar in Slavic Linguistics.** Selected topics in the analysis of Slavic languages. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
491. **Individual Topics.** Prerequisite: Graduate standing with a major or minor in Russian; consent of department. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

Ukrainian

101. **Basic Ukrainian, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no previous study of Ukrainian. 4 hours.
102. **Basic Ukrainian, II.** Continuation of Ukrainian 101. Prerequisite: Ukrainian 101 or equivalent proficiency. 4 hours.
103. **Intermediate Ukrainian, I.** Completion of grammar, oral drills, and written exercises. Prerequisite: Ukrainian 102 or equivalent. 4 hours.
104. **Intermediate Ukrainian, II.** Selected readings in contemporary Ukrainian literature. Prerequisite: Ukrainian 103 or equivalent. 4 hours.
118. **Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
398. **Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours or $\frac{3}{4}$ unit.

SOCIAL SCIENCE

Office: College of Liberal Arts and Sciences

Office Address: 294 Lincoln Hall, 702 South Wright, Urbana

300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Political Science 300. See Political Science 300.

SOCIAL WORK

Acting Director of School: Paula A. Meares

School Office: 1207 West Oregon Street, Urbana

100. **Contemporary Social Work.** A broad survey of the field of social welfare; introduction to social services, social welfare organizations, major social problems and target population groups, and the methods employed in service to individuals, groups, and communities; and includes the range of personnel and skills in social work agencies, and the means of education and training for social work. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Honors Seminar.** Lectures, student presentations, and discussions on selected topics in social work. Prerequisite: Twelve hours in social work courses; senior standing; 4.0 grade-point average in social work courses; and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.
298. **Practice Seminar.** Critical examination of the application of knowledge to social work practice; emphasis on reciprocal relationships between personal problems and needs, social environment, agency services, and helping methods; and consideration of new trends in practice and empirical knowledge. Prerequisite: Social work major; consent of undergraduate field instruction coordinator; concurrent registration in Social Work 299. 3 hours.
299. **Field Instruction.** The student is assigned to field instructors for learning experiences in social agencies and communities; experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele and communities. Prerequisite: Social work major; consent of undergraduate field instruction coordinator. 4 to 12 hours.
300. **Methods of Social Work Intervention, I.** Examination of the methods of social work intervention (casework, group work, and community organization) utilized in various social work agencies and social welfare settings; emphasis on understanding of the values, knowledge, principles, and processes of social work practice. Prerequisite: Admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
301. **Methods of Social Work Intervention, II.** An introduction to social work practice in groups, organizations, and communities; emphasizes understanding the values, principles, and processes of social work practice as well as developing skills for service delivery to groups, organizations, and communities. Prerequisite: Social Work 300; admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
303. **Delivery of Health Care: Problems and Perspectives.** Same as Health and Safety Studies 303. The wide range of factors—ecological, social, cultural, medical, organizational, economic, and political—which influence health care in a complex nation like the United States; attention to perspectives from various fields of study. Prerequisite: Junior standing and consent of instructor. 3 hours or 1 unit.
310. **Social Welfare Policy and Services, I.** Critical study of the income maintenance system in the United States as a response to the problems of inequality of opportunity and income, poverty, and income security; consideration of alternative approaches with discussion of the social worker's role in the system. 3 hours or 1 unit.
311. **Social Services Policy and Services, II.** Critical evaluation of social policy and services in selected problem areas; includes the process of social policy analysis, current issues in fund-

- ing and monitoring of personal social services, and strategies for dealing effectively with social problems. Prerequisite: Credit or concurrent registration in Social Work 310. 3 hours or 1 unit.
313. **Social Services for Health and Rehabilitation.** The psychological and sociological impact of illness and disability on the individual, the family, and the community, emphasizing the social worker's role in medical and rehabilitation settings. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
314. **Social Services in Mental Health and Retardation.** Examination of comprehensive community mental health services as they evolve from definitions of the problems and changes in federal and state social policy; the concept of normalization and its criteria for program evaluation; and changing roles of mental health professionals, paraprofessionals, and consumers in policy making and service delivery. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
315. **Social Work Services for the Aged.** The social needs of older people in the context of developing services and income transfer benefits; identifies major issues in social service delivery; and reviews methods of intervention on behalf of older people in terms of both skill required and policy implications. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
316. **Social Services for Children and Families.** Child and family welfare policies and practice in relation to social services which support, supplement, or substitute for parental care of children; practice and policy issues in relation to the state's responsibility for guardianship, juvenile court, employment of children and young persons, and regulation of child-care facilities; and consideration of trends and issues in family and child welfare planning. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
318. **Special Problems.** A small group seminar for independent study of a topic or topics of special interest in the field of social welfare; emphasis on examination and discussion of significant and current social welfare issues and problems. Prerequisite: Credit or concurrent registration in Social Work 300; consent of instructor. 3 hours or 1 unit.
319. **Social Work and the Public School.** Social work services in schools as a process in school-community-pupil relations; focuses on the school as a social system; includes education as a continuum from pre-school to adulthood, financing and other major problem areas, education, legislation, policies, and service needs, some current education innovations; contains content related to meeting the needs of exceptional children and their families in the public schools. Prerequisite: Graduate standing in social work or consent of instructor. 4 hours or 1 unit.
322. **Introduction to Mental Retardation.** Same as Psychology 322 and Special Education 322. See Special Education 322.
327. **Research Methods in Social Work Practice.** Objectives of research pertaining to social work practice; design of experiments; measurement and methods of collecting data; design of questionnaires and schedules; methods of data analysis including statistical hypothesis testing and applications of inferential techniques; interpretation of results; and preparation of reports. Prerequisite: An introductory course in statistics and admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
351. **Human Behavior and Social Environment, I.** Current research and theory concerning the environmental influences on individual behavior; the family, small group, community, and social organization and the social and cultural causes and effects of discrimination. The social work practice context of each unit of content is a central focus. Prerequisite: Admission to B.S.W. or M.S.W. program and a course in human development. 3 hours or 1 unit.
400. **Comparative Analysis of Approaches to Casework.** Systematic and critical examination of selected approaches, conceptualizations, procedures, and techniques in casework theory and practice; includes the employment of a framework for the analysis and assessment of the various approaches, study of research related to process and outcome, and identification of practice issues. Prerequisite: Social Work 300. 1 unit.
401. **Comparative Approaches to Social Group Work Practice.** Social work practice theory in social group work through comparative study of various practice approaches; includes the utilization of the group work method in contemporary social work practice, practice principles, and the use of group process. Prerequisite: Social Work 300. 1 unit.

402. **Comparative Approaches in Community Organization Practice.** Principles and methods which characterize identifiable approaches used in community organization practice at neighborhood, community, state, and other levels. Prerequisite: Graduate standing in social work; Social Work 300 or consent of instructor. 1 unit.
404. **Seminar and Practicum in Clinical Group Work.** Exploration of concepts and issues related to integrity and encounter groups, self-help groups, and group psychotherapy; provides experience in an intensive encounter based on a structured, contractual integrity group; and emphasizes development of self-awareness, interpersonal skill, and leadership in facilitating clinical groups. Prerequisite: Social Work 401 or equivalent. 1 unit.
405. **Behavior Modification in Social Work.** Examination of conceptual ideas about behavior modification and their usefulness in working with clinical problems of concern to the social worker; focuses on intervention with individuals and families and the application of behavioral principles in working with groups, institutions, and communities; and emphasizes the development of a systematic approach for applying behavior modification principles in actual practice situations. Prerequisite: Social Work 300. 1 unit.
406. **Intervention with Children and Adolescents.** Examination and critical evaluation of selected methods/approaches of intervention; research on their effectiveness and application to specific problems of children and adolescents that come to the attention of social workers and other helping professionals; attention given to remediation and prevention. Prerequisite: Social Work 351 or equivalent, and Social Work 300 or consent of instructor. 1 unit.
407. **Intervention Strategies for Institutional Change.** An ecological systems approach to social work intervention within the public school system; examination of practice principles, issues, and strategies for organizational change, collaborative team work with school and community professionals, and intervention, especially group work, with students and families; contains content related to meeting the needs of exceptional children and their families. Prerequisite: Social Work 300 and graduate status, or consent of instructor. 1 unit.
420. **Social Welfare Planning.** Examination of the interactional, interpersonal, and political aspects of social welfare planning in a variety of settings and under a number of auspices; formulation of models for social welfare planning. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
426. **Social Welfare Administration.** Principles and process of administration and management of social welfare organizations, including review of organization theory, policy formulation, agency structure and staff organization, and budgeting. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
427. **Service Accounting in Social Welfare.** Examines different types of services, to whom they are provided at what costs and with what results; within a systems perspective, considers methods of describing, reporting, and measuring client and target population characteristics, services, and resources; and includes allocation of scarce resources among competing demands and practice in specific methods. Prerequisite: Social Work 327 or equivalent. 1 unit.
428. **Family Therapy Seminar and Practicum.** The principles, issues, and practices of family therapy; examines and compares major theoretical concepts; and enables students to learn how to do family therapy by studying theory and applying it in an actual practice experience. Prerequisite: Social Work 400 or consent of instructor. 1 unit.
431. **Practice in Organizational Settings.** Critical analysis of social work practice: the agency's target population and clientele, task environment, structure, functions, task definitions, monitoring and planning mechanisms; methods of service delivery; ethical and legal considerations in service delivery; the impact of racism, ethnocentrism, and sexism on social work practice. Section for school social work students contains content related to meeting the needs of exceptional children and their families in the public schools. Prerequisite: Concurrent registration in Social Work 468. 1 unit.
432. **Practice Evaluation.** Evaluation of social work practice: defining practice problems; operationalizing goals and objectives; developing hypotheses; designing evaluation plans to test hypotheses; describing interventions; collecting, analyzing, and interpreting data; and presenting results. Students complete an evaluation of some aspect of their own practice or their agency's program. Prerequisite: Social Work 431; concurrent registration in Social Work 469. 1 unit.

435. **Supervision/Consultation/Staff Development.** The philosophy, objectives, principles, and methods of social work supervision, consultation, and training for staff development; analysis of similarities and differences in roles, knowledge, and skills required with emphasis on the teaching-learning-evaluating components; and issues arising from agency setting, changing legislation and program provisions, and relationships to social welfare administration. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
439. **Theory of Social Work Interventions.** Presents theory for social work interventions with individuals, families, groups, and communities and organizations; critically analyzes different theoretical frameworks for such interventions; and examines the conceptual links between theory, process, outcome, and evaluations. Prerequisite: Social Work 400, 401, and 402. 1 unit.
451. **Women: Society and Social Welfare Issues.** Examination and critical evaluation of current research on theory concerning the environmental influences on women's behavior and application of these ideas in practice and policy; attention given to both dynamics of victimization and change strategies as they affect women and children in the social welfare system; emphasis on issues of special concern to poor and minority women. Prerequisite: Social Work 351 or consent of instructor. 1 unit.
452. **Human Growth and Behavior and the Social Environment, II: Psychosocial Disorders.** Interrelationship of physical, emotional, learning, and social aspects of behavior disorders, and implications for the patient, family, and community; psychopathology, including neuroses, psychoses, character disorders, organic conditions, psychophysiological disorders, and mental retardation; and diagnosis and treatment methods, including psychotherapy, somatic and drug therapies, and social work. Prerequisite: Social Work 351 or equivalent. 1 unit.
461. **Special Studies in Social Work, I.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
462. **Special Studies in Social Work, II.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
468. **Field Instruction, II.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Consent of instructor. 1 to 2 units.
469. **Field Instruction, III.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Social Work 468. 1 to 2 units.
484. **National Social Welfare Policy, I.** Analyzes alternative concepts of social policy, the policy formulation process, and constraints on policy development in the United States; examines approaches to assessment of social policies. 1 unit.
485. **National Social Welfare Policy, II.** Emphasis on the case approach within the context of basic political and governmental processes which influence the development, enactment, and application of national policy; analytical study of the background, legislative history, amendments, judicial interpretations, and operation of major national acts comprising our national social welfare policy, or bearing directly on social welfare such as the Social Security Act, the Employment Act, the Civil Rights Acts, and the Economic Opportunity Act. Prerequisite: Social Work 484 or consent of instructor. $\frac{1}{2}$ to 2 units.
489. **Social Work and the Law.** Legal procedures and issues of special relevance to social work practice; includes legal provisions related to poverty, family development and crises, racial and ethnic minorities, institutionalized persons, crime and delinquency, legal authority of social agencies, and regulation of the profession. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
491. **Research Seminar.** Seminar for students preparing research projects, either in groups or individually; experience in the application of research methods to current social work problems. Prerequisite: Social Work 327 or equivalent. 1 to 2 units.
492. **Seminar on Models for Directed Change.** Same as Sociology 492. See Sociology 492.
493. **Seminar: Design of Social Work Research.** Issues and problems in social work research; includes proof and verification, generalizability, and use of scaling and of judgments; and

design of original research study. Prerequisite: Admission to Ph.D. program and Social Work 327, or consent of instructor. 1 unit.

497. **Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Administration, Higher, and Continuing Education 497, and Political Science 469. See Labor and Industrial Relations 497.

499. **Thesis Research.** Research and writing of doctoral thesis. 0 to 4 units.

SOCIOLOGY

Head of Department: James R. Kluegel

Department Office: 326 Lincoln Hall, 702 South Wright, Urbana

100. **Introduction to Sociology.** Examination of how societies grow and change; reciprocal effects of economic, political, community, familial, and scientific institutions on each other and on individual life changes; and social conflict, problems of bureaucratic growth and planned and unplanned social change. 3 hours.

102. **Religion and Science.** Same as History 147 and Religious Studies 102. See Religious Studies 102.

131. **Social Problems.** Origin of problems; consequences of ameliorative strategies. Typical topics include crime, mental illness, drug use, suicide, sexual behavior, violence, and intergroup conflict. 3 hours.

145. **Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Ecology 145 and Women's Studies 112. See Women's Studies 112.

150. **The Construction of Science.** Same as Science, Technology and Society 150. What scientists actually do; readings, discussions, and essay projects to develop an understanding of both the technical and social aspects of scientific practice, what is distinctive about science as well as illuminating the interrelation of science with other elements of our culture; includes a cultural analysis of technology. Prerequisite: For student in the Campus Honors Program; others may enroll with the consent of instructor and the Director of the Honors Program. 3 hours.

180. **Social Thought.** Same as Anthropology 108. Examines the problem of social order and cohesion as treated in the works of major social thinkers from Plato and Aristotle to the present. 4 hours.

185. **Introduction to Social Statistics.** Same as Geography 185. A first course in social statistics for students without mathematics beyond the high school level; topics include the role of statistics in social science inquiry, measures of central tendency and dispersion, simple correlation techniques, contingency analysis, and introduction to statistical inference; includes the statistical analysis of social science data using personal computers in the Social Science Quantitative Laboratory. 4 hours. Students may not receive credit for Sociology 185 if they have already received credit for college level introductory statistics course.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

200. **Introduction to Sociological Theory.** Analysis of such classical theorists as Marx, Weber, Durkheim, and Mead and such contemporary theorists as Parsons, Merton, and Blau. 3 hours.

201. **Introduction to Social Psychology.** The social context of individual and interpersonal behavior. Observation, experimental and survey studies of: socialization; language acquisition and use; sources and changes of self concept; social interaction; emotions; coordination of interpersonal behavior; individual and interpersonal aggression, violence, and control; and adoption or rejection of innovations through social networks. 3 hours. Credit is not given for both Sociology 201 and Psychology 201.

205. **Young Children with Special Needs.** Same as Human Development and Family Ecology 205. Examines family and personal problems of children, birth to five years, with special needs owing to mental and physical handicaps, hospitalization, abuse, and emotional disturbance; studies social environmental effects on the classification of such children; parental needs; program development. 3 hours.

206. **Political Sociology.** A study of power relations within and between the state, bureaucracy, community, social classes, and elites in the United States and other countries. 3 hours.

208. **Collective Political Violence.** The study of the causes, processes, and effects of collective violence, particularly of riots, coups, and revolution. 3 hours. (Counts for advanced hours in LAS.)
210. **The Industrializing Third World.** Explores the development of industrial Third World societies. Particular attention to the state as agent of development, socio-economic structures, labor and social movements, and dependent relationships with the world economy. Case studies from Africa, Asia, and Latin America. 3 hours.
218. **Technology and Society.** Examines the social and cultural origins of modern technology and technological innovation; the effects of technology and its change on society. Topics include the impact of technology on beliefs and values, accommodation and resistance to change, and technology and the Third World. 3 hours.
219. **Comparative Study of Societies.** Theories of the development and interdependence of social, economic, and political institutions; consequences of change. 3 hours.
222. **Introduction to Modern Africa.** Same as African Studies, Anthropology, and Political Science 222. See African Studies 222.
223. **Social Stratification.** Inequities in power, prestige, income, privilege, and lifestyles in the United States and other countries; class and status as determinants of group interests, ideologies, and interaction; and effects of social change and mobility. 3 hours.
224. **Women in Society.** Same as Women's Studies 224. Examines the place of women in society; how society shapes women's opportunities, behavior, values, power, roles, and well-being; how women, in turn, shape social changes in the home and at work. 3 hours.
225. **Racial and Cultural Minorities.** A sociological and social-psychological analysis of minority groups; illustrative material drawn from representative racial, ethnic, and status groups. 3 hours.
226. **Ethnicity in America.** Presents theories of ethnicity: assimilation-Melting Pot, pluralism, competition-conflict. Examines relationships among groups, accommodation among groups as a challenge in national unification, group versus national identification, methods of studying ethnicity, comparisons between United States and other multi-ethnic societies, and immigration as a social problem and policy issue. 3 hours.
229. **Sociology of Religion.** Same as Religious Studies 229. The functions of religious institutions in societies; religious leaders and leadership; religious groups in American society; and adaptations of religious institutions to modern needs and conditions. 3 hours.
231. **Juvenile Delinquency.** Historical change in definitions of delinquency, its causes and control; gangs; the juvenile justice system; treatment of offenders; and preventive programs. 3 hours.
240. **Crowds, Social Movements, and Violence.** Crowd formation and participation; recurring forms of individual and social behavior in crowds; routine and problematic crowd dispersal; social movement origins and participation; growth and organization; strategies, tactics, and consequences for participants and society; origins and consequences of racial, prison, sports and festival riots, and of violent confrontations between protest movements and the police. 3 hours.
241. **Alcohol and Society.** Examines social psychology of alcohol use, patterning and abuse; etiology and epidemiology of alcoholism; politics of social control and treatment; history of prohibition, reform movements, social and cultural comparisons. 3 hours.
242. **Family Violence.** Same as Human Development and Family Ecology 242. Examines the sociology of conjugal and intrafamily violence from comparative, historical, and social psychological perspectives; abuse of family members; the violent situation; interpersonal violence. 3 hours.
243. **Social Perspectives on the Family.** Examines the societal forces shaping aspects of stable and changing family relations in the U.S. and other countries; focuses on social-structural factors affecting marriage, divorce, co-habitation, child-bearing, the division of work and authority, and other features of life. 3 hours.
246. **Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 246. See Ecology, Ethology, and Evolution 246.
249. **Sport and Modern Society.** Same as Kinesiology 249. See Kinesiology 249.
251. **Social Aspects of Mass Communications.** Same as Communications and Journalism 251. See Journalism 251.

259. **Organizations.** Conflict, communication, coordination, and leadership in the bureaucracies that characterize modern society; relations of individuals, organizations, and society; how organizations are intended to work and how they do work, emphasizing business firms, unions, schools, public agencies, hospitals, and prisons. 3 hours.
260. **Work and Occupations.** The meaning of work and leisure in modern society; job satisfaction, alienation, and the work ethic; occupational conflicts over money, status, and authority; impact of occupational segregation by sex and race on earnings, unemployment, and politics; job and career mobility; and improvement of work life and leisure. 3 hours.
264. **Introduction to Medical Sociology.** The sociology of health and illness behavior and the social structure of systems which deliver health care services; includes social constraints on illness, the illness role, medical organizations and professions, and the application of the illness model to deviant forms of behavior. 3 hours.
265. **Contemporary Korean Society.** Same as Asian Studies 265. See Asian Studies 265.
270. **Population Issues.** Same as Rural Sociology 270. Examines the current world population situation; the historical and current patterns of birth, death, migration, marriage, contraception, and abortion; and the world food and energy resources, crowding, and problems of overpopulation. 3 hours.
275. **Community.** Structure and function of communities in mass society; ecological and social psychological perspectives; social networks; ethnographic case studies of small towns and neighborhoods; and community types. 3 hours.
276. **Cities and Suburbs.** Metropolitan communities in modern society; neighborhoods, suburbs, ghettos, and slums as subcommunities; demographic, ecological, and technological aspects of urban change; and urban social networks. 3 hours.
277. **The Social Context of Agriculture.** Same as Rural Sociology 277. See Rural Sociology 277.
288. **Religion in Asian Society.** Same as Asian Studies 288 and Religious Studies 288. See Asian Studies 288.
290. **Individual Study.** Individual study or research project. Prerequisite: Six hours of sociology; written consent of instructor on form available in 326 Lincoln Hall. 1 to 6 hours. May be repeated.
291. **Honors Individual Study.** Prerequisite: Open only to seniors in the sociology field of concentration who are eligible for departmental distinction; written consent of instructor on form available in 326 Lincoln Hall. 3 hours. (Counts for advanced hours in LAS).
295. **Junior-Senior Honors Seminar.** Intensive scrutiny of current literature on one selected topic. Critical reading and discussion followed by writing essays and research proposals. Subject will shift yearly. Prerequisites: For sociology majors only. Student must have at least 4.5 grade-point average in sociology courses and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
296. **Special Topics.** Prerequisite: Sociology 100 and consent of instructor. 3 hours. May be repeated as topics vary.
301. **European Working-Class History: 1750 to the Present.** Same as History 301 and Labor and Industrial Relations 301. See History 301.
302. **Sex Roles.** Same as Human Development and Family Studies 302 and Women's Studies 302. Examines social institutions that affect sex differences in power and prestige, especially market labor, household labor, and fertility; social, emotional, and cognitive developmental differences over the life span. Prerequisite: Sociology 100 or Human Development and Family Ecology 105; or 6 hours of anthropology, geography, political science, or sociology. 3 hours or 1 unit.
303. **Thought and Society in Modern Europe, 1789-Present.** Same as History 345. See History 345.
304. **Thought and Society in Early Modern Europe, 1513-1789.** Same as History 346. See History 346.
305. **Scientific Thought, I.** Same as History 339 and Philosophy 317. See Philosophy 317.
306. **Scientific Thought, II.** Same as History 340 and Philosophy 318. See Philosophy 318.
315. **Sociology of Education.** Same as Educational Policy Studies 315. See Educational Policy Studies 315.
317. **Sociology of Law.** Social origins and consequences of law and legal process, emphasizing problems of legal change and structure and function of legal sanctions. Law and law-like

- phenomena in primitive and modern societies. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
318. **Industry and Society.** Same as Labor and Industrial Relations 318. Selected problems in industrialization and technological change, labor force, meanings of work, the factory as a work place, corporate organization and corporate society, and alienation and authority. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
321. **Family and Kinship in Industrialized Societies.** Mate selection, marriage and consensual unions, separation and divorce, interaction and authority patterns, family crisis and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
324. **Penology.** History of punishment and treatment of offenders; social organization of prison life, male and female inmate cultures, prison race relations, and violence; reform, parole, community correctional facilities, and effectiveness of treatment. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
325. **The Philosophy of Social Science.** Same as Anthropology 329 and Philosophy 375. See Philosophy 375.
327. **Japanese Society.** Same as Asian Studies 303. The institutions of contemporary Japan and their historical roots; the Japanese approach to modernization and development and social change; and implications of the Japanese experience for applied social change in developing areas and for social science theory and methodology. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science or sociology. 3 hours or 1 unit.
331. **Criminology.** Nature and extent of crime; past and present theories of crime causation; criminal behavior in the United States and its relation to personal, structural, and cultural conditions. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
332. **Research Methods in Social Psychology: Laboratory Methods.** Same as Psychology 332. See Psychology 332.
333. **Mental Health in Social Context.** Mental health issues from organizational, demographic, and social-psychological perspectives; emphasizes the sociological implications of mental problems, the organization of treatment and confinement, and the role of the therapist. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
335. **Enthnography of Local Cultures.** Same as Anthropology and Educational Psychology 335. See Educational Psychology 335.
337. **Social Epidemiology.** Examines social correlates of illness (e.g., heart disease, cancer, obesity, alcoholism), methods of social epidemiology, stressors in the social environment, and factors that lessen the impact of stress. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety studies, psychology, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
339. **The Organization of Health Care.** Same as Health and Safety Studies 356. See Health and Safety Studies 356.
340. **Social Movements.** Origins and development of groups in promoting and resisting change, resource mobilization, strategies and tactics, individual and social consequences. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
343. **Social Change in Developing Areas.** Same as Rural Sociology 343. See Rural Sociology 343.
344. **Perspectives on the Modern World System.** Examines competing theoretical and historical perspectives on the modern world system, including debates on the international division of labor, class structure, the interstate system, and cycles and trends in the modern world economy. Analysis of implications for comparative and historical research. Prerequisite: Sociology 100 or 6 hours of anthropology, history, political science, social geography, or sociology. 3 hours or 1 unit.
346. **Sociology of Sport.** Same as Kinesiology 346. See Kinesiology 346.
350. **Soviet Social Institutions.** Structural consequences of Communist ideology and industrialism, social stratification and mobility, nationalities, family and education communications and public opinion, and socialized medicine. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.

352. **Attitude Theory and Change.** Same as Communications 352 and Psychology 352. See Psychology 352.
354. **Social Structure of Southern Africa.** Same as African Studies 354. Examines formation and development of southern Africa as a regional socio-economic structure; interdependence of class, household, labor-force and production processes; studies social and political movements, state formation, and conflict. Prerequisite: Sociology 100 or 222; or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
356. **Economics of Population and Resources.** Same as Economics 356. See Economics 356.
357. **Human Rights.** Same as Political Science 357. Examines the idea of human rights: human rights in liberal democracies, especially in the United States; in pre-industrial societies; in totalitarian states. Studies human rights and cultural evolution; justification of human rights. Prerequisite: Sociology 100 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
358. **Politics of Crime and the Criminal Process.** Same as Political Science 358. See Political Science 358.
359. **The Social Psychology of Organization.** Same as Psychology 359. See Psychology 359.
364. **Population Trends and Patterns.** Introduction to contemporary demographic patterns and their historical development; transition theory and other models of demographic change; components of population growth and distribution; and trends and differentials in mortality and fertility. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
365. **Social Structure of Science.** Focuses on science as a social institution; topics include patterns of recruitment to the scientific profession, social forces shaping scientific specialization, the social stratification of scientists, social factors affecting scientific productivity. 3 hours, or $\frac{1}{2}$ or 1 unit.
366. **Sociology of Scientific Knowledge.** Same as Science, Technology, and Society 301. Sociological analysis of the production, evaluation, the impact of social interests on the development of scientific knowledge, Kuhn's analysis of science, the social shaping of technology, the rationality debate. 3 hours or 1 unit.
373. **Latin American Social and Political Institutions.** Class structures, family, kinship, religious, economic, and political institutions; trends in urbanization, ecological organization, and population. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $\frac{1}{2}$ or 1 unit.
380. **Methods of Field Research.** Instruction, training, and supervised practice in methods of field research as a basic tool of sociology; emphasis on the role of the field researcher as participant, observer, and interviewer in various kinds of research settings, and on approaches to and applications of field data. Prerequisite: Sociology 100 and 185. 3 hours, or $\frac{1}{2}$ or 1 unit.
381. **Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185; Sociology 100 or 6 hours in social geography, anthropology, or political science. 3 hours or $\frac{3}{4}$ unit.
385. **Social Statistics, I.** Introduces statistical methods as applied to sociology and other social sciences: probability concepts, binomial and normal distributions; statistical inference, t-test and F-test, bivariate correlation and regression, multiple regression, dummy variables and analysis of variance, contingency tables; reliability and simple index construction; types of sampling and their effects on analysis. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 185, or Mathematics 112; or equivalent. 3 hours or 1 unit. Students may not receive credit for Sociology 385 if they have received credit for any one of the following: Statistics 100, 210, 310, or 311; Psychology 233, 234, or 235; Economics 171 and 172; Agronomy 340; Educational Psychology 390; Biology 371, 372, or 373; Forestry 321; Social Work 327.
386. **Social Statistics, II.** Examines social science applications of the general linear model and its extensions; topics include: model specification; ordinary and generalized least squares; multicollinearity; selection of predictors; interaction of variables and non-linear regression; panel and time-series data; measurement error; path analysis; recursive and non-recursive struc-

- tural equation models. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 385 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
387. **Social Statistics, III.** Examines social science applications of discrete and continuous multivariate analysis; topics include: analysis of categorical data (loglinear modelling, probit analysis, etc); geometric interpretation of matrices; factor analysis and index construction; canonical analysis; discriminant analysis; unobserved variables and structural equation models; issues in model specification and estimation. Applies statistical computing programs such as ECTA and LISREL to social science data. Prerequisite: Sociology 386 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
388. **Basic Methods of Demographic Analysis.** Introduction to statistical and mathematical procedures in population analysis; the gathering, processing, and evaluating of registration and census data; the life table model; and procedures of mortality and fertility analysis and population projections. Prerequisite: Mathematics 112, or equivalent. 3 hours or 1 unit.
396. **Special Topics.** Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit. May be repeated as topics vary.
400. **Classical Sociological Theory.** Analysis of major classical sociological theorists of the nineteenth and early twentieth centuries, stressing the social, historical, and philosophic foundations of sociological theory; primary emphasis on Marx, Durkheim, and Weber. Prerequisite: Sociology 200 or equivalent. 1 unit.
401. **Contemporary Sociological Theory.** Major theorists and schools of thought since World War I with emphasis on the contemporary period; includes functionalism, exchange theory, conflict theory, symbolic interaction, and phenomenology. Prerequisite: Sociology 400 or equivalent. 1 unit.
402. **Social Stratification.** Theory and data concerning structured social inequality in industrialized societies, with special focus on the United States. 1 unit.
403. **Principles of Sociological Inquiry.** Examines the relationship between theory and method in sociological research; topics include problem formulation, research design, alternative theoretical frameworks and research strategies comparison of actual applications. Prerequisite: Sociology 385 or equivalent. 1 unit.
406. **Psychological Scaling: Unidimensional Methods.** Same as Psychology 406. See Psychology 406.
407. **Techniques in Demographic Analysis.** Same as Rural Sociology 407. The analysis of family formation and dissolution; measures of population movement and distribution; and introduction to the stable population model and to applications in the estimation of demographic measures. Prerequisite: Sociology 388. 1 unit.
409. **Psychological Scaling: Multidimensional Methods.** Same as Psychology 409. See Psychology 409.
411. **Methods in Comparative Sociology.** Examines problems in the design and conduct of research in cross-cultural and cross-national comparative sociology; levels of analysis and observation; the problem of equivalence and that of investigator ethnocentrism; qualitative and quantitative approaches; the ethics and politics of such research. Prerequisite: 1 unit of graduate credit in sociology, or consent of instructor. 1 unit.
414. **Seminar on Social Interaction.** Same as Communications 414. An analysis of social interaction based on the social psychology of C. H. Cooley, G. H. Mead, and W. I. Thomas; presentation of problems of theory, concepts, and method. Prerequisite: 1 unit of graduate credit in sociology. 1 unit.
416. **Survey Research Methods, II.** A laboratory course in survey research methods to provide students with advanced training and experience in problem formulation and computerized data analysis using statistical packages, e.g. SPSS; under staff guidance, a student will select a topic and write a professional-level paper. Three to ten hours of laboratory time per week. 1 unit.
418. **Seminar in Industrial and Economic Sociology.** Same as Labor and Industrial Relations 418. See Labor and Industrial Relations 418.
420. **Social Organization.** Major issues and perspectives on the structure and dynamics of social organization; stratification, elites, formal organizations, and social change; contemporary theoretical and methodological developments in selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.

421. **Demography and Human Ecology.** Classic and contemporary issues and perspectives in demography and human ecology, emphasizing the relationship between demographic phenomena and social life and on the ecological approach to social organization; demographic change, analytic methods in demography, fertility, mortality, and migration; new research developments. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
423. **Social Psychology.** Development of social psychology; contemporary theoretical and methodological perspectives; selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
432. **Special Problems in Theory and Research on Deviant Behavior.** A seminar concerned with the critique of recent theory and research on selected problems in the study of delinquency, crime, mental disorder, and the collaborative development of new theory and research designs. Prerequisite: Sociology 331 or consent of instructor. 1 unit. May be repeated as topics vary.
444. **Seminar in Public Opinion.** Same as Communications 444. Development and theory of public opinion process in society; censorship, interest groups, and propaganda; and mass media and public opinion. 1 unit.
445. **Sociology of Leisure.** Same as Leisure Studies 445. See Leisure Studies 445.
449. **The Sociology of Sport.** Same as Kinesiology 449. See Kinesiology 449.
456. **Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Psychology 453. See Business Administration 410.
474. **Survey Methods in Marketing Research.** Same as Business Administration 431. See Business Administration 431.
477. **Seminar on Community Organization.** Same as Rural Sociology 477. Theories relating to the community concept and the analysis of community organization; the process of community change as applied to societies in various parts of the world. Prerequisite: Sociology 275 or consent of instructor. 1 unit.
482. **Recent Developments in Sociology.** Intensive study of selected topics based on contemporary works of major importance in the development of sociological theory. 1 unit. May be repeated as topics vary.
485. **The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Psychology 485. See Business Administration 435.
487. **Special Problems in Rural Sociology.** Same as Rural Sociology 487. See Rural Sociology 487.
488. **Covariance Structure and Factor Models.** Same as Educational Psychology, Psychology, and Statistics 488. See Psychology 488.
490. **Individual Topics in Sociology.** Supervised individual investigation or study of a topic not covered by regular courses; topic selected by the student and the proposed plan of study must be approved by the adviser and the staff member who supervises the work. $\frac{1}{2}$ to 2 units.
494. **Multivariate Analysis in Psychology and Education.** Same as Educational Psychology and Psychology 494. See Psychology 494.
499. **Thesis Research.** 0 to 4 units.

SOILS

(See Agronomy)

SPANISH, ITALIAN, AND PORTUGUESE

(Including Catalan, and Romance Linguistics)

Head of Department: Ivan A. Schulman

Department Office: 4080 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Catalan

- 301. **Studies in Catalan Language.** An introductory study of the Catalan language. Prerequisite: Eight hours of Latin or any Romance language. 2 hours or ½ unit.
- 302. **Studies in Catalan Literature.** Introduces Catalan literature through study of major works. Prerequisite: Catalan 301 or consent of instructor. 2 hours or ½ unit.

Italian

- 101. **Elementary Italian.** For students who have no credit in Italian. 4 hours.
- 102. **Elementary Italian.** Continuation of Italian 101. Prerequisite: Italian 101 or one year of high school Italian. 4 hours.
- 103. **Intermediate Italian.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Italian 102 or two years of high school Italian. 4 hours.
- 104. **Intermediate Italian.** Continuation of Italian 103. Prerequisite: Italian 103 or three years of high school Italian. 4 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. **Introduction to the Study of Italian Literature.** Introduction to the study of Italian literature with emphasis on methodology for critical analysis of literary texts and on major periods and movements in their cultural and historical contexts. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 210. **Advanced Grammar.** Study of the structure of modern Italian in both its phonological and syntactic aspects for the student who already has a functional command of the language, with an emphasis on developing ability to analyze and interpret grammatical structures. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 220. **Conversation, I.** Training in oral-aural skill and in writing. Prerequisite: Italian 210 or consent of instructor. 3 hours.
- 222. **Conversation, II.** Continuation of Italian 220. Prerequisite: Italian 220 or consent of instructor. 3 hours.
- 240. **Italian Civilization of the Middle Ages and Renaissance.** Same as Comparative Literature 240. The development of Medieval Italian civilization in a literary context from the Sicilian School of love poetry to the early Renaissance in Florence; lectures and readings are in English. 3 hours.
- 280. **Italian for Business and the Professions.** Introduction to vocabulary of Italian commerce; composition of business letters and similar texts. Prerequisite: Italian 104 or consent of instructor. 3 hours.
- 290. **Special Topics in Italian Studies.** Selected substantive readings for independent study on a given special topic of Italian literature, culture, language, or linguistics. Prerequisite: Italian 104 and consent of instructor. 2 to 4 hours. May be repeated. Counts for advanced hours in LAS).
- 291. **Honors Senior Thesis.** For candidates for honors in Italian. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
- 300. **Italian for Speakers of Spanish.** An accelerated language learning course designed for speakers of Spanish. The focus will be primarily on those linguistics structures specific to Italian which differ significantly from Spanish equivalents. Early emphasis on production skills;

comprehension-based skills will be introduced in rapid succession. Intended for students who have no credit in Italian. Students who have received credit in Italian 400 and 401 may enroll. 3 hours or $\frac{3}{4}$ unit.

302. **Composition and Stylistics.** Refinement of written discourse for academic and professional expectations and requirements. In addition to quizzes and a final examination, a major, formal paper on an assigned topic will be required. Prerequisite: Italian 210 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
306. **Italian Culture.** Introduction to factors that have shaped present-day Italy; basic concepts contributing to understanding its present social and cultural development; taught in Italian. Prerequisite: Italian 200 or 220, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
308. **The Italian-American Experience.** Study of the process of acculturation of the Italian ethnic group in North America; taught in Italian. Prerequisite: Italian 306 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Dante.** Same as Comparative Literature 313. An interpretation of Dante's *Divine Comedy* with special attention to its position in the medieval world; a knowledge of Italian not required. 3 hours or $\frac{3}{4}$ unit.
314. **Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Comparative Literature 314. Studies in Petrarch and Boccaccio; nonconcentrators in Italian may read the works in translation; lectures are in English. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or $\frac{3}{4}$ unit.
320. **Masterpieces of Italian Renaissance Literature.** Same as Comparative Literature 320. A reading of masterpieces of the 1400 and 1500s and a study of their predecessors and influence; nonconcentrators in Italian may read the works in translation; lectures are in English. Content rotates. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units with consent of instructor.
330. **From Baroque to Romanticism.** Major literary developments in Italy from the end of the Renaissance to the New Italy of the Risorgimento (Baroque, Arcadia, Enlightenment, Neoclassicism, Romanticism). Prerequisite: Italian 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
340. **Modern Italian Novel.** An appreciation of the modern Italian novel through a close reading of some representative works (e.g., Verga, Moravia, Vittorini, Pavese). Prerequisite: Italian 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
342. **Modern Italian Poetry.** An appreciation of modern Italian poetry through a close reading of some representative works (e.g., D'Annunzio, Pascoli, Montale, Quasimodo, Saba, Ungaretti, Novissimi, Zanzotto). Prerequisite: Italian 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
350. **Italian Syntax and Phonology.** Introduction to the essential syntactic and phonological structures of Modern Standard Italian in combination with appropriate discussion of corresponding linguistic concepts. Prerequisite: Italian 210 and 302, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, German, Spanish, and Portuguese 360. See English as an International Language 360.
362. **Introduction to Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, German, Portuguese, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
400. **Beginning Course for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Italian for Graduate Students.** An intensive language course designed to teach reading skills to graduate students; a continuation of Italian 400. Prerequisite: Italian 400 or consent of instructor. 4 hours. No graduate credit.
410. **Seminar on Italian Medieval and Renaissance Literature.** Graduate readings and critical studies of major and minor Italian Medieval and Renaissance works from the ninth to sixteenth-century; readings in the original languages; content and topics rotate. Prerequisite: Italian 313, 314, or 320, or consent of instructor. 1 unit. May be repeated to a maximum of 8 units.

- 440. **Seminar in Modern Italian Literature.** Critical analysis of post-Renaissance literary movements and texts; topics vary. Prerequisite: Italian 330, 340, 342, or equivalent or consent of instructor. 1 unit. May be repeated in a semester to a maximum of 2 units; may be repeated to a maximum of 4 units.
- 450. **Seminar in Italian Linguistics.** 1 unit.
- 462. **Seminar in Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
- 463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Portuguese, Russian, and Spanish 463. See French 463.
- 471. **Proseminar in Foreign Language Teaching.** Same as Spanish and Portuguese 471. See Spanish 471.
- 481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Portuguese, Russian, and Spanish 481. See French 481.
- 495. **Special Topics in Italian.** ½ or 1 unit.
- 499. **Thesis Research.** 0 to 4 units.

Portuguese

- 101. **Elementary Portuguese, I.** For students who have no credit in Portuguese. 4 hours.
- 102. **Elementary Portuguese, II.** Continuation of Portuguese 101. Prerequisite: Portuguese 101. 4 hours.
- 103. **Intermediate Portuguese.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Portuguese 102 or two years of high school Portuguese. 4 hours.
- 104. **Intermediate Portuguese.** Continuation of Portuguese 103. Prerequisite: Portuguese 103 or three years of high school Portuguese. 4 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. **Composition and Conversation, I.** Prerequisite: Portuguese 104 or consent of instructor. 3 hours.
- 212. **Composition and Conversation, II.** Prerequisite: Portuguese 210 or consent of instructor. 3 hours.
- 220. **Readings in Portuguese.** Readings and discussion in Portuguese of a variety of texts by leading Luso-Brazilian writers covering various genres and themes; designed to emphasize reading, discussion, and enjoyment rather than literary criticism. Open to non-Portuguese majors; may not be counted for majors. Prerequisite: Portuguese 104 or equivalent. 3 hours.
- 300. **Intensive Portuguese for Spanish Speakers.** An accelerated course based on Portuguese-Spanish contrastive analysis; designed to enable students who can already read Spanish to read non-literary and literary works in Portuguese and to develop a modicum of listening comprehension. Prerequisite: Spanish 104 or equivalent, or consent of instructor. 3 hours or ½ unit.
- 304. **Luso-Brazilian Culture.** Affords a broad understanding of the origins of Luso-Brazilian civilization and culture. Prerequisite: Portuguese 212 and 220, or equivalent. 3 hours, or ½ or 1 unit.
- 306. **Brazilian Culture.** Affords a broad understanding of contemporary Brazilian civilization and culture. Prerequisite: Portuguese 212 and 220, or equivalent. 3 hours, or ½ or 1 unit.
- 310. **Studies in Brazilian Literature.** Prerequisite: Consent of instructor. 3 hours or ¾ unit.
- 320. **Studies in Portuguese Literature.** Prerequisite: Consent of instructor. 3 hours or ¾ unit.
- 360. **Principles of Language Testing.** Same as English as an International Language, French, German, Italian, and Spanish 360. See English as an International Language 360.
- 362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 362. See Spanish 362.
- 380. **Classroom Language Acquisition.** Same as English as an International Language, French, German, Italian, and Spanish 380. See Spanish 380.
- 382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.

410. **Seminar in Brazilian Literature.** Advanced study of literary movements, major writers, and intellectual and cultural ideas in Brazilian literature; subject matter varies each time the course is offered. Prerequisite: Portuguese 310 or consent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
420. **Seminar in Portuguese Literature.** Advanced studies on a specific topic, writer, group of writers or literary movement in Portuguese literature; subject matter may vary. Prerequisite: Portuguese 320. 1 unit. May be repeated for credit as topic varies.
450. **Seminar in Portuguese Linguistics.** Detailed study of topics in Portuguese and Brazilian language and linguistics. Prerequisite: Portuguese 300 and 362 and Linguistics 300, or consent of instructor. 1 unit. May be repeated for credit as topic varies.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 462. See Spanish 462.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Italian, Russian, and Spanish 463. See French 463.
471. **Proseminar in Foreign Language Teaching.** Same as Spanish and Italian 471. See Spanish 471.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, German, Italian, Russian, and Spanish 481. See French 481.
495. **Special Topics in Portuguese and Brazilian Literature.** $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** 0 to 4 units.

Romance Linguistics

362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 362. See Spanish 362.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 462. See Spanish 462.

Spanish

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 124). Approval to do so must be obtained from the department.

101. **Elementary Spanish.** For students who have no university credit in Spanish. 4 hours.
102. **Elementary Spanish.** Continuation of Spanish 101. Prerequisite: Spanish 101 at the University of Illinois at Urbana-Champaign. All other second semester Spanish students should enroll in Spanish 122. 4 hours. Credit is not given for both Spanish 142 and 102.
103. **Intermediate Spanish, I.** Continued development of reading, writing, and conversational skills for students who may be interested in pursuing Spanish in more advanced courses. Unlike Spanish 123, Spanish 103 places considerable emphasis on written expression in Spanish. Followed by Spanish 104, or 124, this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
104. **Intermediate Spanish, II.** Continuation of Spanish 103 for students who may be interested in pursuing Spanish in more advanced courses; continued emphasis on written and oral expression and on the reading of advanced texts. Completion of this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 103 or equivalent placement score. 4 hours.
122. **Elementary Spanish.** Second-semester Spanish course for all students who did not take Spanish 101 at this University. Prerequisite: Spanish 101 elsewhere or assignment by placement exam. 4 hours.
123. **Reading and Speaking Spanish, I.** Readings with discussion in Spanish; review and development of grammar essential to competence in reading and speaking. Followed by Spanish 124, this course fulfills the LAS foreign language requirement. Students completing Spanish

- 123 may not enroll in Spanish 104 without departmental approval. Students planning to take advanced courses in Spanish should enroll in Spanish 103. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
124. **Reading and Speaking Spanish, II.** Continuation of Spanish 123. Readings with discussion in Spanish; continued development of conversational skills. This course fulfills the LAS foreign language requirement, but does not serve as a prerequisite for more advanced courses in Spanish without departmental approval. Students planning to take additional courses in Spanish should enroll in Spanish 104. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
125. **Beginning Spanish for Near-Native Speakers.** Introduction to Spanish orthography, syntax and vocabulary for students of Hispanic background who have had little or no formal training in the Spanish language. Prerequisite: Consent of instructor. 4 hours.
127. **Intermediate Spanish for Near-Native Speakers.** Review at the intermediate level of Spanish orthography, syntax, and vocabulary for students of Hispanic background who have little or no formal training in the Spanish language, and an introduction to the study of U.S. Hispanic minority literature. This course fulfills the LAS foreign language requirement. Prerequisite: Spanish 125 or consent of instructor. 3 hours.
141. **Elementary Spanish for Agriculture and Related Fields, I.** Introductory course for students in agriculture and related disciplines interested in acquiring Spanish-language competency for use in the fields of agriculture, foods and nutrition, and rural development; presents basic grammar and vocabulary, scientific terminology, and agricultural and cultural information on the Spanish-speaking areas of the world. 4 hours. Not open to students who have received credit for Spanish 101.
142. **Elementary Spanish for Agriculture and Related Fields, II.** Emphasizes conversation and focuses on Latin America; for students in agriculture, foods and nutrition, and rural development. Prerequisite: Spanish 141 or consent of instructor. 4 hours. Credit is not given for both Spanish 102 and 142.
199. **Undergraduate Open Seminar.** 1-5 hours. May be repeated.
200. **Readings in Hispanic Literature and Culture.** Readings and discussion in Spanish of a variety of texts by leading Hispanic and Hispanic-American writers covering genres and themes; designed to emphasize reading, discussion, and enjoyment rather than literary criticism. Open to non-Spanish majors. Prerequisite: Spanish 104 or equivalent. 3 hours. Credit may be received by Advanced Placement "Language" or "Literature" examination. Does not count for credit toward the major.
210. **Practical Review of Spanish.** Review of major challenges in Spanish grammar, including the verb system (major tenses and moods, morphology, and aspect), areas of contrast with English, and some lexical semantic issues. Prerequisite: Spanish 104 or equivalent. 3 hours.
212. **Advanced Spanish Grammar.** Intensive study and analysis of Spanish grammar including tense, aspect, and mood; morphological problems; syntactic variation; style in oral and written expression; brief discussion of dialectal variation. Prerequisite: Spanish 210; senior standing or consent of instructor. 3 hours. (Counts for advanced hours in LAS).
214. **Spanish Composition.** Basic composition course; problems of written Spanish and principles of Spanish stylistic patterns; weekly written exercises. Prerequisite: Spanish 210 or consent of instructor. 3 hours.
216. **Introduction to Spanish Phonetics.** Practical, introductory course to Spanish phonetics, stressing practice in pronunciation. May be offered as intensive eight-week course. Prerequisite: Spanish 104 or equivalent. 2 hours.
220. **Oral Spanish.** Practice in speaking Spanish; to be taken concurrently with or subsequent to Spanish 210; meets four hours per week. Prerequisite: Spanish 104 or equivalent. 3 hours.
222. **Intensive Spoken Spanish.** Intensive oral contact with Spanish; meets four hours per week. Prerequisite: Spanish 220 or consent of instructor. 3 hours. May be repeated.
225. **Introduction to the Study of Hispanic Literature, I.** Introduction to the literatures of both Spain and Spanish America; emphasizes the major periods and movements in the light of cultural, artistic, social, and historical contexts and the methodology for reading those texts through literary analysis appropriate for a variety of genres: novel, drama, poetry, short

- story, essay; focuses on literature written before 1700. No advanced placement credit. Prerequisite: Spanish 200 and Spanish 210; Spanish 214 recommended. 3 hours. Spanish 225 and 227 must be taken in sequence.
227. **Introduction to the Study of Hispanic Literature, II.** Introduction to the literatures of both Spain and Spanish America; emphasizes the major periods and movements in the light of cultural, artistic, social, and historical contexts and the methodology for reading those texts through literary analysis appropriate for a variety of genres: novel, drama, poetry, short story, essay; focuses on literature written after 1700. No advanced placement. Prerequisite: Spanish 225; Spanish 214 recommended. 3 hours. Spanish 225 and 227 must be taken in sequence.
230. **Introduction to Translation.** Theory and practice of written translations of non-technical texts from English to Spanish and Spanish to English: brief study of concepts and objectives of translation; analysis of examples and exercises; term project in translation selected in consultation with instructor. Prerequisite: Spanish 210. 2 hours.
240. **Culture of Spain.** Survey of Spanish civilization from the beginning to present times. Prerequisite: Spanish 210 and 220, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
242. **Hispanic Literature in the United States.** A survey of literature in English by and about people of Mexican, Puerto Rican, and Cuban descent in the United States. 3 hours.
244. **Hispanic Literature and Culture.** Same as Comparative Literature 244. Topics in major areas of Hispanic literature and culture; topics vary. Will count towards major only to satisfy culture requirement. Taught in English. 3 hours. May not be repeated more than twice for credit.
250. **Spanish Literature, I: Major Works and Writers.** Introduction to selected Medieval and Golden Age texts. Prerequisite: Spanish 214, 225, and 227. 3 hours. (Counts for advanced hours in LAS.)
252. **Spanish Literature, II: Major Works and Writers.** Introduction to selected texts from 1700 to the present. Prerequisite: Spanish 214, 225, and 227. 3 hours. (Counts for advanced hours in LAS.)
254. **Spanish American Literature, I: Major Works and Writers.** Study of major writers and representative works of Spanish American literature from Pre-Columbian times until 1875. Prerequisite: Spanish 210, 214, and 227. 3 hours. (Counts for advanced hours in LAS.)
256. **Spanish American Literature, II: Major Works and Writers.** Study of major writers and representative works of Spanish American Literature from 1875 until the present. Prerequisite: Spanish 210, 214, and 227. 3 hours. (Counts for advanced hours in LAS.)
260. **Introduction to Hispanic Linguistics.** Introduction to Spanish phonology, syntax, sociolinguistics, dialectology, and history of the language; includes an overview and opportunity to examine an issue in each area in detail. Prerequisite: Spanish 210. 3 hours. (Counts for advanced hours in LAS.)
270. **Parateaching.** Same as French, German, Latin, and Russian 270. See French 270.
274. **Spanish Grammar for Communicative Language Teaching.** A survey of major Spanish syntactic and morphological patterns with particular emphasis on the acquisition of Spanish grammar by non-native speakers. Students will develop a sensitivity for appropriate teaching of Spanish grammar. Required for teacher education majors. Prerequisite: Spanish 210 and teacher education major, or consent of instructor. 3 hours.
276. **Teachers Course.** Required for teacher-education majors in Spanish. Prerequisite: Spanish 210 or 220, or consent of instructor. 4 hours.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Russian 279. See Humanities 279.
280. **Spanish for Industry and Commerce, I.** Introduction to vocabulary of Hispanic commerce; composition of business letters and similar texts. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
282. **Spanish for Industry and Commerce, II.** Advanced study of Hispanic commercial vocabulary; composition of commercial correspondence and documentation. Prerequisite: Spanish 280. 3 hours.
284. **Translating and Interpreting for Commercial and International Studies.** Spanish/English and English/Spanish interpretation and technical translation; exercises in translation of tech-

- nical reports and manuals. Prerequisite: Spanish 230 and 280, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
290. **Readings in Spanish.** Reading on a specific topic of Hispanic studies chosen in consultation with an advisor. Prerequisite: Spanish 104 and consent of undergraduate advisor. 2 to 4 hours. May be repeated for credit as topic changes. (Counts for advanced hours in LAS.)
291. **Special Topics for Honors Students.** For candidates for honors in Spanish; intensive study of topics in Hispanic literature or linguistics. Prerequisite: Consent of instructor and of departmental honors advisor. 1 to 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
300. **Introduction to Medieval Spanish Literature.** Historical and cultural background for the Middle Ages; selected readings in medieval literature from the Jarchas to the Corbacho. Prerequisite: Spanish 250 or equivalent. 3 hours or $\frac{3}{4}$ unit.
302. **Medieval Literature.** In-depth study of selected major works of literature through 1550, surveying the principal currents of pertinent scholarship; special emphasis on the position of Spanish medieval literature in the broader context of European literature in both the Latin and the various vernacular languages. Prerequisite: Spanish 300. 3 hours or $\frac{3}{4}$ unit.
310. **Literature of the Golden Age.** A study of authors and genres of the Golden Age. Prerequisite: Spanish 250 or equivalent. 3 hours or $\frac{3}{4}$ unit.
314. **Cervantes: Don Quixote.** Introduction to Don Quixote, to its relationship to other selected masterpieces of the Golden Age, and to the main currents and forms of Golden Age prose. Prerequisite: Spanish 250 or equivalent. 3 hours or $\frac{3}{4}$ unit.
320. **Neoclassicism, Romanticism, Realism.** Study of representative authors and genres of the nineteenth century; particular emphasis on the neoclassical comedy, romantic drama and poetry, and the realistic novel. Prerequisite: Spanish 250 and 252 or equivalent. 3 hours or $\frac{3}{4}$ unit.
322. **Spanish Literature from 1898 to 1939.** Study of representative authors of the Generations of 1898 and 1927 with particular emphasis on literary experimentalism (symbolism, impressionism, surrealism, etc.) and the historical and ideological currents of the period as related to Spanish literature. Prerequisite: Spanish 252 or equivalent. 3 hours or $\frac{3}{4}$ unit.
324. **Contemporary Spanish Literature.** Study of the representative authors, genres, and literary modalities in the literature of Spain since the Spanish Civil War; particular emphasis on the neo-realist, existentialist (*tremendista*) novel, and the social novel and theatre, as well as on social and experimental trends in all genres since the mid-1960's and in the post-Franco era. Prerequisite: Spanish 252 or equivalent. 3 hours or $\frac{3}{4}$ unit.
330. **Colonial Spanish American Literature.** Intensive study of Colonial Spanish American literature from the chronicles through the literature of Emancipation; topics include the development of genres and their adaptations, presence of indigenous cultures, contrastive poetics, relationship of socioeconomic and literary development and independence. Prerequisite: Spanish 254 or equivalent. 3 hours or $\frac{3}{4}$ unit.
340. **Spanish-American Novel.** Major movements and writers in the development of the Spanish-American novel from its beginnings to the present. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
342. **Spanish-American Drama.** Intensive and analytical study of the works of principal playwrights of the modern and contemporary periods in Spanish America. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
344. **Spanish-American Short Story.** Intensive and analytical study of the principal *cuéntistas* of Spanish America. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
346. **Spanish-American Poetry.** Major poets and movements in the development of Spanish-American poetry from the Colonial Period to the present. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
350. **Introduction to Spanish Linguistics.** Introduction to the study of language as a formal object and a communicative code using Spanish as a data base; development of Spanish phonology, morphology, syntax, and semantics; consideration of pragmatic and sociolinguistic dimensions. Prerequisite: Spanish 212, 216, and 260, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
352. **Spanish Syntax.** Systematic introduction to the foundations of Spanish syntax based on standard and more recent treatments of Spanish and syntactic theory. Prerequisite: Spanish 350. 3 hours or $\frac{3}{4}$ unit.

354. **Spanish Phonology.** Systematic introduction to the sound structures of Spanish, concentrating on recent contributions of theoretical linguistics to the understanding of the phonology of Spanish in its standard and selected dialectal varieties. Prerequisite: Spanish 350. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, German, Italian, and Portuguese 360. See English as an International Language 360.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 362. Comparative and historical analysis of the Romance languages. Prerequisite: Four semesters of a Romance language or Latin, or equivalent. 3 hours or $\frac{3}{4}$ unit.
364. **History of the Spanish Language.** 3 hours or $\frac{3}{4}$ unit.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, German, Italian, and Portuguese 380. Provides for an introduction to the context, process(es), and product of classroom language acquisition; emphasis is placed upon research, research findings, and implications of research. Prerequisites: Humanities 279, Linguistics 200, or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Portuguese, and Slavic 382 and Linguistics 386. See Humanities 382.
390. **Topics in Hispanic Studies.** Topical studies of Hispanic literature or linguistics beyond the scope of regular offerings at the 300-level. Prerequisite: Corresponding introductory course at the 300-level, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated as topics change to a maximum of 9 hours or 2 $\frac{1}{4}$ unit.
399. **Study Abroad.** Lectures, seminars, and practical work in Spanish language, literature, and civilization in Spain. Prerequisite: Spanish 200, 225, and 227, or 220 and 222, or equivalent. 0 to 18 hours, or 0 to 3 units.
400. **Beginning Spanish for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Spanish for Graduate Students.** Continuation of Spanish 400; special readings in the critical literature of several disciplines. Prerequisite: Spanish 400 or consent of instructor. 4 hours. No graduate credit.
404. **Seminar in Medieval Literature.** Research work in medieval Spanish literature; theory and practice. Topics vary. Prerequisite: Spanish 300, 302, or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
410. **Seminar in Golden Age Literature.** Same as Comparative Literature 404. Prerequisite: Spanish 310 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
420. **Seminar in Modern Spanish Literature.** Study of problems in the works of a major writer or group of writers of the eighteenth or nineteenth centuries. Prerequisite: Spanish 320. 1 unit. May be repeated for credit as topic varies for a maximum of 2 units.
422. **Seminar in Twentieth-Century Spanish Literature.** Investigation of literary problems presented by the Spanish novel, drama, poetry and/or essay since 1900. Prerequisite: Spanish 324 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
430. **Seminar in Spanish-American Novel.** Same as Comparative Literature 462. Special problems in methodology and research; includes other prose fiction. Prerequisite: Spanish 340 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
432. **Seminar in Spanish-American Poetry.** Prerequisite: Spanish 346 or equivalent. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
440. **Seminar in the History of Ideas.** Major topics in Hispanic intellectual history; sample topics include *El ensayo como Genero instrumental de las ideas*; *El peso de la identidad cultural*, *Corrientes ideologicas coloniales*, and *Idealismo y realismo*. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
442. **Seminar in Special Topics of Hispanic Literature.** Selected topics in Hispanic literature not previously covered in existing courses. 1 unit. May be repeated for credit as topic varies to a maximum of 4 units.
450. **Seminar in Spanish Synchronic Linguistics.** Selected topics of Spanish phonology and syntax in the light of present-day linguistic theory. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.

452. **Seminar in Spanish Diachronic Linguistics.** Selected topics on the development of Spanish and its dialects in the light of present-day historical methods. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topic varies to a maximum of 2 units.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 462. Selected topics in comparative Romance linguistics. Prerequisite: Spanish 362 and consent of instructor. 1 unit. May be repeated as topic varies.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Russian, Italian, and Portuguese 463. See French 463.
471. **Proseminar in Foreign Language Teaching.** Same as Italian and Portuguese 471. An in-depth exploration of fundamental concepts in foreign language teaching; designed for departmental Teaching Assistants; topics include classroom discourse, teaching approaches, reading, listening, writing, and principles of language testing. Prerequisite: Teaching assistantship in the Department of Spanish, Italian, and Portuguese, or consent of instructor. 1 unit.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Italian, Portuguese, and Russian 481. See French 481.
495. **Special Topics in Spanish.** ½ or 1 unit.
499. **Thesis Research.** 0 to 4 units.

SPECIAL EDUCATION

Acting Head of Department: Adelle Renzaglia

Department Office: 288 Education Building, 1310 South Sixth, Champaign

117. **Exceptional Children.** Introduction to the study of children who deviate from the average in mental, physical, and social characteristics, including a study of the characteristics of such children and the adaptation of educational procedures to their abilities and disabilities. Prerequisite: Sophomore standing or Psychology 100. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
218. **Exceptional Students in Secondary Schools.** Introduction to the education of handicapped students in secondary schools, covering the legal bases for special education, the historical treatment of handicapped high school students, and modifications in teaching methods to meet specific learning or behavior difficulties. 1 hour.
249. **Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
307. **Special Needs Students in Secondary Schools.** Examines characteristics, assessment, and methodology of teaching handicapped students in regular classrooms of the secondary schools; major emphases include informal assessment procedures, modification of materials, and individualization of instruction. Prerequisite: Registration in a secondary education teacher certification program, or consent of instructor. 3 hours, or ½ or 1 unit.
308. **Teaching Students with Learning and Behavior Problems in the Regular Classroom.** Examines the role of the regular classroom teacher in educating students with mild learning and behavior problems; topics include: identifying and describing learning and behavior problems, classroom behavior management techniques, remediation of academic skill deficits, and measuring and evaluating pupil progress. 3 hours or 1 unit.
309. **Vocational Education for Special Needs Learners.** Same as Vocational and Technical Education 309. See Vocational and Technical Education 309.

314. **Applications in Assessment of Young Exceptional Children.** Practice in designing and applying assessment devices and procedures and in using them to make educational decisions for handicapped children, birth through kindergarten age. Prerequisite: Credit or concurrent registration in Special Education 324; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
316. **The Gifted Child in School and Society.** A consideration of the gifted in society; who they are, their physical, psychological, social, and educational characteristics, and society's needs and provisions for them. The major portion of the course is devoted to the consideration and evaluation of instructional and administrative adjustments that should be made for the gifted in the educational structure. Prerequisite: Educational Psychology 211 or 236. 3 hours, or $\frac{1}{2}$ to 1 unit.
322. **Introduction to Mental Retardation.** Same as Psychology and Social Work 322. Study of the social, emotional, physical, and learning characteristics and problems of mentally handicapped children; identification and diagnosis; available services and provisions; and educational programs and lifelong problems and adaptations for these individuals and their families. Prerequisite: Psychology 100. Special Education 117, or equivalent. 3 hours or $\frac{1}{2}$ or 1 unit.
324. **Tests and Measurements in Special Education.** Interpretation of norm- and criterion-referenced tests for special populations; examines selection and design of observation systems; applies measurement assessment data to making instructional decisions for handicapped infants, youth, and young adults. 2 hours or $\frac{1}{2}$ unit.
332. **Characteristics and Methods of Educating the Multiply Handicapped.** Studies the physical and developmental characteristics of multiply handicapped individuals; places special emphasis upon individuals with cerebral palsy and other physical handicaps; reviews methods of educational interventions and requires demonstration of competencies in rudimentary physical management of multiply handicapped individuals. 3 hours or 1 unit.
335. **Behavior Analysis for Teachers: Applications with Exceptional Individuals.** Prepares students to remediate behavior problems of exceptional students and adults using applied behavior analysis techniques; teaches students to define, observe, and record behavior, to chart and evaluate behavior, and to apply behavioral procedures to remediate classroom behavior problems. 3 hours, or $\frac{1}{2}$ or 1 unit.
336. **Systematic Instruction for Students with Special Needs.** Elements of data-based instruction emphasizing educational planning for individuals with special needs; includes task and developmental analysis, writing instructional programs, and individualization of instruction. Covers infancy to young adults; mild to severe degrees of handicap. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 4 hours or 1 unit.
337. **Curriculum Development and Classroom Organization for Students with Moderate and Severe Handicaps.** Studies curriculum design, development, and adaptation for students with moderate and severe handicaps; studies the following basic curriculum areas: domestic/home living, self-care, socialization, community living, leisure and recreation, and functional academics; and emphasizes throughout the course the evaluation of curriculum and program effectiveness. Prerequisite: Special Education 336. 4 hours or 1 unit.
338. **Families of Children with Special Needs.** Studies the impact on their families of children with special needs; models for the study of family systems are applied to understanding families of special needs children; emphasis on planning family-focused interventions and exploring strategies for working with parents in a variety of settings. Prerequisite: Practicum experience or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Vocational and Technical Education 345. Provides students with an orientation to a behavioral approach to vocational training for handicapped adolescents and adults; topics include training, managing and evaluating vocational behavior, total service planning, and competitive employment placement and follow-up. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 3 hours or 1 unit.
359. **Workshop and Laboratory in Curriculum and Methodology.** An intensive exploration of curriculum development in specialized areas of education. Requests for initiation of course sections are made by faculty or students. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
365. **Intervention Issues and Practices with Young Children with Disabilities.** Introduction to the field of early childhood special education, including its history and major issues; instructional methods used in teaching and facilitating development in young children with disabilities.

- ities are covered in depth. Prerequisite: Concurrent registration in Special Education 424 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
410. **Law and the Handicapped.** Studies the legal rights of handicapped and disabled individuals with special emphasis on educational aspects; examines the inter-relationship of constitutional law, statute law, administrative law, and case law at the federal, state, and local levels. 1 unit.
411. **Drugs in Special Education.** Psychoactive drugs are used extensively with children in special education; this course involves a general survey of reasons for the prescription, behavioral effects as observed in the classroom, effects on the child's behavior at home, issues concerning the use of the drugs, and litigation about these issues. 1 unit.
417. **Programs for Special Students.** Introduces special education: characteristics, assessment, and teaching methodology for students with learning and other handicaps; methodology is directed to the regular classroom teacher of special students. Prerequisite: Provisional teaching certification or completion of student teaching; or consent of instructor. 1 unit.
420. **The Social Psychology of the Handicapped.** Same as Rehabilitation Education 420. See Rehabilitation Education 420.
421. **Administration and Supervision of Special Education.** Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs; examination of administrative and supervisory practices in educating exceptional children with emphasis on special education programs in the public schools; and application of administrative theory to special education programs. Field trips to observe and evaluate programs are required. Prerequisite: Special Education 417: Administration, Higher, and Continuing Education 450. 1 unit.
422. **Theories of Academic Remediation.** Examines major theoretical approaches in the field of learning disabilities and critically evaluates them in light of research; topics include: definitions of learning disabilities, assessment and remediation strategies, critical evaluation of research, and issues in the field of learning disabilities. 1 unit.
424. **Supervised Practice in Special Education.** Supervised practice in one or more settings in which either mildly or severely impaired students are served; practicum settings may include day, residential, special, and regular schools which serve handicapped students. Prerequisite: Admission to the graduate program in special education; consent of supervising faculty member. 1 to 2 units.
425. **Principles and Practices of Resource Consulting Teaching.** Data-based instruction in a direct service setting; emphasizes provision of indirect (consultation) services to regular classroom teachers. Prerequisite: One semester of Special Education 424. 1 unit.
426. **Theories and Practice of Consultation for Special Educators.** Focuses on aspects of resource consulting teacher services which go beyond direct instruction services; emphasizes training resource room teachers to work as consultants to regular classroom teachers, parents and paraprofessionals. Students complete a series of consultation projects. 1 unit.
438. **Interdisciplinary Team Approaches to Planning and Intervention for Special Needs Children.** Study of roles and functions of teams in special education service delivery; considers models of team process within and between service settings; explores dynamics of interaction on teams including approaches to decision-making, communication, and conflict resolution; examines professional roles and tasks of team members in the intervention process. Prerequisite: Practicum experience or consent of instructor. $\frac{1}{2}$ or 1 unit.
448. **Mental Retardation in the Community.** Seminar on the integration of mentally handicapped adults into community settings; topics include legal, empirical, and ideological factors in the selection of residential, day-service, and recreational alternatives for the institutionalization and deinstitutionalization of mentally handicapped individuals. Prerequisite: Special Education 322. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department head prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department head.

456. **Problems and Trends in Special Education.** Introduces significant problems, points of view, and trends in the field concerned; explores significant research related to organization, content, and techniques in the field in question. Students are encouraged to make special studies in approved areas. 1 to 2 units.
465. **Development and Characteristics of Young Children with Special Needs.** Examines the major handicapping conditions found in young children, birth - six, with a focus on the impact of these handicaps on development; briefly examines interventions used by a variety of professions in addressing specific developmental needs of children with a variety of handicaps. Prerequisite: Educational Psychology 236 or equivalent. $\frac{1}{2}$ or 1 unit.
466. **Early Childhood Special Education: Organizing for Early Intervention.** Discusses program issues and research in relation to the efficacy of various program models for young children with special needs; draws particular implications for program organization variables such as space, personnel roles, and curriculum; covers infancy to six. Prerequisite: Special Education 365, and concurrent enrollment in Special Education 424 or consent of instructor. $\frac{1}{2}$ or 1 unit.
483. **Single Subject Research Design.** Same as Educational Psychology 483. Studies research designs that require one or a few subjects; discusses issues of the validity of treatment comparisons and generalizability of results; and presents several statistical approaches for testing a priori hypotheses. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in the education of exceptional children; open only to persons who have been admitted for doctoral study. Sections may be offered in the following fields: (d) program planning and orientation; and (t) teacher education. 0 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
492. **Concepts and Issues in Special Education, I.** Studies the delineation of roles and competencies for leadership positions; includes literature critique, and preparation and presentation of a major review paper in an area of research interest. Prerequisite: Admission to doctoral studies in Special Education, or consent of instructor. 1 unit.
493. **Concepts and Issues in Special Education, II.** Seminar in current concepts and issues relating to all exceptional children; includes presentations by experts in sub-specialties of the field; requires critical review of key readings and preparation of papers synthesizing lectures, discussions and readings. Prerequisite: Special Education 492 or consent of instructor. 1 unit.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

SPEECH AND HEARING SCIENCE

Acting Head of Department: Marlyn O'Neill
Department Office: 901 South Sixth, Champaign

102. **Human Communication: Systems, Processes, and Disorders.** Examines broad perspectives of theories and information regarding normal and abnormal communication: how speech and language develop, how people hear, how they produce speech and what can go wrong; addresses the impact of speech and hearing science on society, culture, and modern technologies. 3 hours.
105. **Voice and Articulation.** Same as Speech Communication 105. Basic factors of voice and speech sound production; analysis of faults that result in minor speech deviations or inadequacies; and individual analysis and guided practice toward improvement of speech habits. 2 hours.
198. **Freshman Seminar.** A special experimental seminar or independent study course intended to cover topics not treated by regular course offerings; open to undergraduates at any level.

Requests for activation of this course may be made by students or by faculty and should be directed to the head of the academic department concerned. While credit toward graduation is normally granted, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. 0 to 9 hours. May be repeated.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **General Phonetics.** Same as Speech Communication 201. Basic principles of phonetic study; includes observation and representation of pronunciation, ear training, and practice in transcription. 3 hours, or $\frac{1}{2}$ or 1 unit.
260. **American Sign Language.** Same as Linguistics and Psychology 260. See Psychology 260.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Ten hours of speech and hearing science, and written approval by the faculty members who will supervise the student's work. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
291. **Honors Course.** Individual study leading either to a thesis or to departmental honors. Prerequisite: Senior standing; a grade point of 4.0 or consent of the head of the department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
302. **Manual Communication, I.** Study of methods of manual communication with hearing impaired individuals; analysis of the language of signs and finger spelling in relation to origins, development, and structure; and extensive practice in manual communication. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
303. **Manual Communication, II.** Continuation of Speech and Hearing Science 302; an in-depth study of manual methods of communicating with hearing impaired individuals; particular emphasis on development of fluency in communicating with language-deficient deaf children and adults; and extensive practice in idiomatic language of signs. 2 hours or $\frac{1}{2}$ unit.
310. **Effects of Noise.** Presents the effects of noise (industrial, recreational, and transportation) on the individual and the community. Topics include methods of measuring noise, the physiological and psychological effects of noise; methods of abatement and hearing conservation; and legal aspects of noise damage and noise control. 3 hours or $\frac{1}{2}$ unit.
348. **Speech and Language Clinical Methods in the Schools.** Same as Elementary and Early Childhood Education 348. Study of methods and materials used in the schools by the speech and language clinician. Prerequisite: Speech and Hearing Science 388. 3 hours or $\frac{1}{2}$ unit.
375. **Speech Science, I.** Same as Speech Communication 375 and Linguistics 375. Introduction to the anatomic and physiologic characteristics of the normal speech and hearing mechanisms. 4 hours or 1 unit.
376. **Speech Science, II.** Same as Speech Communication 376 and Linguistics 376. Consideration of the physiology of the speaking act, the acoustical characteristics of voice and of speech sounds, and the hearing of speech. Prerequisite: Consent of instructor. 4 hours or 1 unit.
378. **Hearing Science.** Acoustics, anatomy, and physiology of the auditory system; psychophysical methods; and a consideration of auditory theories and mechanics. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
383. **Development of Spoken Language.** Same as Speech Communication 383. Study of the correlates of language development from the prelinguistic period to adulthood. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **Introduction to Stuttering.** Study of the theoretical and research literature concerning the causes, diagnosis, and treatment of stuttering and an analysis of clinical procedures in stuttering therapy. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **Speech Pathology, I.** A study of the symptoms, causes, and treatment of articulation disorders. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
386. **Language Disorders in Children.** Definition, etiology, and description of various types of language disorders in children; assessment and intervention of these clinical cases. Prerequisite: Consent of instructor. 3 hours or 1 unit.
387. **Basic Principles in Speech Pathology.** Discussion, demonstration, and practice of clinical approaches used with speech and language disorders. Prerequisite: Speech and Hearing Science 385, 388, and 389. 5 hours or 1 unit.
388. **Speech Pathology, II.** A study of the symptoms, causes, and treatment of voice disorders. Prerequisite: Speech and Hearing Science 385 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

389. **Appraisal in Speech Pathology.** Introduction to principles of diagnosis; discussion of administration, scoring, and interpretation of tests utilized during speech and language evaluation. Prerequisite: Speech and Hearing Science 383 and 385, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
390. **Introduction to Hearing Disorders and Audiometry.** Review of the history of audiology as a profession; study of symptoms, causes, and treatment of hearing losses; and principles and application of basic audiometry. 4 hours or 1 unit.
392. **Diagnosis of Hearing Impairments in Infants and Young Children.** Symptoms and causes of hearing impairment in young children; practice in procedures used for the measurement of residual hearing; and the selection and use of hearing aids. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
393. **Aural Habilitation and Rehabilitation.** Principles and methods of clinical and classroom retraining of the hard-of-hearing; includes lip reading, auditory training, speech disorders and conservation, and counseling. Required in curriculum of teacher training in speech and hearing science. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
398. **Practicum in Audiology.** Observation, practice, and research in diagnosis and rehabilitation of auditory disorders. Students may repeat either Speech and Hearing Science 387 or 398, but not both, for 3 hours. Prerequisite: Speech and Hearing Science 389 and 393. 3 hours or $\frac{1}{2}$ unit.
399. **Design and Analysis of Experiments in Speech and Hearing Science.** An introduction to experimental designs and methods of statistical analysis in speech and hearing research. Prerequisite: Graduate standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
401. **Applied Phonology.** A survey of basic knowledge concerning normal and deviant phonological development, and principles for applying this knowledge to the assessment and remediation of phonological disorders. Prerequisite: Consent of instructor. 1 unit.
418. **Communication and Language Problems of the Hearing Impaired, I.** An advanced course in the problems and procedures involved in the acquisition of language and communication by persons with severe hearing impairment, particularly those with profound prelingual deafness; emphasis on research and measurement in the development of speech, speechreading, residual hearing, reading, written language, and manual communication, including finger spelling and the language of signs; and stress on the applications of recent approaches in linguistics and psycholinguistics to language development. Prerequisite: Consent of instructor. 1 unit.
475. **Experimental Phonetics, I.** Same as Linguistics 475. Theoretical consideration of speech as motor behavior; special reference to physiological investigations of normal respiration, phonation, and articulation; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
476. **Experimental Phonetics, II.** Same as Linguistics 476. Theoretical consideration of speech as an acoustical phenomenon; special reference to acoustical investigations of voice and speech sounds; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
481. **Seminar in Neuropathologies of Speech and Language.** Advanced study of speech, vocal, and linguistic problems associated with cerebral palsy and aphasia; topics offered in rotation, one or two each semester, include neurological aspects, aphasia, and cerebral palsy. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
482. **Seminar in Stuttering.** Advanced study of stuttering disorders; topics vary, but emphasis is placed on measurement, clinical evaluation, and therapeutic methods. Prerequisite: A course in stuttering. 1 unit.
483. **Psychology of Speech and Hearing Disorders, I.** Same as Psychology 483. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to speech disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
486. **Advanced Clinical Techniques in Speech and Hearing.** Semi-independent management of complex cases; participation in examination and analysis; topics offered each semester include theory of clinical practice, speech pathology, audiology, language disorders, and field study. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.
489. **Seminar in Orofacial Anomalies and Laryngeal Pathologies of Speech.** Advanced study of speech and vocal problems associated with cleft palate, laryngeal dysfunctions, and facial-

maxillary disturbances; topics offered in rotation, one each semester, include cleft palate and vocal problems. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.

490. **Medical Aspects of Speech Disorders and Audiology.** Study of acute and chronic hearing and speech disorders traceable to disease of the ear and vocal mechanisms in relation to the techniques and philosophies utilized in a medically oriented environment. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
491. **Seminar in Hearing Disorders.** Principles and methods of clinical management of all types of hearing disorders; survey of current literature and research. The following topics are offered in rotation, one or two each semester: automatic audiometry, aural rehabilitation, and hearing aids and amplification. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
492. **Advanced Audiology.** Advanced study of rationale and development of principles associated with special techniques, procedures, and methods used in audiology. 1 unit.
495. **Special Problems.** Investigation of speech and hearing projects not included in theses. Prerequisite: Consent of head of the department. $\frac{1}{2}$ to 2 units.
496. **Proseminar in Speech and Hearing Science.** Required seminar for all graduate students; involves reporting of ongoing research of faculty, visiting researchers, and students. 0 units.
499. **Thesis Research.** Individual research in the various areas of speech and hearing science. 0 to 4 units.

SPEECH COMMUNICATION

Head of Department: J. G. Delia

Department Office: 244 Lincoln Hall, 702 South Wright, Urbana

101. **Principles of Effective Speaking.** Preparation and presentation of short informative and persuasive speeches; emphasis on the selection and organization of material, methods of securing interest and attention, and the elements of delivery. 3 hours. Credit is not given for both Speech Communication 101 and either 111 or 112.
102. **Introduction to Speech Communication.** Survey of the questions probed, the methods employed, and the current status of knowledge in the speech communication discipline; provides opportunities to understand the range of concerns and to explore specific areas of interest of the field. 4 hours.
105. **Voice and Articulation.** Same as Speech and Hearing Science 105. See Speech and Hearing Science 105.
107. **Parliamentary Procedure.** Principles and practice of parliamentary procedure. 2 hours.
111. **Verbal Communication.** Principles and practice in communication; stress on fundamentals of exposition in writing and speaking. The University rhetoric requirement is fulfilled by this course in conjunction with Speech Communication 112. 3 hours. Credit is not given for both Speech Communication 111 and 101. Students with credit in Speech Communication 112 may not receive additional credit for Rhetoric 105 and 108.
112. **Verbal Communication.** Theory and practice of communication; stress on deliberation and fundamentals of persuasion through speaking and writing. The University rhetoric requirement is fulfilled by this course. Prerequisite: Speech Communication 111. 3 hours. Credit is not given for both Speech Communication 112 and 101.
113. **Group Discussion and Conference Leadership.** Study of leadership, group process, and interpersonal relations in the small group, conference, and the public forum; emphasis on practice in leading and participation in various types of public discussion and conference, with materials drawn from current public questions. Prerequisite: Sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours.

120. **Advanced Oral Communication.** Advanced principles of speech preparation and presentation; special problems and types of speeches; and considerable practice in composition and delivery of speeches. Prerequisite: Speech Communication 101 or equivalent. 3 hours.
123. **Public Discussion and Debate.** Study of and participation in public discussion and debate with emphasis on thorough preparation and research, principles of analysis, reasoning, evidence, and persuasive presentation of well-founded convictions; previous debate experience not required. 3 hours.
141. **Oral Interpretation.** Same as Theatre 180. Oral reading for understanding, appreciation, and communication. 3 hours.
142. **Group Oral Interpretation of Literature.** Same as Theatre 181. Study of modern modes of group presentation of literature; emphasis on practice in script preparation, directing, and performance in chamber theatre and readers' theatre. Prerequisite: Speech Communication 141 or consent of instructor. 2 hours.
161. **Fundamentals of Acting.** Same as Theatre 170. See Theatre 170.
177. **The Arts of Public Discourse.** The nature and forms of practical and artistic public speech, including adaptations for the mass audience. 4 hours.
178. **The Arts of the Theatre and Interpretative Speech.** The nature and forms of performing speech arts of theatre, interpretation, and film, including adaptations for the mass audience. 4 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors concentrators or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors advisor. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **General Phonetics.** Same as Speech and Hearing Science 201. See Speech and Hearing Science 201.
203. **Dramatics for Teachers.** Survey of methods and procedures of play production in the secondary school. 3 hours.
204. **Speech for Teachers.** A course in teaching methods designed for prospective teachers who are non-speech communication majors; discussion of methods and materials available for teaching speech and directing extracurricular speech activities. 3 hours.
207. **The Art of the Screen: Humor.** Study of selected comedies and other specimens of film and television humor in relation to theories of humor. Prerequisite: Consent of instructor. 3 hours.
208. **Ideology and the Rhetoric of Film.** Examines the nature and communicative functions of the ideological content of narrative cinema, with emphasis on the Hollywood film; considers ideological dimensions of film as communication, explicit and implicit ideological dimensions of the Hollywood social problem film, relationship of genre and ideology, and the ideology of the institution of cinema. Prerequisite: Sophomore standing and one course in speech communication or film. 3 hours.
210. **The Rhetorical Tradition.** Survey of major trends in the development of rhetorical theory from Homer to the present. 3 hours. (Counts for advanced hours in LAS.)
211. **Business and Professional Speaking.** Study, preparation, and presentation of the chief types of business speeches; special attention to conferences, sales talks, interviews, and job applications. Prerequisite: Speech Communication 101. 2 hours.
213. **Persuasion and the Arts.** Introduction to the study of narrative films, theatre, fiction, and poetry as vehicles of indirect and overt persuasion. 3 hours.
221. **Persuasion.** Study of the processes of motivation as applied to speeches intended to influence group opinion and action; practice in the preparation and delivery of short persuasive speeches. Prerequisite: Speech Communication 101; junior standing. 3 hours. (Counts for advanced hours in LAS.)
223. **Argumentation: Theory and Practice.** Study of the theory of argument, e.g., evidence, reasoning, and construction of briefs; practice in formal and informal forms of debate and public discourse on current public questions. Prerequisite: Speech Communication 101; sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
230. **Interpersonal Communication.** Study of communication theory and its application to interpersonal relations; extensive discussion of problems of conflict and misunderstanding in personal affairs to facilitate the development of knowledge, insights, and skills in the processes of face-to-face interaction. Prerequisite: Speech Communication 101 and sophomore stand-

- ing; by permission of the head of the department, the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
243. **The Oral Interpretation of Shakespeare.** Analysis and oral presentation of selections from Shakespeare's plays. Prerequisite: Junior standing; Speech Communication 141. 2 hours. (Counts for advanced hours in LAS.)
247. **Teaching of Speech.** Same as Curriculum and Instruction 247. See Curriculum and Instruction 247.
252. **The Rhetoric of Dissent.** A study of the rhetorical strategies and tactics employed in selected cases of dissent in American political and social life. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
253. **Case Studies in Public Discourse.** Detailed examination of selected cases of significant public discourse. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
254. **Freedom of Speech and the Ethics of Speech Communication.** Examination of the nature and variety of responses to value questions concerning communication; includes a survey of the evolution of and current controversies in freedom of speech. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
255. **Directing; Script Preparation.** Same as Theatre 281. See Theatre 281.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.25; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
291. **Honors Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Individual study leading to a thesis for honors in the Department of Speech Communication. Prerequisite: Senior standing; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
296. **Special Topics in Speech Communication.** Special topics in speech communication not treated in regularly scheduled courses. See *Timetable* for current topics. Prerequisite: Sophomore standing and one course in speech communication; or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
308. **The Art of the Screen: Exposition and Persuasion.** Same as Communications 308. Critical study of the application of the eclectic principles of the screen narrative to the transmission of information and the influencing of attitude, opinion, and action; lectures, discussions, and reports; viewing of selected films and television programs. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
313. **Interpersonal Communication: Discussion and Interview.** Advanced study of theory, research, techniques, and training methods in interviewing and group discussion; emphasis on empirical research findings concerning communication processes in face-to-face groups. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
315. **Greek, Roman, and Medieval Rhetorical Theory.** Same as Classical Civilization 315. Examination of the development of rhetorical theory, criticism, and pedagogy in Western thought; analysis of the contributions of major figures and works from Homer to the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
317. **Contemporary Rhetorical Theory.** Coverage of the major contributors to rhetorical theory from James and Winans to the present. 3 hours, or $\frac{1}{2}$ or 1 unit.
319. **Studies in Russian and East European Cinema.** Same as Communications and Slavic 319. See Slavic 319.
320. **Argumentation and Public Decision Making.** Study of the philosophical, logical, and psychological bases of public decision making through discussion and debate. Prerequisite: Speech Communication 223 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
321. **Theories of Persuasion.** Survey of theories of persuasion derived from rhetorical, philosophical, and psychological sources and their application to persuasive discourse. Prerequisite: Speech Communication 221 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.

322. **Renaissance and Modern Rhetorical Theory.** Significant movements in the development of rhetorical theory in England, France, and America from 1500 to the present. Prerequisite: Senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
323. **Rhetorical Criticism.** Methods of interpreting and judging persuasive discourse with emphasis on political speaking and writing; lectures and practice in criticism. Prerequisite: Credit or concurrent registration in Speech Communication 322 or 350. 3 hours, or $\frac{1}{2}$ or 1 unit.
324. **Persuasion in the Campaign and Movement.** Consideration of factors central to the sustained persuasive campaign or movement; special attention to the nature and functions of persuasion in the political campaign. Prerequisite: Speech Communication 221 or 321, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
329. **Language of Religion.** Same as Religious Studies and Linguistics 329. See Religious Studies 329.
332. **Women and Language.** Same as Linguistics and Women's Studies 332. Study of actual and perceived differences and similarities in the use of language by women and by men; emphasizes the social contexts of speech. Prerequisite: A course in speech communication or linguistics, or equivalent. 3 hours or 1 unit.
335. **Interpersonal Communication Processes.** Same as Communications 335. Study of the major processes involved in an individual's adjustment to the communication situations of everyday life; emphasis on the development of interpersonal competency and orientations, social perception, interpersonal sentiment and hostility, trust, and the social context as factors influencing the understanding and evaluation of interpersonal messages. 3 hours, or $\frac{1}{2}$ or 1 unit.
342. **Oral Interpretation of Poetry.** Analysis and oral presentation of literature representative of various poetic forms. Prerequisite: Speech Communication 141. 3 hours, or $\frac{1}{2}$ or 1 unit.
344. **Criticism of the Oral Interpretation of Literature.** Examination of theories of aesthetics and practical criticism and their application to the criticism of specific examples of the oral performance of literature. Prerequisite: Speech Communication 141 or graduate standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
345. **Oral Interpretation of Prose Fiction.** Same as Theatre 376. Modern concepts underlying the relationship of interpretation to the reader's experience of literature; discussions, reports, and oral interpretations of prose forms (including chamber theatre and readers' theatre). Prerequisite: Speech Communication 141 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
350. **Selected Topics in the History and Criticism of Public Discourse.** Study of selected periods and genres of public discourse in historical context, including British, American, French, Russian, German, Chinese, and Japanese. Prerequisite: One course in rhetorical criticism or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated with different content to a maximum of 12 hours or 4 units.
353. **Criticism of Contemporary Public Discourse.** Rhetorical criticism of selected aspects of contemporary public communication. 3 hours, or $\frac{1}{2}$ or 1 unit.
374. **Introduction to Empirical Research Methods in Speech Communication.** Introduction to descriptive and experimental methods in speech communication; intended to produce understanding and critical evaluation of research designs. 3 hours or $\frac{1}{2}$ unit.
375. **Speech Science, I.** Same as Linguistics and Speech and Hearing Science 375. See Speech and Hearing Science 375.
376. **Speech Science, II.** Same as Linguistics and Speech and Hearing Science 376. See Speech and Hearing Science 376.
383. **Development of Spoken Language.** Same as Speech and Hearing Science 383. See Speech and Hearing Science 383.
387. **Introduction to Myth and Folklore.** Same as Comparative Literature, English, German and Slavic 387. See English 387.
396. **Combined Undergraduate/Graduate Seminar.** Seminar on advanced topics in speech communication not treated in regularly scheduled courses; see *Timetable* for current topics. Prerequisite: Junior standing and two courses in speech communication, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
400. **Studies in Dramatic Form and Structure.** Same as Theatre 401. See Theatre 401.
403. **Seminar for Teachers of Speech.** Investigation of current principles, materials, and developments in the field of speech communication and of their relationship to the teacher. 1 unit.

417. **Contemporary Viewpoints in Speech Communication Theory.** Same as Communications 417. A readings seminar comparing the principal approaches to communication and rhetorical theory in the twentieth century along with a consideration of their philosophical assumptions. 1 unit.
429. **Seminar in Speech Communication.** Special topics in speech communication. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
430. **Contemporary Theories of Oral Communication.** Systematic study of speech making and discussion as related to contemporary views of communication; examination of the theoretical literature and experimental evidence. Prerequisite: Consent of instructor. 1 unit.
436. **Seminar in Theories and Procedures of Discussion.** Intensive examination of selected problems of communication in small, task-oriented groups; evaluation of special instrumental forms, such as the unstructured group, the work group, the panel, and the lecture-forum; critical analysis of recent research in group communication as a means of making decisions and of changing attitudes and behavior. Prerequisite: Speech Communication 313 or equivalent. 1 unit.
437. **The Analysis of Interpersonal Interaction.** Same as Communications 437. Exploration of theory, methodology, and empirical findings of descriptive and experimental approaches to the analysis of verbal and nonverbal interaction processes, in both laboratory and naturalistic settings. Prerequisite: Speech Communication 335 or consent of instructor. 1 unit.
438. **Seminar in Rhetorical Theory.** Study of special topics in the history of rhetorical theory. 1 unit. May be repeated for a maximum of 4 units.
465. **Seminar in Theatre Art.** Same as Theatre 407. See Theatre 407.
468. **Seminar in Theatre History.** Same as Theatre 406. See Theatre 406.
469. **Seminar in the Stage History of Classic English Plays.** Same as English 469 and Theatre 405. See English 469.
474. **Experimental Design in Speech Communication Research.** Detailed treatment of major issues and options in designs employed in speech communication research. Prerequisite: Speech Communication 374 or equivalent; introductory statistics course. $\frac{1}{2}$ or 1 unit.
495. **Special Problems.** Individual investigation of special projects not included in theses. Prerequisite: Consent of head of department. $\frac{1}{2}$ to 2 units. Open to master's candidates for a maximum of 1 unit, and to doctoral candidates for 1 or 2 units.
499. **Thesis Research.** 0 to 4 units.

STATISTICS

Head of Department: Jerome Sacks

Department Office: 101 Illini Hall, 725 South Wright, Champaign

100. **Statistics.** Same as Mathematics 161. A first course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models. Prerequisite: Mathematics 112. 3 hours. Credit is not given for both Statistics 100 and any one of the following: Economics 171 or 172, Psychology 233, 234, or 235, or Sociology 385.
210. **Statistics for Scientists.** Same as Mathematics 263. A first course in the use of statistical methodology for the interpretation and analysis of data arising from scientific investigations; directed toward a general audience of students in physical, biological, social, or engineering sciences; and prepares the student for the sequel course, Statistics 320. Prerequisite: Mathematics 242, 244, or 245; or equivalent. 3 hours. Credit is not given for both Statistics 210 and any one of the following: Economics 171 or 172, Psychology 233, 234, or 235, or Sociology 385.
290. **Individual Study.** Prerequisite: Consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
291. **Honors Individual Study.** Prerequisite: Consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.

- 300. Exploring and Analyzing Data.** Same as Anthropology 338. Exploring the structure of data: numerical summaries, graphical displays, transformations, curve-fitting; random variables: binomial, normal; statistical models: linear regression, analysis of variance, contingency tables and categorical data; statistical inference: estimation, confidence intervals, hypothesis testing. Emphasis on computational aspects and applications to data in various disciplines. Prerequisite: College algebra and consent of instructor. 4 hours or 1 unit. Students with credit in any 300-level Department of Statistics course may not receive credit for Statistics 300.
- 308. Actuarial Statistics, I.** Same as Mathematics 308. See Mathematics 308.
- 309. Actuarial Statistics, II.** Same as Mathematics 309. See Mathematics 309.
- 310. Introduction to Mathematical Statistics and Probability, I.** Same as Mathematics 363. Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Offers a basic one-semester introduction to statistics and also prepares students for Statistics 311. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit.
- 311. Introduction to Mathematical Statistics and Probability, II.** Same as Mathematics 364. Continuation of Statistics 310. Includes moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests. Prerequisite: Either Statistics 310 or both Statistics 100 and Mathematics 361. 3 hours or 1 unit.
- 320. Methods of Applied Statistics.** Same as Mathematics 369. Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests; emphasizes when and why various tests are appropriate and how they are used. Prerequisite: Statistics 210 or an introductory statistics course, Mathematics 132 or 134 or equivalent, and knowledge of basic matrix manipulations; or consent of instructor. 3 hours or 1 unit.
- 324. Analysis of Variance.** Same as Mathematics 365. Estimation and hypotheses testing in linear models; one-, two-, and higher-way layouts; incomplete layouts; analysis of covariance; and random effects models and mixed models. Prerequisite: Credit or concurrent registration in Mathematics 315 and Statistics 311. 3 hours or 1 unit.
- 325. Applied Regression and Design.** Explores linear regression, least squares estimates, F-tests, analysis of residuals, regression diagnostics, transformations, model building, factorial designs, randomized complete block designs, Latin squares, split plot designs. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 326. Sampling and Categorical Data.** Sampling: simple random, stratified, systematic, cluster, and multi-stage sampling. Categorical data: multiway contingency tables, maximum likelihood estimation, goodness-of-fit tests, model selection, logistic regression. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 327. Statistical Consulting.** Students, working in groups under the supervision of the instructor, consult with faculty and graduate students through the Statistical Consulting Service; readings from literature on consulting. Prerequisite: Statistics 324 or consent of instructor. 3 hours or 1 unit.
- 328. Statistical Computing.** Same as Mathematics 393. Examines statistical packages, numerical analysis for linear and nonlinear models, graphics, and random number generation and Monte Carlo methods. Prerequisite: Statistics 311 or equivalent; knowledge of FORTRAN. 3 hours or 1 unit.
- 329. Time Series Analysis.** Same as Mathematics 394. Studies theory and data analysis for stationary and pre-stationed time series; examines auto-regressive moving average model building and statistical techniques; and discusses spectral model building and statistical analysis using windowed periodograms and Fast Fourier Transformations. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 330. Topics in Applied Statistics.** Same as Mathematics 368. Formulation and analysis of mathematical models for random phenomena; extensive involvement with the analysis of real data; and instruction in statistical and computing techniques as needed. Prerequisite: Statistics 311 or 320; or consent of instructor. 3 hours or 1 unit. May be taken for credit more than once with consent of instructor.

351. **Introduction to Probability Theory, I.** Same as Mathematics 361. See Mathematics 361.
356. **Introduction to Probability Theory, II.** Same as Mathematics 366. See Mathematics 366.
370. **Instruction at the Secondary School Level.** Presents major concepts of modern statistics and appropriate teaching methodologies for secondary school teachers attending the Illinois Institute for Statistics Education; emphasizes use of the computer as an instructional tool; students develop and teach a unit in statistics. Prerequisite: Institute acceptance. $\frac{1}{2}$ or 1 unit.
410. **Mathematical Statistics, I.** Distributions, transformations, order-statistics, exponential families, sufficiency, delta-method, Edgeworth expansions; uniformly minimum variance unbiased estimators, Rao-Blackwell theorem, Cramer-Rao lower bound, information inequality; equivariance. Prerequisite: Statistics 311. 1 unit.
411. **Mathematical Statistics, II.** Bayes estimates, minimaxity, admissibility; maximum likelihood estimation, consistency, asymptotic efficiency; testing and confidence intervals; Neyman-Pearson lemma, uniformly most powerful tests; likelihood ratio tests and large-sample approximation; nonparametrics. Prerequisite: Statistics 410. 1 unit.
425. **Current Research in Applied and Computational Statistics.** Various topics, such as ridge regression; robust regression; jackknife, bootstrap, cross-validation and resampling plans; E-M algorithm; projection pursuit; all with a strong computational flavor. Prerequisite: Statistics 325, 326, and 411; or consent of instructor. 3 hours or 1 unit.
451. **Theory of Probability, I.** Same as Mathematics 451. See Mathematics 451.
452. **Theory of Probability, II.** Same as Mathematics 452. See Mathematics 452.
453. **Probability and Measure, I.** Same as Mathematics 481. See Mathematics 481.
454. **Probability and Measure, II.** Same as Mathematics 482. See Mathematics 482.
455. **Applied Stochastic Processes.** Same as Mathematics 461. See Mathematics 461.
463. **Information Theory.** Same as Computer Science, Electrical and Computer Engineering, and Mathematics 463. See Mathematics 463.
470. **Statistical Decision Functions.** Same as Mathematics 470. Statistics from the point of view of decision making; introduction to the theory of games; minimax and other decision functions; techniques for determining optimal decision functions; and applications to nonsequential and sequential decision making in practice. Prerequisite: Consent of instructor. 1 unit.
471. **Multivariate Analysis.** Same as Mathematics 471. Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: Statistics 311 and Mathematics 315, or consent of instructor. 1 unit.
475. **Large Sample Theory.** Limiting distribution of maximum likelihood estimators, likelihood ratio test statistics, U-statistics, M-, L-, and R-estimators, nonparametric test statistics, Von Mises differentiable statistical functions; asymptotic relative efficiencies; asymptotic expansions. Prerequisite: Statistics 411 and either Mathematics 451 or 482. 1 unit.
478. **Topics in Statistics.** Same as Mathematics 478. Prerequisite: Consent of instructor. 1 unit.
488. **Covariance Structure and Factor Models.** Same as Educational Psychology, Psychology, and Sociology 488. See Psychology 488.
490. **Reading Course.** Directed reading on various topics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated, subject to approval by the student's advisor.
499. **Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

TEXTILES AND APPAREL

(See Consumer Sciences)

THEATRE

Head of Department: D. Knight

Department Office: 4-122 Krannert Center for the Performing Arts, 500 South Goodwin, Urbana

100. **Practicum, I.** Practical work in acting, directing, playwriting, theatre management, and in the design, construction, and handling of scenery, lighting, sound, properties, costumes, and makeup for public performance. 40 hours of production activity to be arranged for each credit hour. Prerequisite: Consent of instructor for non-theatre majors. 1 to 3 hours. May be repeated to a maximum of 12 hours.
106. **Basic Theatre Practice, I.** Introduction to the theatre focusing on scenecraft; the fundamentals of acting; and the introduction of specific skills needed for continued study in acting or design areas. Student must enroll for all sections to receive credit. Prerequisite: Concurrent registration in Theatre 108. Limited to Theatre majors. 2 to 6 hours.
107. **Basic Theatre Practice, II.** Introduction to the theatre focusing on costume, makeup, and acting; introduction to specific skills needed for continued study in acting or design areas. Student must register for all sections to receive credit. Prerequisite: Theatre 106 and concurrent registration in Theatre 108. Limited to Theatre majors. 2 to 6 hours.
108. **Basic Theatre Practice Laboratory.** Practical experience in two of the following four areas: scenery and props construction and crew, costume construction and crew, lighting crew, and performance workshop. Prerequisite: Concurrent registration in either Theatre 106 or 107. Limited to theatre majors. 2 hours. May be repeated once.
109. **Dramatic Analysis.** Introduction to the study of plays for theatre practitioners employing analytical methods and plays from modern theatre. Requires paper or project assignments for each play. Prerequisite: Consent of instructor for non-theatre majors. 3 hours.
110. **Literature of the Theatre.** Introduction to the principal modes of dramatic expression in the plays of three important historical periods employing methods of dramatic analysis considered in Theatre 109. Prerequisite: Theatre 109 or consent of instructor.
142. **Stage Makeup.** Principles, materials, and application techniques for two- and three-dimensional makeup; lecture, demonstration, and intensive practice. Prerequisite: Theatre 107 or consent of instructor. 2 hours.
151. **Acting Studio, I.** Orientation to acting vocabulary; improvisation as a tool for communication of experience through speech and action; basic scene study; basic physical training for expressive body dynamics; fundamentals of voice and speech production. A performance is given at the end of the semester. Prerequisite: Theatre 107 and sophomore standing in acting. 1 to 8 hours. Students must register for all sections to receive credit.
152. **Acting Studio, II.** Special emphasis on analysis of roles, characterization, and application of skills learned through improvisation to scripted plays; continued voice and movement training, and dialects. A performance is given at the end of the semester. Prerequisite: Theatre 151. 1 to 8 hours. Students must register for all sections to receive credit.
170. **Fundamentals of Acting.** Same as Speech Communication 161. Study of the methods of acting, with emphasis on basic acting techniques; role of character in relation to play as a whole, the internal and emotional values of the play, and their interpretation by means of voice and action. 3 hours.
175. **Improvisation in Acting.** Exploration and communication of experience through speech and action on the stage. Prerequisite: Theatre 106, 107, or 170. 4 hours.
176. **Relationships in Acting.** Behavior in stage performance explored on the basis of the actor's relationship with self, with objects, and with other players; emphasizes analysis of playscript to discover action, environment, and relationships. Prerequisite: Theatre 106, 107, or 175; or consent of instructor. 4 hours.
180. **Oral Interpretation.** Same as Speech Communications 141. See Speech Communications 141.
181. **Group Oral Interpretation of Literature.** Same as Speech Communications 142. See Speech Communications 142.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

210. **Stage Electronics.** A laboratory course to familiarize the beginning theatre student with current wiring practices and control techniques related to theatrical electronic control systems. 3 hours.
223. **Stage Mechanics, I.** Studies traditional materials, techniques, and processes used in executing scenery for the theatre. Prerequisite: Theatre 107 or consent of instructor. 4 hours.
224. **Stage Mechanics, II.** Examines newly accepted and developing techniques, processes, and materials used in constructing and rigging stage scenery. Prerequisite: Theatre 223. 4 hours.
225. **Scene Design, I.** Projects and lectures addressing basic technical and aesthetic skills of scene design. 3 hours.
226. **Scene Design, II.** Projects and discussions focusing on single setting problems for proscenium stage. Prerequisite: Theatre 225. 3 hours.
227. **Senior Projects in Design, I.** Professional studio and independent projects for student designers specializing in stage scenery, lighting, or costume design. Prerequisite: Consent of instructor. 6 hours.
228. **Senior Projects in Design, II.** Continuation of Theatre 227. Prerequisite: Theatre 227. 6 hours.
230. **Technical Direction.** Studies mechanical drawing for the theatre, production organization, and technical direction. 2 hours.
231. **Stage Lighting Practice.** A studio course analyzing current lighting practices and equipment by means of production oriented assignments. 3 hours.
232. **Lighting Design for the Stage.** Lighting design for the proscenium stage. Prerequisite: Theatre 231, or consent of instructor. 3 hours.
233. **Stage Drafting, I.** Drafting for scenery construction and rigging. Prerequisite: Theatre 107. 4 hours.
242. **Introduction to Costume Patterning.** Introduction and practice of basic sewing, craft, and patterning skills required to construct period theatrical costumes. 3 hours.
253. **Acting Studio, III.** Development of the actors' skills for musical theatre through the study of dance for actors, movement for the stage, body alignment and awareness, continued vocal training emphasizing singing, and analysis and performance of British and American musical materials. A performance is given at the end of the semester. Prerequisite: Theatre 152. 1 to 8 hours. Students must register for all sections to receive credit.
254. **Acting Studio, IV.** Acting in twentieth century plays. Concentrated training in American dialects and development of movement skills and mask characterization. A performance is given at the end of the semester. Prerequisite: Theatre 253. 1 to 8 hours. Students must register for all sections to receive credit.
255. **Acting Studio, V.** Major emphasis on acting in Shakespearean and other Elizabethan drama; training in stage combat, sword and rapier; concentration on speech for Shakespeare and the classical stage. A performance is given at the end of the semester. Prerequisite: Theatre 254. 1 to 8 hours. Students must register for all sections to receive credit.
256. **Acting Studio, VI.** Study of the techniques of acting for the camera; scenes are recorded on audio-visual tape; special topics include speech for the microphone and unarmed combat for the stage. A performance is given at the end of the semester. Prerequisite: Theatre 255. 1 to 8 hours. Students must register for all sections to receive credit.
263. **Theatre of the Black Experience.** Surveys the Black Theatre Movement's history and literature, and studies dramatic works focused on the black experience through the rehearsal and performance of representative works of black dramatists. 3 hours. May be repeated to a maximum of 9 hours.
281. **Directing: Script Preparation.** Same as Speech Communication 255. Methods of script analysis and the development of production concepts; explorative projects culminate in the readying of a script for rehearsal. Prerequisite: Theatre 273 and 274, Theatre 152, or Theatre 170. 3 hours.
291. **Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
292. **Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
300. **Practicum, II.** Advanced practical work in acting, directing, and theatre management; the design, construction, and handling of scenery, lighting sound, properties, costumes, and

- makeup for public performance. Prerequisite: For nontheatre majors, consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{1}{2}$ unit. May be repeated to a total of 12 hours or 2 units.
310. **Theatre Planning and Programming.** Studies recent theatre architecture and theatre renovations, examining the programming process, the stage forms, the merits of various stage technological systems, and the related business, audience and production facilities of a theatre center. 3 hours or 1 unit.
321. **Design for Directors.** Concepts in production design for the theatre director and exploration of theory through projects. Prerequisite: Theatre 107 or consent of instructor. 3 hours or 1 unit.
322. **Scene Design for Non-Majors.** Lectures and projects investigating aesthetic and mechanical problems of designing scenery for the stage; no prior design experience required. Prerequisite: Consent of instructor. 3 hours or 1 unit.
323. **Stage Mechanics, III.** Advanced study in the design and construction of large weight-supporting scenery. Prerequisite: Theatre 224 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
324. **Stage Mechanics, IV.** Advanced study in the design and construction of moving scenic elements. Prerequisite: Theatre 323 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
325. **Scene Design, III.** Investigates non-proscenium performance spaces and non-traditional design forms, including thrust and arena stage, television scenery, and industrial show design. Prerequisite: Theatre 225 and 226. 4 hours or 1 unit.
326. **Scene Design, IV.** Design studio investigating important design styles; students develop projects dealing with period design. Prerequisite: Theatre 225, 226, and 325. 4 hours or 1 unit.
330. **Theatrical Projection.** Integrates photographic and shadow projection with the scenic design, including preliminary research and work-ups, media preparation, projection surfaces, and stage projection equipment. Prerequisite: Theatre 231 and consent of instructor. 4 hours or 1 unit.
331. **Sound for the Theatre.** An introduction to sound reproduction, recording, and basic systems design as applied to the modern theatre. Prerequisite: Theatre 210. 3 hours or $\frac{3}{4}$ unit.
332. **Stage Management.** Studies the principles and the craft of stage management. Prerequisite: Sophomore standing in a theatre curriculum or consent of instructor. 4 hours or 1 unit.
336. **History of Scene Design.** Surveys major historic developments in stage design. Prerequisite: Junior standing. 3 hours or 1 unit.
337. **Scene Painting Techniques.** Techniques and practice of scene painting; lab time required. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
338. **Rendering Techniques for the Stage.** Perspective techniques for the stage; model building; developing the perspective sketch. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
339. **Property Design.** Principles of stage property design. Prerequisite: Theatre 335 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
340. **Lighting Design for Dance.** Survey of conceptual technique and practice of dance lighting; also non-traditional lighting problems including disco, rock, cabaret and industrial shows. Prerequisite: Theatre 231 or 232, or equivalent. 4 hours or 1 unit.
342. **Costume Patterning.** Draping and drafting patterns for period costumes. 3 hours or 1 unit.
345. **Costume History for the Stage, I.** Surveys theatrical costume and fashion of major periods; emphasizes relationships to styles of art and dramaturgy, social milieu, and production design. Prerequisite: Theatre 223 and 224, or 415, or equivalent. 4 hours or 1 unit.
346. **Costume History for the Stage, II.** Continuation of Theatre 345. Prerequisite: Theatre 345 or equivalent. 4 hours or 1 unit.
347. **Costume Rendering.** Studio course in costume rendering techniques: analysis of costume figure, rendering of fabrics, exploration of various rendering media. Prerequisite: Theatre 245. 3 hours or 1 unit.
353. **Creative Dramatics for Children.** Study of the subject matter and techniques of creative dramatics for children with laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
354. **Theatre for the Child Audience.** Study of the history, objectives, and techniques of play production for the child audience; laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **The History and Development of the American Musical Theatre.** Surveys the American Musical from early minstrel show and operetta origins to current unique theatrical form. Prerequisite: Junior standing or above. 3 hours or $\frac{3}{4}$ or 1 unit.

361. **Development of Theatrical Forms, I.** History of the drama and theatre of ancient Greece and Rome, the Middle Ages, and the Italian and English Renaissance. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 4 hours or 1 unit.
362. **Development of Theatrical Forms, II.** History of the drama and theatre of the Spanish Renaissance, seventeenth-century France, the English Restoration, the eighteenth and nineteenth centuries in Europe and America, and the Orient. Prerequisite: Theatre 361 or equivalent and consent of instructor. 4 hours or 1 unit.
371. **Contemporary Theatrical Forms.** Study of post-World War I theatre, including the New Stagecraft, expressionism, Brecht and epic theatre, theatre of the absurd, and later developments. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 3 hours or 1 unit.
372. **Introduction to Theatre Management.** An introduction to the basic practices of theatre and arts management with emphasis on facilities management, arts marketing, and the financial problems in the performing arts. Prerequisite: Junior standing in theatre or consent of instructor. 3 hours or 1 unit.
375. **Acting: Rehearsal Techniques.** Acting laboratory emphasizing the actor's work with the director. Fall semester deals with contemporary drama; spring semester deals with classical drama. Taught in conjunction with Theatre 381; students may not register concurrently in Theatre 381. Prerequisite: Theatre 176 or consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 2 units.
376. **Oral Interpretation of Prose Fiction.** Same as Speech Communications 345. See Speech Communications 345.
381. **Directing: Rehearsal.** Exploration of methods for directing actors and conducting rehearsal. Students may not register concurrently in Theatre 375. Reading and research in current directing principles and practices required of graduate students. Prerequisite: Theatre 281 and consent of instructor. 3 hours or 1 unit.
385. **Preparation for Auditions.** Each actor, through extensive research, prepares a portfolio of audition pieces for the opportunities imminent before and after graduation for resident companies, commercial productions, and film, or professional graduate schools. Prerequisite: Theatre 151, 152, 253, and 254; or consent of instructor. 2 hours or ½ unit.
390. **Professional Internship.** Professional employment with an approved host institution in an area related to the student's academic program; exposure to professional situations in which the commercial theatre operates. Full documentation of internship activities required. Prerequisite: Senior or graduate standing in theatre; consent of Internship Coordinator. 0 to 14 hours, or 0 to 3 units.
401. **Studies in Dramatic Form and Structure.** Same as Speech Communication 400. Studies in the relationship of dramatic form and structure to the contemporary production of historical and modern plays. Prerequisite: Consent of instructor. 1 unit.
403. **Studies in Theatre History: Seventeenth Century to 1900.** Examines selected movements and contributors to the theatre from the English Restoration to the nineteenth century. Prerequisite: Theatre 362 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
404. **Studies in Theatre History: Twentieth Century.** Examines selected movements and contributors to the theatre from the late nineteenth-century to the contemporary period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
406. **Seminar in Theatre History.** Same as Speech Communication 468. Studies in the history of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
407. **Seminar in Theatre Art.** Same as Speech Communication 465. Studies in the aesthetics of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
411. **Colloquium in Advanced Design and Theatre Technology.** Projects in design for the theatre or in theatre technology, including stage scenery, costuming, lighting, makeup, projections, and sound and stage systems. Prerequisite: Candidacy for M.F.A. in theatre with design and technology specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.

415. **Proseminar in Theatre Practice.** Review of contemporary theatre practice in the United States and western Europe, survey of methods in production research, and advanced instruction in theatre specialties. Prerequisite: Admission to graduate study in theatre. 1 unit.
450. **Theatre in Education.** Examines effective teaching practices for students of theatre and the development of theatre and the development of theatre education in America. Topics include: methods of teaching theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
471. **Colloquium in Acting.** Intensive professional training in acting, dynamics, voice and speech, and theatre movement with a different focus each semester on one particular period of dramatic literature. Prerequisite: Candidacy for M.F.A. in theatre with acting specialty, or consent of instructor. $\frac{1}{4}$ to 2 units. Students must register for all sections to receive credit. May be repeated to a maximum of 12 units.
480. **Theory of Staging.** Seminar in theatre interpretation which considers alternative rationales which explicitly or implicitly underlie performance conceptions; performance theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
481. **Colloquium in Directing.** Individual assignments in directing, stage managing, or coaching of actors carried out in conjunction with the semester's productions; prepared at Krannert Center or in conjunction with the training of actors in the undergraduate curriculum. Prerequisite: Candidacy for M.F.A. in theatre with directing specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
491. **Special Problems.** Individual research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 2 units.
495. **Creative Project.** Open to M.F.A. candidates in theatre only. 1 to 2 units.
499. **Thesis Research.** 0 to 4 units.

THEORETICAL AND APPLIED MECHANICS

Head of Department: F. J. Rizzo

Department Office: 212 Talbot Laboratory, 104 South Wright, Urbana

NOTE: Credit is allowed for only one of Theoretical and Applied Mechanics 150, 152, 154, or 156. Credit is not allowed for both Theoretical and Applied Mechanics 212 and either Theoretical and Applied Mechanics 154 or 156.

150. **Analytical Mechanics (Statics).** Resultants of force systems; conditions of equilibrium of force systems; analysis of forces acting on members of trusses, frames, etc.; forces due to friction; and centroids. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 2 hours.
152. **Engineering Mechanics, I (Statics).** Analysis of force systems; equilibrium of two- and three-dimensional systems; trusses, frames, friction; principle of virtual work. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 3 hours.
154. **Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212 with less emphasis on some topics. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 4 hours.
156. **Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 5 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
212. **Engineering Mechanics, II (Dynamics).** Elements of vector calculus as applied to mechanics; kinematics of three-dimensional motion of a particle and of a rigid body; motion relative to translating and rotating reference frames; and kinetics of particles and rigid bodies using principles involving force, mass and acceleration, work and energy, and impulse and momentum. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.

221. **Elementary Mechanics of Solids.** Relationship between the internal stresses and deformations produced by external forces acting on deformable bodies, primarily elastic components. Normal and shear stresses and deformations produced by tensile, compressive, torsional and bending loading of members; state of stress and failure; deflection of beams; elastic strain energy and impact loading; stability and buckling of columns. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.
224. **Behavior of Materials.** Same as Civil Engineering 210. Mechanical behavior of engineering materials, including metals, ceramics, polymers, and materials of construction (concrete, wood, bitumens, and asphaltic concretes); laboratory sessions demonstrating macroscopic behavior and explanations of that behavior in terms of phenomena on the microscopic level. Prerequisite: Theoretical and Applied Mechanics 221. 4 hours.
235. **Fluid Mechanics.** Lectures and weekly laboratory sessions on fluid properties; fluid statics; continuity, momentum, and energy principles via control volumes; ideal and real fluid flow; introduction to the Navier-Stokes equation; similitude; laminar and turbulent boundary layers; closed conduit flow, open channel flow, and turbomachinery. Prerequisite: Theoretical and Applied Mechanics 212. 4 hours.
293. **Research and Design Project.** Formulation of an applied mechanics research and design project to be completed in Theoretical and Applied Mechanics 294. Guidance is received from a faculty member; experience in research and development aspects of engineering design is gained by means of mathematical modelling, numerical analysis, and laboratory experimentation. Prerequisite: Senior or second-semester junior standing in engineering mechanics. 2 hours.
294. **Research and Design Project.** Completion of the project formulated in Theoretical and Applied Mechanics 293. Each student prepares a technical report or paper and presents the results orally; the best papers are presented at a symposium held at the end of the semester, bound together and published as a Theoretical and Applied Mechanics *Report*. Prerequisite: Theoretical and Applied Mechanics 293. 4 hours.
299. **Thesis.** Thesis investigation of special subjects including theoretical and/or experimental research. Prerequisite: Senior standing; approval of head of department. 3 hours.
308. **Fluid Mechanics of Convective Heat Transfer.** Same as Mechanical Engineering 308. See Mechanical Engineering 308.
311. **Vibrations of Mechanical Systems, I.** Theory and application of free and forced vibrations of single and multiple degree of freedom discrete linear systems; matrix methods and the eigenvalue problem; Lagrange's equations; damping; modal analysis; impulse and spectral responses; high-speed PC data acquisition; and experimental vibration analysis. Prerequisite: Theoretical and Applied Mechanics 154, 156, or 212; and Math 341 or 285. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Theoretical and Applied Mechanics 311 and Civil Engineering 374.
314. **Advanced Dynamics for Engineers.** Newtonian mechanics of a system of particles; Lagrangian mechanics of a dynamical system; the kinematics and dynamics of a rigid body; and engineering applications. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 285 or equivalent, and credit or concurrent registration in Mathematics 343. 3 hours or $\frac{3}{4}$ unit.
321. **Advanced Mechanics of Solids.** Review of elementary mechanics of solids; transformations of stress and strain; modes and criteria for failure, including fracture-mechanics concepts; unsymmetrical bending; shear flow and shear center; torsion of noncircular sections; curved beams; Castigliano's theorem; plasticity and limit-load calculations. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
324. **Flow and Fracture of Structural Metals.** Fundamental concepts of strength of crystalline engineering materials at atomic, single crystal, and polycrystalline levels of association in relation to engineering mechanisms of failure; functional relationship between material variables, state of stress, strain, time, temperature, and failure of engineering components by creep, stress rupture, fatigue, and brittle fracture. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
326. **Experimental Stress Analysis.** Measurement of stresses or deformations that are of significance in the engineering design of load-resisting members; use of optical, electrical, and mechani-

- cal instrumentation; brittle coatings, electrical resistance gauges, photoelasticity; new methods. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent. 3 hours or $\frac{3}{4}$ unit.
327. **Deformation and Fracture of Polymeric Materials.** Introduction to structure, morphology, and properties of amorphous and semi-crystalline polymers and polymer blends; polymer linear viscoelasticity-continuum mechanics (phenomenological treatment); molecular aspects of polymer linear viscoelasticity; nonlinear viscoelastic behavior; yield phenomena and plastic flow; mechanisms and mechanics of damage and fracture; damping and impact behavior of polymers; adhesion, composites, and surface coating. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
328. **Mechanical Behavior of Composite Materials.** Fundamental concepts underlying formation, characteristics, and behavior of such composite materials as fiber-reinforced laminates, honeycomb structural sandwiches, and load-bearing adhesive joints; their use in engineering structures and components under static, dynamic, and cyclic loading. Micromechanics, lamination theory, visco-elasticity, anisotropic elasticity, hygrothermal stress, fracture mechanisms and mechanics, and degradation in different environments; methods of design, analysis, and testing. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
335. **Dynamics of Fluids.** An intermediate course in the mechanics of fluids introducing analytical methods of solution for ideal and real fluids; potential flow theory, theoretical approaches to viscous flows, including boundary layer theory; and the analysis of compressible flows. Prerequisite: Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
351. **Fundamental Concepts of Deformable Body Mechanics.** Introduction to the general theories of kinematics of deformable bodies; general balance laws applicable to continuum mechanics; constitutive relations (stress-strain relations); and introductions to linear elasticity, linear viscoelasticity, and special concepts in other areas of solid mechanics and fluids. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 280 and 285. 3 hours or $\frac{3}{4}$ unit.
360. **Continuum Mechanics, I.** A unified treatment of modern continuum mechanics; linear algebra and analysis, review of kinematics and general balance laws, and general theory of mechanical constitutive equations (simple materials). Prerequisite: Theoretical and Applied Mechanics 351 or equivalent. 3 hours or $\frac{3}{4}$ unit.
373. **Fundamentals of Engineering Acoustics.** Same as Electrical and Computer Engineering 373. See Electrical and Computer Engineering 373.
392. **Design and Analysis in Engineering Practice.** Examples of design problems which occur in engineering practice and the procedures which are used to solve them; emphasis on establishing the relationship between the sophistication of analysis and the level and nature of the design process. Considerable use is made of the case study approach and students are expected to execute a number of tasks at different design levels. Prerequisite: Senior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
393. **Independent Study.** Individual studies in any area of theoretical and applied mechanics. 1 to 8 hours, or $\frac{1}{4}$ to 2 units.
400. **Seminar.** Discussion and lectures on current research topics in Engineering Mechanics. Required of all graduate students each semester. $\frac{1}{4}$ unit.
412. **Vibrations of Mechanical Systems, II.** Examination of problems in the free and forced vibration of continuous linear elastic structures, including strings, rods, beams, membranes, and plates; Hamilton's principle, Sturm-Liouville problems; solution by separation of variables, integral equation and transform methods; variational and other approximate methods of solution including the finite element method; Green's functions; and random vibrations and statistical energy analysis. Prerequisite: Theoretical and Applied Mechanics 311 or Civil Engineering 374; Theoretical and Applied Mechanics 314 or equivalent. 1 unit.
416. **Energy Principles in Engineering Mechanics.** Introduction to the variational principles of mechanics and their applications to engineering problems; the derivation, interpretation, and applications of the principle of virtual displacements, the principle of minimum potential energy, and the principle of complementary energy; major emphasis on Castigliano's theorem, Hamilton's principle, and Lagrange's equations of motion; brief treatment of variational methods of approximation; and numerous illustrative applications to the stress analysis of statically determinate and statically indeterminate frames, problems of elastic stability,

the theories of rings and curved beams, the theory of elastic plates, vibrations of structures, and wave motions. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.

417. **Stochastic Structural Dynamics.** Same as Aeronautical and Astronautical Engineering 452. See Aeronautical and Astronautical Engineering 452.
418. **Aerodynamic Noise.** Same as Aeronautical and Astronautical Engineering 453. See Aeronautical and Astronautical Engineering 453.
424. **Properties of Engineering Materials.** Structure of metals and behavior of materials under various conditions of loading and use, including static loading, creep, fatigue, and impact; effects of high and low temperature, strain rate, state of stress, and internal structure; criteria of failure; relation of mechanical properties to behavior; significance of mechanical properties; tests and interpretation of test data; and material specifications. 1 unit.
428. **Analysis of Nonlinear Systems.** Same as Electrical and Computer Engineering 428. See Electrical and Computer Engineering 428.
429. **Theory of Linear and Nonlinear Viscoelasticity.** Same as Aeronautical and Astronautical Engineering 429. See Aeronautical and Astronautical Engineering 429.
431. **Foundations of Fluid Dynamics I - Ideal Flow.** Dynamics of flows in which viscosity is negligible: analysis of drag and lift, slender-body theory, Prandtl's lifting-line theory, bubble dynamics, free-streamline theory, linear and nonlinear wave motion, hydrodynamic stability, vortex motion, modern mathematical and computational techniques for inviscid flows. Prerequisite: An intermediate course in fluid dynamics, advanced calculus and a course in differential equations. 1 unit.
432. **Foundations of Fluid Dynamics II - Viscous Flow.** Dynamics of flows in which viscosity is significant or dominant: development of the necessary mathematical tools, theoretical and numerical concepts, and fundamental physics of viscous layers that arise in both high Reynold's number and low Reynold's number flows; dimensional analysis, exact solutions to the Navier Stokes equations, jet and wakes, microhydrodynamics, fluid stability, and turbulence; demonstration of numerical techniques and their application. Prerequisite: An intermediate level course in fluid mechanics, advanced calculus and a course in differential equations. 1 unit.
438. **Turbulence.** Statistical models for characterizing turbulence; statistical theory, energy considerations, and nature of turbulence in typical flows; laboratory experiments illustrating hot-wire technique of turbulence measurements and the structure of turbulence. Prerequisite: Theoretical and Applied Mechanics 432 or equivalent. 1 unit.
441. **Applied Analysis in Engineering.** Training in applications of mathematics to engineering problems, including ordinary differential equations and special functions, boundary-value problems and series solutions, and partial differential equations; illustrations taken from engineering mechanics. Prerequisite: Mathematics 242; Mathematics 280 and 285 recommended. 1 unit.
442. **Applied Analysis in Engineering.** Continuation of Theoretical and Applied Mechanics 441. Application of complex-variable methods; Laplace transforms; Fourier transforms; and special topics selected by the instructor. Prerequisite: Mathematics 242; Mathematics 280 and 285 recommended. 1 unit.
445. **Advanced Physical Acoustics.** Same as Electrical and Computer Engineering 445. See Electrical and Computer Engineering 445.
451. **Theory of Elasticity with Application to Engineering Problems.** Study of the mechanics of elastic deformable bodies, based on the fundamental concepts of equilibrium, geometry of strain, and properties of materials; detailed study of relations between stresses, strains, and displacements; and special consideration given to their significance in engineering problems. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 280; Mathematics 341 or equivalent. 1 unit.
452. **Theory of Elasticity with Application to Engineering Problems.** Continuation of Theoretical and Applied Mechanics 451. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
454. **Theory of Shells.** Stress analysis of shell-type structures, such as ships, submarines, monocoque aircraft structures, concrete roofs and domes, pressure vessels, and containers for liquids; differential geometry of shell theory, equilibrium equations, momentless theory, strains, statically indeterminate problems, energy formulations, and stability of shells. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.

457. **Topics in the Theory of Elasticity.** Topics which may be covered are: large elastic deformations, equilibrium solutions for rubber-like materials; conservation laws and variational principles for large elastic deformations; linear small strain behavior; large displacements with small strains; infinitesimal deformations, stress functions and displacement potentials; numerical techniques for boundary-value problems; anisotropic materials; bodies with initial stress; stability of equilibrium states; elastic behavior of composite bodies. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent, or consent of instructor. 1 unit.
458. **Elastic Waves.** Simple one-dimensional waves; Fourier and Laplace transforms; review of linear elasticity; waves in an unbounded medium; reflection, refraction, and surface waves; basic singular solutions; integral representation theorems; waves in an elastic half-space; waveguides; waves in anisotropic and heterogeneous media. Prerequisite: Theoretical and Applied Mechanics 311 or Electrical and Computer Engineering 373; and Theoretical and Applied Mechanics 431 or 451; and Mathematics 340; or consent of instructor. 1 unit.
459. **Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Physics 459. See Mathematics 459.
462. **Theory of Plasticity.** The physical and mathematical formulation of the mechanics of inelastically deformed bodies; plastic stress-strain laws; and their association with yield and loading function; members subjected to biaxial and triaxial stress conditions; applications to flexure and torsion of prismatic members; expansion of thick-walled cylinders and spherical shells; and introduction to problems in plane plastic flow and variational plasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent. 1 unit.
474. **Numerical Methods for Boundary Value Problems in Mechanics.** Theory and application of various numerical methods in applied mechanics; discusses finite element method; finite difference techniques and boundary integral methods; covers variational, Rayleigh-Ritz and weighted residual methods. Discusses requirements for convergence and accuracy; considers applications including elasticity, elastodynamics, nonlinear solid mechanics, fluid flow, heat transfer, and other topics of interest. Prerequisite: Mechanical Engineering 345 or Computer Science 355, or consent of instructor. 1 unit.
485. **Fracture Mechanics.** Analytical and experimental techniques used to solve current fracture problems; discussion of the macroscopic theories used to determine the static strength of bodies containing cracks; linear elastic fracture mechanics (the tool and the model) and its relation to the Griffith criterion of fracture; elastic-plastic fracture mechanics models; small-scale yielding results and their implications; an introduction to fracture mechanics in the realm of general yielding; fracture control. Prerequisite: Theoretical and Applied Mechanics 324 and 451, or consent of instructor. 1 unit.
493. **Advanced Independent Study (Special Problems).** Analytical or experimental studies in one or more phases of theoretical and applied mechanics, including mechanics of materials, theory of elasticity, theory of plasticity, properties of materials, mechanical vibrations, hydraulics and fluid mechanics, and applied mathematics. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

URBAN AND REGIONAL PLANNING

Head of Department: Lewis D. Hopkins
Department Office: 9071 West Nevada, Urbana

101. **Planning of Cities and Regions.** Survey of city and regional planning as related to problems and programs of urbanization and resource development. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Contemporary Planning Practice.** Interaction with practicing planners in a seminar setting designed to acquaint undergraduate students with diverse opportunities in the planning field and to facilitate sound career development through structured introduction to the profes-

- sion and its current forms and issues. Prerequisite: Urban Planning 101 or consent of instructor. 2 hours.
205. **Ecological Systems in Planning.** Basic ecological principles pertinent to planning and management through examination of problems that arise from inadequate consideration of structure and function of ecological systems; analysis of contemporary planning issues in framework of natural and cultural systems context. One-day field trip required. 3 hours.
240. **Land Use Planning Process.** Techniques in the preparation of land use plans, including a review of the land use aspects of community facilities and transportation. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours.
247. **Planning Workshop, I.** Field work dealing with selected physical and/or social planning problems. Prerequisite: Consent of instructor. 6 hours.
260. **Urban Social Problems and Planning.** Examines the traditional pattern of social planning decisions and emergent alternatives at the federal, city, and neighborhood levels; includes case studies, field work, and term project. 3 hours.
290. **Planning Internship.** Professionally supervised field experience in public and private planning or development agencies; designed to introduce students to professional employment and actual planning practice. Students work in a department-approved agency of their own choice either during the summer session or part-time during a regular semester. At least two weeks of full-time employment or its equivalent is required for each semester hour of credit. Summary reports are submitted by both employer and student. Prerequisite: Senior standing or consent of instructor. 0 to 6 hours. No more than 6 hours of Urban Planning 290 may be applied toward the Bachelor's degree.
297. **Special Problems.** Special projects, research, and independent reading. Prerequisite: Consent of head of department. 3 to 6 hours.
301. **Development of American Planning Thought.** Planning from the mid-nineteenth century to the present as related to cultural, societal, and philosophical influences. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
303. **Urban Structure and Functions.** The concept of urban structure; the elements of urban spatial structure and growth; the human stresses in urban spatial structure; and structural remedies past and present. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
304. **Urban Planning Theory.** Examination of the urban planning function within a theoretical, methodological, institutional, and professional context. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
305. **Environmental Planning in a Watershed Context.** Uses the watershed as the basic organizing concept in environmental planning and management; methods for assessing watershed boundaries, geology, soils and surface and groundwater system processes. Emphasizes ecological implications of patterns of land use on functional and qualitative aspects of watershed systems. All-day field trip required. 4 hours or 1 unit.
308. **Law and Planning Implementation.** Cases, legislation, and materials illustrative of the social, economic, and environmental interrelationships of land-use planning and the dynamic role of law as a system of controlled conflict; traditional and emerging concepts of zoning, subdivision regulation, housing codes, and review procedures. Prerequisite: Political Science 150, or 505 and 906, or Urban Planning 313, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **Graphics and Communication for Planners.** Graphics, media communication, photography, and report preparation techniques applied particularly to professional planning practice. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
316. **Planning Analysis.** Research and analytic techniques in urban planning; economic base and employment, population, market analysis; and derivation and use of statistical data. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
320. **Planning for Historic Preservation.** Survey of the preservation movement in relation to urban planning; techniques for selection of sites and definition of districts; funding, regulation, and implementation measures; and case studies of preservation plans and programs. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
326. **Urban Design and Planning Methods.** Concepts and techniques of urban analysis, plan making, and implementation essential for effective interdisciplinary work in urban design; case studies of major types of large-scale projects. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

327. **Preservation Planning Workshop.** Small group field work dealing with application of planning principles and techniques to actual preservation planning problems in a nearby community or area. Prerequisite: Urban Planning 101 or 320, or consent of instructor. 3 to 6 hours, or $\frac{3}{4}$ to 1 $\frac{1}{2}$ units. May be repeated to a maximum of 12 hours or 3 units.
330. **Urban Transportation Planning.** Same as Civil Engineering 330. Role of transportation in urban development and planning; characteristics of urban-person transportation systems and methods of analysis and forecasting of urban-person transportation demand; transportation systems management and capital improvement programming; and emphasis on the needs and activities of metropolitan planning organizations. Prerequisite: Civil Engineering 230, Urban Planning 332, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
331. **Regional Transportation Planning.** Same as Civil Engineering 331. See Civil Engineering 331.
337. **Transportation Planning Workshop.** Analysis, evaluation, and plan preparation for a client of a real-world transportation problem; the planning process including extensive use of Urban Transportation Planning Systems (UTPS) package. Prerequisite: One transportation-related course. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
341. **Land Resource Evaluation.** Same as Landscape Architecture 341. See Landscape Architecture 341.
342. **Seminar on Environmental Policy and Law.** Identification and analysis of environmental issues and legal developments primarily at the state and federal levels. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
343. **Environmental Quality Management.** Same as Environmental Studies 393. See Environmental Studies 393.
344. **New Town Development in Europe and the U.S.** Applies planning and design skills to the development and management of New Towns with case study examples. Prerequisite: Urban Planning 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Urban Economic Development and Fiscal Packaging.** Public-private-partnerships in urban economic development, including study of potentials, problems, and projects; financing urban economic development through federal grant programs, tax increment financing and other means. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
347. **Land Use Planning Workshop.** Small group field work applying principles and techniques to specific land use problems in selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
348. **Environmental Planning Workshop.** Small group field work applying planning theory, principles, and techniques to specific environmental problems of selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
349. **Environmental Management and Planning Simulation.** Management of environmental resources for a large urban area using computer assisted gaming simulation techniques; focuses on the law, technology, administration, and politics associated with environmentally sensitive decisions that require interrelated responses and development of consistent strategies. Prerequisite: Urban Planning 307, 308, 342, 401, or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
358. **Economic Development Planning Workshop.** Small group field work applying planning and economic principles and techniques to specific economic development problems in selected jurisdictions. Prerequisite: Urban Planning 316 or 407, or equivalent. 4 or 6 hours, or 1 or 1 $\frac{1}{2}$ units.
365. **Social Planning Evaluation.** Evaluates design and research as it applies to social planning; emphasizes the logic and theoretical assumptions underlying the design, development, implementation, and evaluation of social planning programs rather than techniques of data analysis. Prerequisite: Sociology 185 or Urban Planning 316, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
374. **Neighborhood Planning.** Examines rationale and techniques for planning at the neighborhood level; the major social, political, and economic issues that confound public and private sector efforts to revitalize distressed neighborhoods. Prerequisite: Urban Planning 260 or 360, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
375. **Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Environmental Studies 341, and Geography 341. See Civil Engineering 341.

377. **Housing Workshop.** Small group field work dealing with real world problems and clients; clients vary each time the course is taught. Local, regional, state, and national governments or nonprofit organizations serve as clients. Prerequisite: Urban Planning 247 or 473; or consent of instructor. 3 to 6 hours, or $\frac{3}{4}$ to $1\frac{1}{2}$ units. May be repeated once for credit.
394. **Special Topics in Urban and Regional Planning.** Seminar on topics of current interest, as announced in the *Timetable*. 2 to 6 hours, or $\frac{1}{2}$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 12 hours or 4 units.
399. **Study Abroad.** Studies comparative urban, regional, national and supranational planning systems, with emphasis on comparing European and Third World with United States planning. Consists of a seminar-discussion section and an application-workshop section. Prerequisite: Urban Planning 247 or equivalent, Urban Planning 301 or 304, or consent of instructor. 0 to 10 hours, or 0 to $2\frac{1}{2}$ unit.
401. **Land Use and Site Development Planning.** Develop skills and understanding of land use and site development from an environmental and physical perspective within the context of comprehensive planning; including laboratory and field work. Prerequisites: Admission to the Master of Urban Planning curriculum or consent of instructor. Concurrent enrollment in other MUP core courses is intended. $\frac{3}{4}$ unit.
402. **Planning Problems and Cases.** Individual and team experiences in solving problems that require creative application of knowledge and of planning processes to all aspects of human settlements; emphasizes professional skills, including graphics, computer analysis, writing, and presentation; also, reviews of planning cases. Prerequisite: Urban and Regional Planning 307, 308, 401, and 407, or equivalent preparation; and concurrent registration in Urban and Regional Planning 406. $1\frac{1}{2}$ units.
405. **Economic Analysis of Public Plans and Policies.** Techniques of policy analysis and evaluation; includes microeconomic concepts, cost-benefit analysis, cost-effectiveness, and planning-programming-budgeting systems; and examines selected public policies in areas such as transportation, environmental control, health, education, housing, and local finance. Prerequisite: Consent of instructor. $\frac{3}{4}$ unit.
406. **Urban and Regional Analysis.** Same as Geography 406. Economic and demographic analysis of regional growth and change; emphasizes forecasting and impact studies. Topics include data sources, economic base studies, population estimation and projection, economic impact analysis, and employment projection; practical application of methods to a study area. Prerequisite: Introductory statistics such as Sociology 185 or Geography 185 or consent of instructor. $\frac{3}{4}$ unit.
407. **Economic Analysis of Public Plans and Policies.** Techniques of policy analysis and evaluation; includes microeconomic concepts, cost-benefit analysis, cost-effectiveness, and planning-programming-budgeting systems; and examines selected public policies in areas such as transportation, environmental control, health, education, housing, and local finance. Prerequisite: Consent of instructor. 1 unit.
414. **Issues in Local Public Finance.** Recent trends in financing local governments; revenue and expenditure analysis; accounting and budgeting methods for local governments, with particular emphasis on financing capital improvements and the planning process. Prerequisite: Graduate standing in Urban and Regional Planning, or consent of instructor. 1 unit.
434. **Urban Transportation Policy.** Major policy elements in urban transportation and the relationship of urban transportation to the region, including the decision-making process, configuration and growth of the metropolitan area, and allocation of resources. 1 unit.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Landscape Architecture, Leisure Studies, and Rural Sociology 440. See Environmental Studies 440.
445. **Spatial Design Methods.** Same as Landscape Architecture 442. See Landscape Architecture 442.
450. **Issues in Regional Development.** Same as Geography 450. See Geography 450.
456. **Regional Science Methods: Economic and Demographic.** Same as Geography 456. See Geography 456.
457. **Seminar in Regional Science.** Same as Geography 457. See Geography 457.
473. **Housing and Urban Policy Planning.** The role of housing in American social policy planning; economic modeling of the housing market, emphasizing supply and demand functions and private market imperfections; and analysis of public policies for housing as they affect

- special consumer groups, such as the poor, the elderly, and the nonwhite. Prerequisite: Urban Planning 407 or consent of instructor. 1 unit.
474. **Housing and Community Development Law.** Seminar using expanded case methods to research and analyze housing and community development law emphasizing rights, responsibilities, and procedures. Prerequisite: One law course using the case method, comparable legal experience. 1 unit.
475. **Housing and Urban Planning Analysis.** Housing location and developmental models; housing need and market analysis techniques; survey and appraisal of housing; and case studies of current housing problems and current research priorities. Prerequisite: Urban Planning 407 and 473, and a course in urban real estate; or consent of instructor. 1 unit.
480. **Advanced Planning Theory.** Recent advances in planning, policy-making and decision-making theories as they relate to the efficient use of land and to the complex interrelationships among the major uses of land, i.e., housing, transportation, agriculture; specific applications vary annually, reflecting the students' dissertation research topics. Prerequisite: Urban Planning 301, 303, and 304; or equivalents. 1 unit.
483. **Environmental Science and Planning Research.** Same as Landscape Architecture 483. Critical examination of the nature of scientific knowledge and world views as they relate to environmental planning and resource management; discussion drawn from community and ecosystem ecology and planning/management practice in considering research perspectives on contemporary environmental problems. Prerequisite: Urban Planning 305, 348, or consent of instructor. 1 unit.
490. **Professional Internship.** Summer, part-time, or other professional-level employment in the field of planning, usually in an area of concentration; exposure to the social, political, and institutional setting in which planning operates; and full documentation of internship activities required. Prerequisite: Consent of instructor. 0 units.
494. **Seminar.** Selected topics in urban and regional planning; several sections each semester. Prerequisite: Consent of instructor. 1 unit.
497. **Urban Planning Research.** Independent study in selected urban and regional planning topics. Prerequisite: Consent of instructor and head of the department. $\frac{1}{4}$ to 1 unit. No more than 4 units may be applied toward the Master of Urban Planning degree.
498. **Master's Project.** Major independent or small-group project, conducted in lieu of a master's thesis. Prerequisite: Consent of instructor. 1 $\frac{1}{2}$ unit.
499. **Thesis Research.** Prerequisite: Graduate standing in urban and regional planning; consent of the head of the department. 0 to 4 units.

VETERINARY BIOSCIENCES

Head of Department: W. C. Wagner

Department Office: 3516 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

300. **Gross Anatomy, I.** The systematic and topographic study of the pure and applied anatomy of the dog and cat by lecture and dissection laboratory. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
301. **Histology-Embryology, I.** Lecture-laboratory consideration of basic microscopy, cytology, and both the development and histology of tissues and their organization into the locomotory, integumentary, and digestive systems of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
302. **Gross Anatomy, II.** Study of the systematic and topographic anatomy of the large domestic animals, including reference to diagnostic and surgical procedures, by lecture and dissection laboratory. Prerequisite: Veterinary Biosciences 300 and 301, or consent of instructor. 5 hours or 1 $\frac{1}{4}$ units.

303. **Bone and Cartilage Biology.** Examines the anatomy, physiology, and biomechanics of cartilage and bone; emphasizes biology of remodeling and repair. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
305. **Histology-Embryology, II.** Lecture-laboratory consideration of the development and histology of the cardiovascular, urinary, reproductive, respiratory, and endocrine systems of domestic and laboratory animals. Prerequisite: Veterinary Biosciences 301. 3 hours or $\frac{3}{4}$ unit.
306. **Veterinary Orthopedic Biomechanics.** Same as Bioengineering 306. Explores the relationship between the biology and mechanics of the musculoskeletal system and its role in the pathobiology and treatment of orthopedic diseases utilizing the techniques of morphology and mechanical engineering; interdisciplinary course for both life science and engineering students. Prerequisite: Biology 111 and Physiology 101, or equivalents; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
307. **Comparative Primate Anatomy.** Same as Anthropology 308. Lecture-discussion and dissection laboratory comparing the organ systems of old and new world primates to those of a dog. Prerequisite: Veterinary Biosciences 300 or Physiology 234, or equivalent; consent of instructor. 2 hours or $\frac{1}{2}$ unit.
309. **Veterinary Clinical Electrocardiography.** Utilizes basic principles of cardiac electrophysiology in delineating the value and limitations of electrocardiography in veterinary medicine and diagnosing cardiac enlargement and/or arrhythmias. Prerequisite: Veterinary Biosciences 316. 1 hour.
310. **Neurobiology.** An introduction to the science of neurobiology, both neuroanatomy and neurophysiology and their importance to an understanding of the normal integrative nervous system of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Physiology, I.** Lecture-discussion and laboratories on endocrine, reproductive, and renal systems, physiology of vision, ear structure and function. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
316. **Physiology, II.** Lecture-discussion of digestive, cardiovascular, and respiratory systems; and acid-base balance. Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
317. **Physiology-Pharmacology Laboratory.** Laboratory study of physiological processes and the effects of drugs upon these processes. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
318. **Pharmacology, I.** Lecture-discussion on the general principles of pharmacology and analysis of the action of chemical agents on physiological processes. Prerequisite: For professional students, second-year standing in the veterinary curriculum; for graduate students, Veterinary Biosciences 315 and 316, or equivalent. 2 hours or $\frac{1}{2}$ unit.
319. **Pharmacology, II.** Lecture-discussion on the action of chemical agents on physiological processes and disease-producing organisms. Prerequisite: Veterinary Biosciences 318 or equivalent. 3 hours or $\frac{3}{4}$ unit.
320. **Toxicology.** Discusses the mechanisms of action, clinical, diagnostic, and therapeutic aspects of chemical and plant toxicants in domestic animals. Prerequisite: Veterinary Biosciences 319 or equivalent. 2 hours or $\frac{1}{2}$ unit.
321. **Advanced Clinical Cardiology.** Lecture-discussion course devoted to veterinary clinical cardiology; discusses various cardiac conditions such as arrhythmias, congenital anomalies, acquired vascular disease, and other common types of acquired cardiac disease from the standpoint of diagnosis, treatment, and management. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
322. **Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Clinical Medicine 322. Lectures designed to assist the student in integrating knowledge of the science of pharmacology with an understanding of veterinary internal medicine; emphasizes the establishment of therapeutic objectives as applied to various body systems. Prerequisite: Fourth-year standing in the veterinary curriculum. 2 hours.
324. **Nutritional Aspects of Large Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in cattle, horses, sheep, and swine; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific dis-

- ease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
326. **Nutritional Aspects of Small Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in small animals; presentation of therapeutic principles; and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 1 hour.
329. **Advanced Veterinary Toxicology.** Applies and expands concepts in Veterinary Biosciences 320; emphasizes discussion of clinical and diagnostic aspects of major toxicoses. The optional laboratory is offered only to students enrolled in the discussion section; laboratories and field trips give students additional expertise in proper diagnostic and therapeutic practices. Prerequisite: Veterinary Biosciences 320. 1 or 2 hours.
345. **Statistical Methods.** Same as Agricultural Engineering, Animal Science, and Forestry 345. See Animal Science 345.
349. **Basic Toxicology.** Same as Environmental Studies 349. See Environmental Studies 349.
367. **Radiology and Radiobiology.** Same as Veterinary Clinical Medicine 367. See Veterinary Clinical Medicine 367.
378. **Veterinary Clinical Orientation.** Same as Veterinary Clinical Medicine and Veterinary Pathobiology 378. See Veterinary Clinical Medicine 378.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
405. **Morphology of Reproduction.** Morphology of genital and endocrine organs of reproduction in domestic and laboratory animals, including histochemistry and radioautography; interpretation of illustrations, such as light and electron micrographs, as well as morphometric and stereologic data. Prerequisite: Credit or concurrent registration in Physiology 406. $\frac{1}{2}$ unit.
412. **Advanced Endocrinology.** Same as Animal Sciences 412 and Physiology 412. See Physiology 412.
413. **Cardiovascular Physiology.** Same as Physiology 413. Structure and function of myocardial cells, mechanics of contraction, determinants of cardiac performance, methods for assessing cardiac contractility, determinants of myocardial oxygen utilization, coronary circulation and its regulation, neurogenic control of circulation, circulation during exercise, heart failure, myocardial hypoxia and ischemia. Prerequisite: Veterinary Biosciences 316 or Physiology 401; or consent of instructor. $\frac{1}{2}$ unit.
414. **Neurotoxicology.** Same as Environmental Studies 414 and Psychology 414. Examines mammalian nervous system responses to xenobiotics (chemicals, pharmaceuticals, and toxins). Also studies neurotoxic responses beginning with the molecular and cellular level up to the behavioral level using biochemical, electrophysiological, and behavioral methods. Prerequisite: Credit or concurrent registration in Biochemistry 350 or 352, and Veterinary Biosciences 310 or equivalent. $\frac{3}{4}$ unit.
419. **Neural Control of Cardiorespiratory and Autonomic Function.** Same as Physiology 419. Critical analysis of classic and most influential papers of cardiorespiratory and autonomic control. With instructors' guidance, students select important papers for individual presentation, to be followed by class discussion. Full student participation at each class meeting is required. Prerequisite: Physiology 302 or equivalent physiology course with consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
431. **Advanced Reproductive Endocrinology.** Same as Animal Science 431 and Physiology 431. See Animal Science 431.
432. **Advanced Reproductive Physiology.** Same as Animal Science 432. See Animal Science 432.
433. **Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433 and Physiology 433. See Animal Science 433.
461. **Analytical Methods: Analysis of Drugs in Biological Fluids.** Review of methods used in the detection of drugs/metabolites and toxins in biological fluids and tissues; emphasis on current laboratory methods and procedures (spectrophotometry, chromatography, immuno-

assay, sample preparation, method validation, used in various aspects of pharmacologic toxicologic research requiring quantitation of drugs toxins. Prerequisite: Consent of instructor. 1 unit.

463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Animal Science 463 and Biophysics 463. Lectures, demonstrations, and laboratory on the fundamentals of radioisotope procedures and applications in biology and medicine. Prerequisite: Quantitative chemistry; one year each of mathematics, physics, and biology, or consent of instructor. 1 unit.
465. **Comparative Disposition of Xenobiotics.** Lecture-discussion concerning the fate of foreign chemicals in various species of animals; principles of absorption, distribution, biotransformation, and excretion of drugs and toxicants; and pharmacokinetics and factors which modify these processes. Prerequisite: Biochemistry 353 and Veterinary Biosciences 320, or equivalent. 1 unit.
466. **Comparative Environmental Toxicology and Drug Resistance.** The chemistry, action, and disposition of selected toxic substances at levels associated with environmental contamination; nature and biological consequences of host-toxicant interactions from the perspective of chronic and subclinical effects. Prerequisite: Veterinary Biosciences 465 or Environmental Studies 331; or consent of instructor. $\frac{3}{4}$ unit.
467. **Principles of Drug and Toxicant Evaluation.** Comprehensive discussion of the factors involved in the development of new drugs, the evaluation of drug safety and efficacy, and the analysis of the results of clinical trials. Prerequisite: Veterinary Biosciences 318, 349, or equivalent; and credit or concurrent registration in Agronomy 340 or Biology 371. $\frac{3}{4}$ unit.
468. **Molecular Toxicology.** Same as Environmental Studies 468. See Environmental Studies 468.
490. **Seminar.** Required of all graduate students whose major is veterinary biosciences. 0 or $\frac{1}{4}$ unit.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
496. **Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

VETERINARY CLINICAL MEDICINE

Head of Department: H. Fred Troutt

Department Office: 244 Small Animal Clinic, 1008 West Hazelwood, Urbana

322. **Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Biosciences 322. See Veterinary Biosciences 322.
327. **Practice Management for Veterinarians.** Principles of managing a private veterinary practice including practice evaluation, financing, legal formats for owning and operating a practice, economics, personnel management, accounting and record keeping, and marketing. Prerequisite: Third or fourth year standing in veterinary curriculum. 1 hour.
330. **Companion Animal Medicine, I.** Pathophysiology, diagnosis, treatment, and prophylaxis of diseases of the eye and nervous system. Prerequisite: Registration in the Veterinary curriculum or consent of instructor. 2 hours.
331. **Companion Animal Medicine, II.** Pathophysiology, diagnosis, treatment, prophylaxis of infectious diseases, endocrine disorders, diseases of the skin, and gastrointestinal diseases. Prerequisite: Registration in the Veterinary curriculum or consent of instructor. 3 hours.
332. **Companion Animal Medicine, III.** Pathophysiology, diagnosis, treatment, and prophylaxis of diseases of blood-forming organs, and of the cardiovascular, respiratory, and urinary systems. Prerequisite: Registration in the Veterinary curriculum or consent of instructor. 3 hours.
333. **Companion Animal Medicine, IV.** Pathophysiology, diagnosis, treatment, and prophylaxis of diseases of horses and caged birds. Prerequisite: Registration in the Veterinary curriculum or consent of instructor. 2 hours.

334. **Food Animal General Medicine and Herd Health Management.** Diagnosis, treatment, and prevention of infectious and management related diseases of food animals. Prerequisite: Third year standing in Veterinary Medicine. 5 hours.
342. **Interpretive Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 342. See Veterinary Pathobiology 342.
347. **Veterinary Clinical Oncology.** Advanced clinical techniques used in the diagnosis and treatment of neoplastic diseases of domestic animals. Prerequisite: Fourth year standing in the veterinary curriculum. 1 hour.
348. **Advanced Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 348. See Veterinary Pathobiology 348.
351. **Introduction to Surgery.** Surgical principles including sterile technique, hemostasis, tissue handling, and wound healing with emphasis on clinical application in domestic animals; laboratory covers demonstrations and practice of surgical principles. Prerequisite: Third year standing in veterinary curriculum. 1 hour.
352. **General Small Animal Surgery.** Surgical procedures of major body systems, emphasizing preoperative, operative, and postoperative patient care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 351. 1 ½ hours.
353. **General Large Animal Surgery.** Surgical procedures of major body systems, emphasizing preoperative, operative, and postoperative patient care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 351. 1 ½ hours.
354. **Special Small Animal Surgery.** Lecture and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and after care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 352. 2 ½ hours.
355. **Special Large Animal Surgery.** Lecture and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and after care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 353. 2 ½ hours.
362. **Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases; lectures, quizzes, and demonstrations. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
363. **Small Animal Dermatology.** The first half of the course presents a systematic approach to small animal dermatologic diagnoses and therapeutics; the second half deals with immunological disorders, seborrheic syndromes, hereditary disorders, cutaneous neoplasms, and feline dermatology. Prerequisite: Veterinary Clinical Medicine 331 or equivalent, or consent of instructor. 1 hour.
366. **Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
367. **Radiology and Radiobiology.** Same as Veterinary Biosciences 367. General principles of radiology and radiobiology techniques and application to the diagnosis and therapy of animal diseases; lectures and discussions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 3 hours.
369. **Clinical and Laboratory Practice.** Clerkship in veterinary clinical medicine and surgery for VM-4 professional students. Prerequisite: Fourth-year standing in veterinary medicine professional curriculum, or equivalent. 2 to 5 hours.
371. **The Evolution and Principles of Surgery.** Studies the evolution of surgery from an empiric craft to a scientific discipline. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
372. **Veterinary Jurisprudence.** Principles of law of importance to members of the veterinary profession; animal disease and related regulatory laws and their administration; and federal procedure under animal disease, food, and meat inspection laws. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
373. **Small Animal Urology.** The anatomic and physiologic basis for urologic examination of the dog and cat; discussions integrate lesions, pathogenesis, and signs of disease and stress the

- pathophysiologic basis of diagnosis and therapy in small animal urology. Prerequisite: Veterinary Clinical Medicine 332 or consent of instructor. 1 hour or $\frac{1}{4}$ unit.
375. **Theriogenology.** Examines principles of animal reproduction, fertility, and obstetrics of all species of domestic animals, emphasizing farm animals; lectures, discussion, and laboratory practice in obstetrics, pregnancy diagnosis, and male and female in fertility. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
376. **Veterinary Anesthesiology and Fluid Therapy.** Principles of veterinary anesthesiology emphasizing clinical application of anesthetic techniques and procedures in domestic animals; clinical pharmacology of preanesthetic, anesthetic and related drugs, anesthetic and physiologic monitoring equipment, and shock; teaches fluid and electrolyte therapy with overall emphasis on maintenance of homeostasis in anesthetized animals. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
377. **Disease Prevention and Therapy in Swine Production.** Practical diagnostic, preventive, and treatment procedures in modern veterinary swine practice; relationships between swine production methods and disease conditions; and herd health programs. Lectures, laboratories, and field trips. Prerequisite: Fourth-year standing in veterinary curriculum. 2 hours.
378. **Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Pathobiology 378. Lectures and demonstrations illustrating the interrelationships between the basic sciences and their applications in medicine and surgery; includes methods of restraint and handling of several animal species. Prerequisite: First-year standing in the veterinary curriculum. 1 hour.
379. **Advanced Veterinary Ophthalmology.** Anatomic, physiologic, pathologic, and pharmacologic considerations in eye diseases and their treatments; instrumentation and methods of study of ocular structure, physiology, and diseases; and laboratories devoted to techniques of examination of the eye and surgical procedures used in treatment of eye diseases. Prerequisite: Fourth-year standing in veterinary curriculum. 1 or 2 hours (1 hour if taking lecture only; 2 hours if taking lecture and lab), or $\frac{3}{4}$ unit.
380. **Dairy Herd Health Management.** A study of dairy cattle practice, including economics, enterprise, management, herd and individual cow health, reproduction, and disease control. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
382. **Exotic Pets.** Principles of restraint, diagnosis, and medical and surgical treatment of diseases of small exotic mammals, birds, reptiles, and fish kept as pets. Prerequisite: Third-year standing in veterinary curriculum. 1 hour.
384. **Client Relations.** Introduction to client relations, including techniques of effective verbal and nonverbal communication and applications of these techniques for veterinary students. 1 hour.
385. **Advanced Radiographic Interpretation: Large Animal.** In-depth study of radiographic diagnosis applied to large animals, primarily equine; lecture, case study, and discussion centering on anatomic areas, e.g., foot, fetlock, metacarpus/metatarsus, carpus, tarsus, upper limb joints, and head and neck. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
386. **Advanced Radiographic Interpretation—Small Animal.** An exercise in systematic interpretation of small animal radiographs. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
387. **Advanced Veterinary Anesthesiology.** Lectures cover mechanical ventilators and the physiologic effects of mechanical ventilation on acid-base status, cardiopulmonary function and other homeostatic mechanisms in anesthetized animals; high frequency ventilation in relation to other forms of mechanical respiratory support; recently developed anesthetic agents, techniques, and their clinical applications; interactions between non-anesthetic drugs and their effects on surgical patient response to anesthetic and anesthetic-related agents. Prerequisite: Fourth year standing in veterinary curriculum or consent of instructor. 1 hour or $\frac{1}{4}$ unit.
388. **Human Interactions with Nonhuman Animals - Issues and Answers.** Study of human interaction with, behavior toward, and treatment of nonhuman animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 1 hour.
389. **Small Animal Diagnostic Instrumentation.** Training in the use of special medical and surgical diagnostic techniques, including endoscopy, ultrasound, and an introduction to electrodiagnostics. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.

390. **Equine Reproduction.** Instruction in equine reproductive physiology, infectious and noninfectious infertility problems, obstetrical procedures, and preventive medicine practices. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
391. **Advanced Orthopedics: Fracture Fixation.** Advanced instruction in the pathophysiology of bone fracture and healing, techniques of fracture fixation and complications of fracture repair. Prerequisite: Veterinary Clinical Medicine 354; fourth year standing in the veterinary curriculum. 1 hour.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
393. **Advanced Neurology.** An advanced course which expands the participants' knowledge of clinical neurology and introduces participants to research techniques used in the elucidation of neurologic disease processes. Prerequisite: Senior or graduate standing in the College of Veterinary Medicine; or consent of instructor. 1 hour or $\frac{1}{2}$ unit.
395. **Beef Cattle Economics, Management, and Herd Health.** A study of management systems and the economic factors that influence the cattle industry; health programs for beef cattle emphasizing the herd approach and the veterinarian's role in the beef cattle industry. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
396. **Advanced Small Animal Surgery.** Lecture and laboratories in advanced small animal surgery. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
397. **Advanced Equine Lameness.** An elective in the diagnosis and treatment of equine lameness. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
399. **Special Senses.** Studies the structure, development, and function of the eye and ear; discusses specific pharmacologic agents and selected anatomical abnormalities which alter normal physiologic processes. Prerequisite: Registration in the veterinary curriculum. 1 hour.
484. **Current Concepts in Comparative Surgery.** Advanced study of topics concerning the pathophysiology, diagnosis, and current therapy of diseases which are treated with surgical procedures. Prerequisite: DVM or equivalent or consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
490. **Seminar.** Required of all graduate students whose major is veterinary clinical medicine. 0 or $\frac{1}{4}$ unit.
491. **Recent Advances in Veterinary Internal Medicine.** A series of lectures, seminars, and discussions devoted to intense study of new pathophysiologic aspects of selected topics in veterinary internal medicine. Each semester is devoted to three topics. Prerequisite: D.V.M. degree or equivalent, and consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
493. **Advanced Topics in Veterinary Clinical Medicine.** Instruction in advanced diagnosis, therapeutic modalities, and research methodologies in the areas of small animal internal medicine, small animal surgery, equine and food animal medicine and surgery, ophthalmology, theriogenology, radiology, and clinical pharmacology. Prerequisite: D.V.M. degree or equivalent; consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units.

VETERINARY MEDICAL SCIENCE

Dean of College: Victor E. Valli

Department Office: 3229 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

Effective January 1, 1980, the graduate courses in veterinary medical science have been realigned with one of the three departments in the College of Veterinary Medicine. The following courses have been retained to allow existing VMS students to complete their degree requirements in veterinary medical science.

490. Seminar. Required of all graduate students whose major is veterinary medical science. ¼ unit.

499. Thesis Research. 0 to 4 units.

VETERINARY PATHOBIOLOGY

Acting Head of Department: Kenneth Todd

Department Office: 2522 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln, Urbana

- 310. Immunogenetics and Immunophysiology.** Same as Animal Sciences 310 and Biology 310. See Animal Sciences 310.
- 326. Parasitologic Techniques and Systematics.** Survey of taxonomy of animal parasites; structures used for taxonomy are studied after collection, preservation, and preparation of parasite specimens. Prerequisite: Veterinary Pathobiology 333 or equivalent. 3 hours or ¾ unit.
- 329. Veterinary Medicine and Society: Ethics, Economics, and Egos.** Introduction to the process of integrating personal and professional development with social need and cultural determinants of that need; seminar format using selected writings in history and philosophy of medicine, science, and developmental psychology with class discussions relating readings to professional development. Prerequisite: Veterinary Pathobiology 330. 1 or 2 hours.
- 330. Veterinary Medical History, Ethics, and Orientation.** Introduction to the history, recent developments, scope, and trends of veterinary medical education, practice, research, public health, and other areas; functions, obligations, and organization of the profession. Prerequisite: First-year standing in veterinary curriculum. 1 hour.
- 331. Veterinary Bacteriology and Mycology.** Studies the properties of bacteria and fungi responsible for diseases of domestic and wild animals; emphasizes epidemiology, pathogenesis, and morphological and cultural characteristics of bacteria and fungi, and diagnosis. Prerequisite: First-year standing in veterinary curriculum or consent of instructor. 4 hours or 1 unit.
- 332. Veterinary Immunology.** Fundamental principles of immunology; mechanisms and functions of the humoral and cell-mediated immune responses; role of the immune system in protection against infectious diseases and tumors; immune dysfunctions and diseases of immunologic origins. Lectures and laboratory. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 2 hours or ½ unit.
- 333. Veterinary Parasitology.** Protozoan, arthropod, helminth parasites affecting domestic animals and humans; lectures, discussions, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 20 hours in chemistry or animal biology, or both; consent of instructor. 5 hours or 1 unit.
- 334. General Pathology.** Cellular, organic, and systematic reactions to acute and chronic injury related to infections, circulatory disturbances, intoxications, parasitism, immunologic disorders, metabolic disturbances, and disturbances of growth, including neoplasms; lectures, quizzes, demonstrations, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 25 hours in histology, parasitology, physiology, and microbiology; consent of instructor. 4 hours or 1 unit.

335. **Special Pathology.** Disease processes including specific diseases, affecting organs and anatomic systems. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 4 hours or 1 unit.
337. **Veterinary Virology.** Fundamental principles of animal virology; mechanisms of virus-cell and virus-host interactions; explores properties of the major groups of animal virus in relation to replication and pathogenesis of viral disease. Lecture and laboratory. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
338. **Veterinary Clinical Pathology.** Discusses the function and interpretation of hematological, chemical, and certain other procedures, including exfoliative cytology, as aids in the diagnosis of animal diseases; emphasizes the correlation of laboratory findings with fundamental changes and clinical manifestations of disease. Prerequisite: Second-year standing in veterinary curriculum. 4 hours.
339. **Basic Biomedical Photography.** Uses photography as a tool for scientific communication emphasizing production and design for research and instructional purposes; encourages students to explore in depth those areas that are of specific interest (e.g., clinical photography, photomicrography, special techniques in lighting, or areas such as multimedia productions or self-instructional techniques). Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 1 or 2 hours.
341. **Food Hygiene and Public Health.** Introduction to public health; diseases of animals transmissible to man; and procedures and techniques used in inspection of food of animal origin. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
342. **Interpretive Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 342. Discusses clinical pathologic findings used in the diagnosis of disease affecting domestic animals including dog, cat, horse, and cow with emphasis on hematology, urinalysis, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338 or equivalent. 2 hours.
343. **Diseases of Poultry.** The causes, symptoms, lesions, prevention, and treatment of noninfectious and infectious diseases of domestic birds; lectures, quizzes, and PLATO demonstrations. Prerequisite: Third- or fourth-year standing in veterinary curriculum or consent of instructor. 2 hours.
344. **Clinical Immunology.** The impact of immunologic mechanisms in clinical medicine; autoimmunity, tolerance, immune complex disease, and immunoprophylaxis; lectures and demonstrations. Prerequisite: Veterinary Pathobiology 332 or equivalent. 2 hours or $\frac{1}{2}$ unit.
346. **Management and Diseases of Laboratory Animals.** Principles of colony management and disease control of common laboratory animals; emphasizes the production and maintenance of quality animals for research; and includes a field trip to AAALAC-accredited facilities. Prerequisite: Two courses in biology and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
348. **Advanced Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 348. Advanced lectures, discussions, and laboratory work in hematology, exfoliative cytology, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338. 2 hours.
350. **Epidemiology.** Principles and uses of epidemiology and biostatistics in the practice of veterinary medicine. Prerequisite: Second-year standing in veterinary curriculum. 2 hours or $\frac{1}{2}$ unit.
355. **Animal Necropsy Procedures.** Instruction and practice in the performance of postmortem dissections; emphasizes the recognition of macroscopic pathologic changes on the assessment of their effects and on their diagnostic significance. For nonpathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 $\frac{1}{2}$ units.
356. **Diseases of Laboratory Animals.** Survey of diseases of major importance in laboratory animal medicine. The etiology, pathogenesis, clinical signs, treatment, and control of the diseases; emphasis on diagnostic principles and methods. 1 hour.
371. **Epidemiology and the Media.** Same as Health and Safety Studies 371. Seminar based on student presentation of current epidemiological topics, followed by class discussion. Topics originate from popular media accounts, combined with information from original scientific communications. Outside speakers provide alternative views about the role of the media in presenting scientific issues. Prerequisite: One semester of epidemiology. 1 hour or $\frac{1}{4}$ unit to $\frac{1}{2}$ unit.

374. **Principles of Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Medical Sciences 374. See Health and Safety Studies 374.
378. **Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Clinical Medicine 378. See Veterinary Clinical Medicine 378.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
415. **Mechanisms of Microbial Infections.** Newer concepts of host-microorganism relations; emphasis on the dynamics and pathogenic mechanisms of microorganisms, immune responses and defense factors of the host, and pathogenesis of specific infections. Lectures, discussions, laboratory, and special problems. Prerequisite: Microbiology 326 or Veterinary Pathobiology 332, or equivalent; consent of instructor. $\frac{3}{4}$ or 1 unit.
416. **Epidemiology of Infectious Diseases.** Same as Health and Safety Studies 476. Ecology of infection and disease; spread of disease and modes of transmission; methods of control; socioeconomic consideration; selected diseases: malaria, Lyme disease, anaplasmosis, schistosomiasis, salmonellosis, pseudorabies, AIDS. Student presentations. Prerequisite: Epidemiology class (Veterinary Pathobiology 350, Health and Safety Studies 374 or equivalent), or consent of instructor. 3 hours of $\frac{3}{4}$ unit.
417. **Principles and Methods of Veterinary Epidemiology.** Same as Health and Safety Studies 477. Theoretical and applied principles of veterinary epidemiology; quantitative and computer-based methodology for evaluating disease risk, prognosis, and treatment at the individual and population level. A veterinary degree is not required for enrollment. Prerequisite: Graduate student standing. $\frac{3}{4}$ unit.
418. **Concepts and Topics in Immunology.** Same as Biology 418. Newer concepts and theories in the field of immunology, including theories of antibody formation and immunological tolerance, regulation of the immune response, biosynthesis and structure of antibodies, and evolutionary aspects of the immune response. Lectures and discussion. Prerequisite: Consent of instructor; Microbiology 327 and Biology 307 recommended. $\frac{1}{2}$ unit.
419. **Animal Virology.** Same as Microbiology 419. A discussion-laboratory with major emphasis on host-parasite relationships, natural history, and epidemiology, supplemented with appropriate laboratory techniques as they pertain to the major groups of animal viruses. Prerequisite: Microbiology 327 and 328, or Veterinary Pathobiology 331 and 332; Biochemistry 350 or 354; consent of instructor. $\frac{3}{4}$ unit.
426. **Statistical Techniques in Epidemiological Research.** Same as Environmental Studies 427, Health and Safety Studies 427, and Medical Sciences 463. See Health and Safety Studies 427.
427. **Parasitology Seminar.** Discussion of selected historic and current literature related to parasitology. Prerequisite: Veterinary Pathobiology 333; or concurrent registration in any one of these courses. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
437. **Molecular and Immunoparasitology.** Discussion of the genetic and immunologic mechanisms for parasite evasion of the immune system, effective and ineffective host responses to the parasite, and disease pathology; these factors are related to parasite survival, vaccine development, and diagnosis. Prerequisite: Consent of instructor. 1 unit.
444. **Immunobiological Methods.** Same as Animal Science 444. Laboratory exercises, demonstrations, and discussions of methods and techniques in cellular immunology and immunobiology. Prerequisite: Biology 307 or Microbiology 327; or equivalent survey course in immunology or immunochemistry. $\frac{1}{2}$ unit.
445. **Veterinary Diagnostic Pathology, I.** Instruction in the performance of necropsy examinations; emphasizes recognition, interpretation, oral presentations, and written descriptions of gross and histologic lesions; emphasizes histologic features of lesions. For pathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 $\frac{1}{2}$ units.
446. **Veterinary Diagnostic Pathology, II.** Instruction in the use of supplemental diagnostic data in the areas of bacteriology, clinical pathology, immunology, parasitology, toxicology, and virology in arriving at differential and definitive diagnoses; emphasizes pathogenesis of gross

- and histologic lesions and mechanisms of lesion development. Prerequisite: Veterinary Pathobiology 445 or equivalent, or consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of $2\frac{1}{2}$ units.
447. **Pathology Seminar.** Discusses selected pathologic and clinico-pathologic material; requires presentation of a formal seminar. Prerequisite: Credit or concurrent registration in Veterinary Pathobiology 445, and consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
448. **Toxicologic Pathology.** Examines the morphological and biochemical aspects of cellular reactions to injury in acute and chronic toxicities; effect of selected toxic agents on target organs in relation to induced functional and structural changes. Prerequisite: Veterinary Pathobiology 334; and Veterinary Biosciences 320 or Animal Science 360; or equivalent. $\frac{3}{4}$ or 1 unit.
449. **Pathology of Selected Systems.** Pathogenesis and pathology of disease processes in selected tissue and organ systems; emphasizes the mechanisms of cellular and tissue responses to injury. Topics differ each term. Prerequisite: Veterinary Pathobiology 335 or equivalent; consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of $2\frac{1}{2}$ units.
450. **Concepts in Pathology.** Discusses experimental and theoretical aspects of general pathology; emphasizes an interdisciplinary approach to mechanisms of disease. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. 1 unit.
453. **Tumor Biology.** Examines concepts and principles of the neoplastic process and its morphologic correlates; topics include events mediated by chemical and viral causes of neoplastic transformation, behavioral alterations that mark commitment to neoplastic growth, biology of metastases, and clonal selection as a property of successful tumors. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. $\frac{3}{4}$ unit.
455. **Comparative Oncology.** Comparative study of the nature of mammalian and avian neoplasms based on general and special methods of tumor identification and classification; lectures, demonstrations, and laboratory. Prerequisite: Veterinary Pathobiology 334 and 335, or equivalent. 1 unit.
459. **Surgical Pathology.** Discusses and interprets disease processes of domestic animals; emphasizes interpretation of pathologic changes in tissue specimens obtained during surgical procedures; correlates structure, function, and prognosis. Prerequisite: Veterinary Pathobiology 445 and 455, or equivalent; consent of instructor. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of $2\frac{1}{2}$ units.
490. **Seminar.** Required of all graduate students whose major is veterinary pathobiology. 0 or $\frac{1}{4}$ unit.
491. **Design and Analysis of Biomedical Experiments.** Principles of sampling, treatment assignment, and statistical analysis applied to biomedical experiments; major emphases include sampling size determination, dose-response functions, and computerized data analysis; use and reporting of statistical methods in biomedical literature are evaluated. Prerequisite: Agronomy 340, Biology 371, or consent of instructor. $\frac{3}{4}$ unit.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
496. **Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Biosciences 496. Interdisciplinary seminar on topics within the area of toxicology; topics vary each semester. Seminars are presented by faculty, visiting lecturers, and students based upon their study, research, and/or professional activities in the selected topic area. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units.

VOCATIONAL AND TECHNICAL EDUCATION

Department Head: L. Allen Phelps

Department Office: 345 Education Building, 1310 South Sixth, Champaign

101. **Nature of the Teaching Profession.** Introduction to educational problems; a general study of the nature of teaching: its opportunities and responsibilities. Through individual work, students are helped to evaluate their potentialities for teaching. 2 hours.
152. **Pre-educational Internship.** Early field experiences in an educational setting, including observation and laboratory experiences in community colleges, adult vocational programs, business and industry, health service settings, or governmental agencies; provides opportunities for career exploration, professional orientation, interrelating theory and practice, and understanding the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 3 hours.
189. **Supervised Occupational Experience.** Provides students preparing to teach in the vocational and technical fields the occupational experience necessary or appropriate to complete the requirements in these curricula. Students who are employed and concurrently enrolled in this course complete assignments covering the related technical information of their chosen fields and undergo regularly scheduled written, oral, and performance examinations. Application for a job assignment must be made three months prior to the semester in which placement is desired. Prerequisite: Sophomore standing. 2 or 3 hours. May be repeated to a maximum of 17 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
240. **Principles of Vocational and Technical Education.** Provides each specialized educational worker with a common orientation as to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Prerequisite: Vocational and Technical Education 101; Psychology 100. 2 to 4 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper five percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
252. **Educational Internship.** A practicum in a postsecondary educational setting to prepare students for educational roles where public school certification is not necessary or appropriate. Prerequisite: Vocational and Technical Education 152 and satisfactory progress in the Technical Education Specialties curriculum. 5 to 8 hours.
271. **Technique and Curriculum Development for Teaching Data Processing and Office Machines.** Introduces curriculum and techniques for teaching the operation of a variety of office machines and computers for processing data; introduces current methods of teaching the use of computer processing equipment and requirements for employment. 3 hours.
275. **Pre-Student Teaching in Agricultural Education.** Supervised experience in the work of a secondary teacher of agricultural education during a two- or three-week period in the summer; planning summer work, teaching adult classes, supervising agricultural practice or on-the-job training of students, advising school-sponsored youth organizations, counseling students, studying a community, becoming acquainted with facilities and equipment used in an agricultural education program, and becoming familiar with the situations in which the student will later do student teaching during a school year. Course work is started during the summer with official registration and course completion in the fall semester. Prerequisite: Educational Policy Studies 201. 2 or 3 hours.
276. **Student Teaching in Agricultural Education.** Supervised experience in the work of a secondary teacher of agricultural education during an eight-week period; planning programs, teaching high school and adult students, managing facilities and equipment, supervising students on the job, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 277. 8 hours.

277. **Programs and Procedures in Agricultural Education.** Preparation for a successful experience in student teaching and for beginning work as a secondary teacher of agricultural education; teaching high school and adult classes, maintaining and using facilities and equipment, supervising agricultural experience programs, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 276. 5 hours.
278. **Vocational Home Economics Education for Youth and Adults.** Preparation for work as a teacher in vocational home economics programs for youth and adults; study of procedures for planning, organizing, executing, and evaluating home economics occupational programs. Prerequisite: Senior standing and consent of instructor. 3 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
309. **Vocational Education for Special Needs Learners.** Same as Special Education 309. Examines contemporary legislation, program models, assessment, and instructional practices pertaining to special needs learners in vocational, technical and practical arts education programs at the secondary and post-secondary levels. Prerequisite: Student teaching or consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
345. **Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Special Education 345. See Special Education 345.
349. **Special Study and Investigation in Vocational and Technical Education.** Offers opportunity for an individual to study, on or off campus, selected problems, trends, and new developments or to conduct specialized technological investigations for the improvement of instructional programs in areas related to vocational and technical education. Prerequisite: Consent of instructor; demonstrated ability to pursue special study or investigation proposed. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
350. **Education for Rural Development in Low Income Countries.** Same as Agriculture 350. Study of educational institutions needed to further rural development in developing nations; emphasizes educational programs that enable rural families to improve their quality of life. Prerequisite: Senior standing. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
353. **Curriculum Development in Nutrition Education.** Same as Health and Safety Studies 313. Applies principles of teaching and learning to nutrition education for children and adults emphasizing choice of content, teaching techniques, and resources to promote interest and enhance achievement. Prerequisite: Foods and Nutrition 220 and Educational Psychology 311, or consent of instructor. 3 hours or 1 unit.
354. **Program Development in Family Life Education.** Studies current issues impacting on families, family organization and family functioning and interaction; reviews theories of human development as they relate to curriculum development in family life education; emphasizes selecting and organizing content, and specific approaches to teaching family relationships in school and non-school settings. Prerequisite: Psychology 100; Human Development and Family Ecology 105; Human Development and Family Ecology 215 or consent of instructor. 3 hours or 1 unit.
359. **Professional Skill Development Workshop in Vocational and Technical Education.** Designed to teach practitioner-oriented skills in specialized areas of vocational and technical education; students or faculty members may make requests for initiation of sections of this course. Topics vary; consult *Timetable* for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
370. **Agricultural Education for Inexperienced Teachers.** Specific help with the problems of beginning teachers; campus meeting in early fall; other meetings in centers in the state convenient to beginning teachers; and visits by instructors to schools in which enrolled teachers are employed. Prerequisite: Vocational and Technical Education 276 and 277 or equivalent. 3 to 4 hours, or $\frac{3}{4}$ to 1 unit.
381. **Foundations of Career, Occupational, and Practical Arts Education.** A study of basic concepts and practices of career, occupational, and practical arts education; explores the development of the curricular areas concerned, including types of programs, their place and role in various types of educational settings, students served, and issues and trends in program change. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.

382. **Cooperative Vocational and Technical Education Programs.** Provides the specific professional background required of teachers, coordinators, and administrators who organize and conduct public school programs utilizing community resources and experiences; includes the background, philosophy, organization, and administration of cooperative education. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
383. **Planning and Organizing Content for Career, Occupational, and Practical Arts Education.** Emphasizes selection, organization, and preparation of content for instructional programs in career, occupational, and practical arts education; students perform task analyses, prepare instructional objectives, arrange content in appropriate sequence, and determine allocation of resources. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
384. **The General Shop Program.** A laboratory and theory course in the organization and administration of the industrial arts general shop program. Prerequisite: Sixteen hours of undergraduate credit in appropriate vocational and technical education courses. 4 hours or 1 unit.
385. **Problems in Concurrent Work-Education.** While employed in approved cooperating business firms, students observe the relationships between their activities and the specialized educational programs in the high school and community college; in class sessions, emphasis on job analysis, current trends, wage and benefit structure, personnel practices, labor relations, and their implications for teaching. Prerequisite: Completion of prescribed courses in vocational and technical education for teaching in their area of specialization; consent of instructor. 4 hours or 1 unit.
387. **Training Programs in Industry.** Study of the organization, instruction, supervision, and evaluation of training programs conducted within industry and their relationships to other educational agencies. 4 hours or 1 unit.
388. **Special Techniques of Teaching Career, Occupational, and Practical Arts Education.** A study of teaching techniques appropriate to career, occupational, and practical arts education; focuses on communication methods and instructional strategies; students conduct investigations, develop materials, and make applications to their areas of concern. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
392. **Curriculum Modification and Individualized Instruction.** Gives students a working knowledge of, and skills in, the principles and application of individualized instruction theory and methods with competency-based vocational education as its prime focus; includes theory and practices in modifying existing curricula and developing new programs and curricula. Prerequisite: Vocational and Technical Education 383, or course work in curriculum development. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
399. **Issues and Developments in Vocational and Technical Education.** A special course for experimentation or for seminar on topics not treated by regularly scheduled courses; requests for initiation of this course may be made by students or faculty members. Topics vary; consult *Timetable* for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
442. **The Community College.** Same as Administration, Higher, and Continuing Education 442. See Administration, Higher and Continuing Education 442.
445. **Investment in Human Resources.** Same as Labor and Industrial Relations 445. See Labor and Industrial Relations 445.
448. **Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Curriculum and Instruction 402. See Administration, Higher, and Continuing Education 448.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chairman prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of advisor and department chair.
450. **Evaluation in Vocational, Technical, and Practical Arts Education.** Theory and techniques of vocational education evaluation in cognitive, affective, and psychomotor domains at different educational levels; development and analysis of activities and instruments for student and program evaluation, follow-up studies, and interpretation of results for self-evaluation and for administrative decision making. Prerequisite: Educational Psychology 392 and Vocational and Technical Education 471, or consent of instructor. 1 unit.

451. **Directing Personnel Development in Vocational, Technical, and Practical Arts Education.** Principles and techniques for development of personnel in programs of vocational, technical, and practical arts education; emphasis on personnel development and instructional supervision of paraprofessionals, employers, and foremen of vocational and technical education students. Prerequisite: One unit in vocational and technical education or consent of instructor. 1 unit.
453. **Disciplined Inquiry in Vocational Education.** Provides an analysis and synthesis of disciplined inquiry in vocational education including an historical perspective, formulation of the research process, and the utilization and communication of research. Prerequisite: Vocational and Technical Education 381 and Educational Psychology 390; or equivalent. 1 unit.
454. **Problems of Home Economics Teachers in the School and Community Setting.** Advanced study of principles of teaching and learning in the school and community setting; includes group meetings on campus and in centers convenient to students, and visits by the instructor to settings in which enrollees work. Instruction utilizes the experience and resources of teachers enrolled. Prerequisite: BS in Home Economics Education; currently teaching home economics. 1 unit.
455. **Principles of Supervision of Home Economics Interns in School and Non-School Settings.** Studies principles and techniques for the development of supervisors of student interns; develops the educational capabilities of supervisors for their role as educators through knowledge of supervisory processes and practices and awareness of the scope of the supervisor's responsibilities. Prerequisite: Educational Psychology 311 and 312; or equivalent. 1 unit.
456. **Problems and Trends in Specialized Fields of Vocational and Technical Education.** Introduction to significant problems, points of view, and trends in the field concerned; explores significant research relating to organization, content, and techniques in the field in question. Topics vary; consult *Timetable* for specific section offerings. Students are encouraged to make special studies in approved areas. 1 unit.
471. **Policy and Program Development in Vocational, Technical, and Practical Arts Education.** Local, state, and national policies for vocational and technical education; organizing for policy making and program development; and developing desirable policies and programs. 1 unit.
472. **Course Planning and Teaching Procedures in Agricultural Education Programs.** Gathering data essential in course planning, constructing course plans, and developing resource units, teaching procedures, and instructional aids for agricultural and extension education programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
473. **Adult Education in Agriculture.** The case for adult education, needs of young and older adults for agricultural education, development and present status of adult education in agriculture, objectives, evaluation, using advisory committees, organizing adult classes, enrolling students, course planning, teaching procedures and aids, supervised practice, group activities, and facilities. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
474. **Supervised Experience in Agricultural Education Programs.** Supervised agricultural experience programs as an educational strategy; importance and meaning of supervised agricultural experiences; planning, conducting, supervising, and evaluating agricultural experience programs; relation of supervised agricultural experience programs to establishment and advancement in an occupation; keeping and using records; and relating class instruction to supervised agricultural experience programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
475. **Organizing and Teaching Agricultural Mechanics.** Agricultural mechanics and laboratory instruction as a phase of vocational education in agriculture: purposes, course planning for high school students, young and older adults; methods of teaching and evaluating on-job instruction; planning agricultural-mechanics laboratories and facilities; and providing and teaching safety in agricultural mechanics. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
476. **Guidance in Vocational, Technical, and Practical Arts Education.** The guidance function of a vocational or technical teacher; developing guidance related instructional programs; identifying and selecting students for vocational and technical programs; determining labor market needs and projections and job requirements; providing occupational information;

- placing graduates, counseling parents, students, supervisors, advisory committee members, union members, and employers, and conducting follow-up studies. 1 unit.
461. **History and Basic Concepts of Vocational and Technical Education.** The historical development of modern vocational education; the educational theories underlying its development; and the educational concepts upon which present programs and procedures are based. 1 unit.
462. **Research Studies in Vocational and Technical Education.** Study and evaluation of examples of research in this field; consideration of the research needed to solve present problems. Each student proposes and completes a brief research project, or plans in detail a major research project to be completed later. 1 unit.
466. **Foundations of Curriculum Development for Occupational and Practical Arts Education.** Synthesizes selected sociological, psychological, and epistemological foundations for curriculum development in occupational and practical arts education; application of theories from fundamental disciplines to practice in existing and emerging curricula involving perceptual and psychomotor learning. 4 to 1 unit.
499. **Administration of Vocational and Technical Education.** Problems and approved practices in the administration and supervision of programs of vocational, technical, and practical arts education in secondary schools, junior colleges, and technical institutes. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in vocational and technical education open only to persons who have been admitted for doctoral study in vocational and technical education; sections are usually offered in the following areas: (a) industrial education, (b) agricultural education, (c) home economics education, (d) business education, and (e) general vocational and technical education. 0 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Limited to students who have been admitted for doctoral study. 1 to 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

WOMEN'S STUDIES

Director of Office: Jean T. Peterson

Office address: 304 Stoven House, 708 South Mathews, Urbana

111. **American Women in Change: An Introduction.** Interdisciplinary introduction to women's studies in literature, history, and speech communication; includes women's actual roles in American history, seventeenth to early twentieth centuries, and literature and sex-related issues in language; and emphasizes interconnections among the three fields. 3 hours.
112. **Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Ecology 145 and Sociology 145. The impact of culture and society on gender roles, including socialization and identity formation, as expressed in life-styles, marriage and family alternatives, and patterns of education and employment. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours.
219. **Women in Japanese Literature.** Same as Asian Studies, Comparative Literature, and Japanese 219. See Japanese 219.
224. **Women in Society.** Same as Sociology 224. See Sociology 224.
235. **Women in Politics.** Same as Political Science 135. See Political Science 135.
245. **Women in the Labor Market.** Same as Economics 245. See Economics 245.
262. **Cultural Images of Women.** Same as Anthropology 262. See Anthropology 262.
272. **History of Women in Europe, 1700 to the Present.** Same as History 272. See History 272.
273. **The History of American Women: Colonial Period to the Present.** Same as History 273. See History 273.
280. **Women Writers.** Same as English 280. See English 280.

302. **Sex Roles.** Same as Human Development and Family Studies 302 and Sociology 302. See Sociology 302.
332. **Women and Language.** Same as Linguistics and Speech Communication 332. See Speech Communication 332.
341. **Applications of Sex Role Theory to Counseling.** Same as Educational Psychology 341. See Educational Psychology 341.
346. **Sexism: Social Service and Social Welfare.** Same as Social Work 346. See Social Work 346.
370. **Selected Topics on Women and Politics.** Same as Political Science 370. See Political Science 370.
396. **Seminar in Women's Studies.** Interdisciplinary seminar on special topics in women's studies. Prerequisite: Women's Studies 111 or 112, and two courses in women's studies at the 200-300 levels; junior standing; or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated once as content varies.

Appendix A

LANGUAGE OFFERINGS

The following is a complete list of the languages regularly offered, together with the unit responsible for offering the course. The reader should consult the listing for the unit for the specific courses offered in the language.

<i>Language</i>	<i>Unit responsible for the language</i>
African Languages	Linguistics
Arabic	Linguistics
Bulgarian	Slavic Languages and Literatures
Catalan	Spanish, Italian, and Portuguese
Chinese	Asian Studies
Coptic	Classics
Czech	Slavic Languages and Literatures
Danish. <i>See</i> Scandinavian	Germanic Languages and Literatures
French	French
German	Germanic Languages and Literatures
Greek (Ancient)	Classics
Hausa. <i>See</i> African Languages	Linguistics
Hebrew	Linguistics
Hindi	Linguistics
Italian	Spanish, Italian, and Portuguese
Japanese	Asian Studies
Korean	Asian Studies
Latin	Classics
Lingala. <i>See</i> African Languages	Linguistics
Norwegian. <i>See</i> Scandinavian	Germanic Languages and Literatures
Persian	Linguistics
Polish	Slavic Languages and Literatures
Portuguese	Spanish, Italian, and Portuguese
Russian	Slavic Languages and Literatures
Sanskrit	Linguistics
Scandinavian	Germanic Languages and Literatures
Serbo-Croatian	Slavic Languages and Literatures
Spanish	Spanish, Italian, and Portuguese
Swahili. <i>See</i> African Languages	Linguistics
Swedish. <i>See</i> Scandinavian	Germanic Languages and Literatures
Ukrainian	Slavic Languages and Literatures
Urdu. <i>See</i> Hindi	Linguistics
Wolof. <i>See</i> African Languages	Linguistics

Other languages may be offered by tutorial in the following units:

Asian Studies
Latin American and Caribbean Studies
Linguistics

Appendix B

RUBRIC ABBREVIATIONS

Following is a list of official rubric abbreviations for courses currently approved for offering on the Urbana-Champaign campus of the University of Illinois.

A A E	Aeronautical and Astronautical Engineering
ACCY	Accountancy
ADV	Advertising
AFAS	Air Force Aerospace Studies
AFLNG	African Languages
AFRO	Afro-American Studies
AFRST	African Studies
AGCOM	Agricultural Communications
AG E	Agricultural Engineering
AG EC	Agricultural Economics
AG M	Agricultural Mechanization
AGR	Agriculture
AGRON	Agronomy
AHCE	Administration, Higher, and Continuing Education
ANSCI	Animal Sciences
ANTH	Anthropology
ARAB	Arabic
ARCH	Architecture
ART&D	Introduction to Art and Design
ARTCI	Cinematography
ARTCR	Crafts
ARTED	Art Education
ARTGD	Graphic Design
ARTGP	General Professional Courses in Art and Design
ARTHI	History of Art
ARTID	Industrial Design
ARTPA	Painting
ARTPH	Photography
ARTPR	Printing
ARTSC	Sculpture
AS ST	Asian Studies
ASTR	Astronomy
ATMOS	Atmospheric Sciences
AVI	Aviation
B ADM	Business Administration
B&T W	Business and Technical Writing
BIOCH	Biochemistry
BIOEN	Bioengineering
BIOL	Biology
BIOPH	Biophysics
BR	Bridge Program
BULG	Bulgarian
BUS	Business
CATAL	Catalan
C E	Civil Engineering
CER E	Ceramic Engineering
CH E	Chemical Engineering
CHEM	Chemistry
CHIN	Chinese
CLCIV	Classical Civilization

C LIT	Comparative Literature
COMM	Communications
COP	Coptic
C S	Computer Science
CSB	Cell and Structural Biology
C&I	Curriculum and Instruction
CZECH	Czech
DANCE	Dance
ECON	Economics
ED PR	Educational Practice
EDPSY	Educational Psychology
EDUC	Education
ECE	Electrical and Computer Engineering
EEE	Ecology, Ethology, and Evolution
E I L	English as an International Language
ENG	Engineering
ENG H	Engineering Honors
ENGL	English
ENTOM	Entomology
ENVST	Environmental Studies
E P S	Educational Policy Studies
E S L	English as a Second Language
F A A	Fine and Applied Arts
FACE	Family and Consumer Economics
FIN	Finance
F N	Foods and Nutrition
FOR	Forestry
FR	French
F S	Food Science
G & D	Genetics and Development
G E	General Engineering
GEOG	Geography
GEOL	Geology
GER	German
GMC	Germanic
GRK	Greek
HDFS	Human Development and Family Studies
HSS	Health and Safety Studies
HEBR	Hebrew
HINDI	Hindi
HIST	History
HORT	Horticulture
HRFS	Human Resources and Family Studies
HUMAN	Humanities
I D	Interior Design
I E	Industrial Engineering
ITAL	Italian
JAPAN	Japanese
JOURN	Journalism
KINES	Kinesiology
KOREA	Korean
L A	Landscape Architecture
L A S	Liberal Arts and Sciences
LA ST	Latin American and Caribbean Studies
LAT	Latin
LAW	Law
LEIST	Leisure Studies

LING	Linguistics
L I R	Labor and Industrial Relations
LIS	Library and Information Science
MATH	Mathematics
MATSE	Materials Science and Engineering
MCBIO	Microbiology
M E	Mechanical Engineering
MED S	Medical Sciences
MET E	Metallurgical Engineering
MIL S	Military Science
MIN E	Mining Engineering
MUSIC	Music
NA	Medical-Surgical Nursing
ND	Psychiatric Nursing
NE	Public Health Nursing
NF	Administrative Studies
NP	Maternal-Child Nursing
NS	General Nursing
N S	Naval Science
NUC E	Nuclear Engineering
NUTRS	Nutritional Sciences
PERS	Persian
PHIL	Philosophy
PHYCS	Physics
PHYSL	Physiology
PLBIO	Plant Biology
PL PA	Plant Pathology
POL	Polish
POL S	Political Science
PORT	Portuguese
PSYCH	Psychology
REHAB	Rehabilitation Education
RELST	Religious Studies
RHET	Rhetoric and Composition
RMLNG	Romance Linguistics
R SOC	Rural Sociology
RUSS	Russian
R TV	Radio and Television
SANSK	Sanskrit
SCAN	Scandinavian
S CR	Serbo-Croatian
SLAV	Slavic
SOC	Sociology
SOC S	Social Science
SOC W	Social Work
SOILS	Soils
SP ED	Special Education
SPAN	Spanish
SPCOM	Speech Communication
SPSHS	Speech and Hearing Science
STAT	Statistics
STS	Science, Technology, and Society
T A	Textiles and Apparel
T A M	Theoretical and Applied Mechanics
THEAT	Theatre
UKR	Ukrainian
U P	Urban and Regional Planning

VB	Veterinary Biosciences
VCM	Veterinary Clinical Medicine
VMS	Veterinary Medical Science
VP	Veterinary Pathobiology
VOTEC	Vocational and Technical Education
WS	Women's Studies

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Where to Write or Telephone for Information about:

ADMISSIONS FOR UNDERGRADUATE, GRADUATE, AND VETERINARY MEDICINE STUDENTS, APPLICATION FORMS; TIMETABLES: Admissions and Records, University of Illinois at Urbana-Champaign, 10 Henry Administration Building, 506 South Wright Street, Urbana, IL 61801, (217) 333-0302.

HOUSING: University Residence Halls, University of Illinois at Urbana-Champaign, 200 Clark Hall, 12013 South Fourth Street, Champaign, IL 61820. Housing Information, University of Illinois at Urbana-Champaign, 2 Turner Student Services Building, 610 East John Street, Champaign, IL 61820, (217) 333-1420.

FINANCIAL ASSISTANCE AND STUDENT EMPLOYMENT: Student Financial Aid, University of Illinois at Urbana-Champaign, Fourth Floor, Turner Student Services Building, 610 East John Street, Champaign, IL 61820, (217) 333-0100.

MINORITY STUDENT AFFAIRS: Minority Students Affairs, University of Illinois at Urbana-Champaign, 130 Turner Student Services Building, 610 East John Street, Champaign, IL 61820, (217) 333-0054.

CAMPUS LIFE AND STUDENT WELFARE: Dean of Students, University of Illinois at Urbana-Champaign, 300 Turner Student Services Building, 610 East John Street, Champaign, IL 61820, (217) 333-0056.

MOTOR VEHICLE AND BICYCLE REGISTRATION: Campus Parking, University of Illinois at Urbana-Champaign, 505 East Green Street, Champaign, IL 61820, (217) 333-3530.

STUDENTS WITH DISABILITIES: Rehabilitation Education Services, University of Illinois at Urbana-Champaign, 1207 South Oak Street, Champaign, IL 61820, (217) 333-4602.

VETERANS' EDUCATIONAL BENEFITS: Veterans Educational Benefits, University of Illinois at Urbana-Champaign, 420 Turner Student Services Building, 610 East John Street, Champaign, IL 61820, (217) 333-0100.

GENERAL INFORMATION: Campus Information Desk, University of Illinois at Urbana-Champaign, 115 Illini Union, 1401 West Green Street, Urbana, IL 61801, (217) 333-INFO.

OTHER INFORMATION: Public Affairs, University of Illinois at Urbana-Champaign, Swanlund Administration Building, 601 East John Street, Champaign, Illinois 61820, (217) 333-5010.

CHICAGO CAMPUS: Admissions and Records, University of Illinois at Chicago, P.O. Box 5220, Chicago, IL 60680, (312) 996-4350. Professional Admissions, P.O. Box 6996, Chicago, IL 60680, (312) 996-7630.

Reference copies of this publication are available at Illinois public libraries, high schools, and community colleges. Copies of the *Undergraduate Programs*, *Graduate Programs*, and *Courses Catalogs* may be purchased at or ordered by mail from the Illini Union Bookstore, 216 South Wright Street, Champaign, IL 61820.

**COURSES
CATALOG**

1992-94



University of Illinois
at Urbana-Champaign

University of Illinois administrative offices at Urbana-Champaign are open Monday through Friday from 8:00 a.m. to 12:00 noon and 1:00 to 5:00 p.m., except on all-campus holidays which are indicated in the University Calendar.

An information center, available to visitors to the campus, is located in the north entrance lobby of the Illini Union. The center is open from 8:00 a.m. to 8:00 p.m. daily, including Saturdays and Sundays, when classes are in session.

Small group information sessions about the campus are available at the Campus Visitor's Center in Levis Faculty Center, 919 West Illinois Street. Visitors are welcome between 9:00 a.m. and 4:00 p.m., Monday through Friday, excluding campus holidays.

The commitment of the University to the most fundamental principles of academic freedom, equality of opportunity, and human dignity requires that decisions involving students and employees be based on individual merit and be free from invidious discrimination in all its forms, whether or not specifically prohibited by law.

The policy of the University of Illinois is to comply with all federal and state nondiscrimination, equal opportunity, and affirmative action laws, orders, and regulations. The University of Illinois will not discriminate against any person because of race, color, religion, sex, national origin, ancestry, age, marital status, disability, unfavorable discharge from the military, or status as a disabled veteran or a veteran of the Vietnam era. This nondiscrimination policy applies to admissions, employment, access to and treatment in the University programs and activities.

Among the forms of invidious discrimination prohibited by University policy but not law is sexual orientation. Complaints of invidious discrimination based solely upon policy are to be resolved within existing University procedures. As of the printing of this catalog, all Military Science and Air Force Aerospace Studies leadership laboratory courses are out of compliance with the University's policy of nondiscrimination based on sexual orientation.

For additional information on the equal opportunity and affirmative action policies of the University, please contact on the Urbana-Champaign campus: Joseph H. Smith, associate chancellor and director of affirmative action (and Title IX and 504 Coordinator), Swanlund Administration Building, 601 East John Street, Champaign, IL 61820, (217) 333-0574.

Information contained herein is for informational purposes only and is subject to change without notice. Individual departments and units should be contacted for further information. Courses, faculty assignments, prerequisites, graduation or completion requirements, standards, tuition and fees, and programs may be changed from time to time. Courses are not necessarily offered each semester or each year. The University retains the exclusive right to judge academic proficiency and may decline to award any degree, certificate, or other evidence of successful completion of a program, curriculum, or course of instruction based thereupon. While some academic programs described herein are designed for the purposes of qualifying students for registration, certification, or licensure in a profession, successful completion of any such program in no way assures registration, certification, or licensure by an agency other than the University of Illinois.

**COURSES
CATALOG**

1992-94

University of Illinois
at Urbana-Champaign

COURSES CATALOG

About the University of Illinois at Urbana-Champaign

Since its founding in 1867, the University of Illinois at Urbana-Champaign has earned a reputation as an institution of international stature. It is recognized for the high quality of its academic programs and the outstanding facilities and resources it makes available to students and faculty, including a library with the third largest academic collection in the country.

The University of Illinois at Urbana-Champaign is a comprehensive institution offering undergraduate, graduate, and professional degrees in more than 100 fields of study. There are approximately 36,200 students (26,400 undergraduate; 9,800 graduate and professional) and 10,500 faculty and staff members in the University community.

About This Catalog

This is one of three catalogs describing study at the University of Illinois at Urbana-Champaign. The *Undergraduate Programs* and the *Graduate Programs* catalogs give detailed information relating to admission, costs, programs, and requirements for undergraduate students and graduate students respectively. This catalog gives information about all courses—both undergraduate and graduate—that are currently available at the University as possible offerings. Course descriptions are arranged in alphabetical order by department and in numerical order within the department listing.

Courses numbered:

100-199 are intended primarily for freshmen and sophomores, although they may also be taken by juniors and seniors. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

200-299 are intended for undergraduate students who satisfy the published prerequisite(s), if any. In certain instances they may be taken by graduate students to make up undergraduate deficiencies, but they may not be taken for graduate credit.

300-399 are intended primarily for juniors, seniors, and professional and graduate students who satisfy published prerequisite(s), if any. These courses are offered for either undergraduate credit (expressed in hours) or graduate credit (expressed in units). Only graduate students and certain seniors with Graduate College approval may receive graduate credit.

400-499 are available for professional and graduate students, and for certain seniors with Graduate College approval to register for graduate credit (expressed in units).

An undergraduate must have 30 hours of credit to be classified as a sophomore, a minimum of 60 hours to be classified as a junior, and a minimum of 90 hours to be classified as a senior. A graduate student is a person who has been admitted to the Graduate College.

Following the title of each course is a brief description of the content, the credit given, and the requirements for admission to the course, if any. Additional information relating to the course content is available from the department offering the course. Special requirements for admission to certain courses are introduced by the word *prerequisite*. Courses listed in this catalog are subject to revision without advance notice and are not necessarily offered each semester or each year. Individual departments or units should be contacted for information regarding regularity of course offerings.

Each department has available the undergraduate course number 199, Undergraduate Open Seminar. This is a special course for independent study, for experimentation, or for seminars on topics not treated by regularly scheduled courses. Requests for initiation of the course and suggestions for areas of study may be made by students or faculty. The seminar may be offered only with the approval of the faculty member involved and the department head. A student may accumulate an unlimited number of credit hours in 199 courses, but no more than 12 such hours listed on the student's transcript may be counted toward fulfilling graduation requirements. Exceptions to this rule are made in cases where a larger number of credit hours in 199 courses is an integral part of a formal, college-approved program of study (such as Individual Plans of Study or Unit One). Credit toward satisfying particular college or departmental requirements is contingent upon approval of the appropriate college or departmental committee.

Credit for undergraduate students is counted in semester hours. A semester hour represents the work of one classroom period for fifty minutes each week through one semester (two periods per week in an eight-week summer session), or the equivalent in laboratory or field work, or approved independent study. In descriptions of courses, "3 hours" means 3 hours of credit each semester or summer session.

Credit for graduate students taking courses numbered 300 and above typically is counted in units. One unit is usually considered the equivalent of 4 semester hours of credit.

Undergraduate students wishing to enroll in courses numbered 300 and above for graduate credit or in 400-level courses for undergraduate credit must obtain the advance approval of the Graduate College.

Each undergraduate student is expected to pursue a normal program of studies; the number of hours required varies with the college and the curriculum. More or less than a normal program may be permitted only by the dean of the student's college or the dean's representative. To be eligible for participation in specified undergraduate student activities, the student must carry 12 hours in a semester. Twelve credit hours and above (3 units and above) in a semester comprise a full program of study for tuition and fees assessment; in an eight-week summer session the number of hours is 6 semester hours and above ($1\frac{1}{2}$ units and above). For information about criteria determining eligibility for Dean's List recognition, interested students should contact their college offices.

The minimum program required for receipt of maximum educational benefit payments under the Veterans Readjustment Benefits Act of 1966 and for receipt of social security benefits as a dependent is 12 hours (or 3 units) in a semester and 6 hours (or $1\frac{1}{2}$ units) in an eight-week summer session.

ACCOUNTANCY

Head of Department: L. A. Tomassini

Department Office: 360 Commerce Building (West), 1206 South Sixth Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Fundamentals of Accounting.** A survey course in the principles of accounting for students registered in schools and colleges other than Commerce and Business Administration. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 200 and either 201 or 202.
- 201. Principles of Accounting, I.** Introduction to financial accounting; the communication of relevant information to external parties; includes development of accounting model, internal control, measurement processes, data classification and terminology, as well as interpretation and use of the resultant financial statements. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Accountancy 201 and 200.
- 202. Principles of Accounting, II.** Introduction to managerial accounting; fundamentals of cost-volume analysis and product costing, management reporting and information for decision-making; introduction to budgets and standards for planning, control, and performance measurement. Prerequisite: Accountancy 201. 3 hours. Credit is not given for both Accountancy 202 and 200.
- 211. Intermediate Accounting, I.** Accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts for external reporting purposes; emphasizes the use of accounting information as a basis for decisions by management, stockholders, creditors, and other users of financial statements and accounting reports. Prerequisite: Accountancy 202. 3 hours.
- 221. Cost Accounting.** Use of costs for control and decision making, with emphasis on standard costs, relevant costs, direct costing, nonmanufacturing costs, and responsibility accounting; for students who have already studied the basic elements of job order, process costs, and budgeting. Prerequisite: Accountancy 202. 3 hours.
- 251. Basic Federal Income Tax Accounting.** Basic discussion of history, theory, and broad outlines of federal income taxation for individuals, partnerships, and corporations, including the more important basic concepts involved in federal income taxation. Prerequisite: Accountancy 200 or 202. 3 hours.
- 290. Cooperative Accounting Education Practice.** Off-campus practice in public, private, or governmental accounting for students participating in intern or cooperative (repeated internship) programs. Prerequisite: Consent of instructor; internship in accounting curriculum. 0 hours. May be repeated.
- 299. Senior Research.** A research and readings course for students majoring in accountancy. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. May be repeated to a maximum of 6 hours.
- 300. Socioeconomic Management as Public Policy.** Same as Business Administration, Political Science, and Social Science 300. See Political Science 300.
- 311. Intermediate Accounting II.** Examines accounting concepts, principles, and theory with an emphasis on the special problems that arise in applying these concepts of financial accounting for external reporting purposes; continuation of Accountancy 211. Prerequisite: Accountancy 211 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 312. Advanced Accounting.** Accounting for various entities including partnerships, consolidations, and mergers; also considers such topics as foreign exchanges, fund and segment reporting, and accounting for reorganizations. Prerequisite: Accountancy 211. 3 hours or $\frac{3}{4}$ unit.
- 322. Managerial Accounting and Organizational Controls.** Studies managerial accounting and its functioning as an information subsystem, in relation to the system of organization and the attainment of the goals of the enterprise; stresses the interactions of the components of the enterprise in response to information generated by the managerial accountant. Prerequisite: Accountancy 221; senior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.

331. **Accounting Systems Design.** Examines the fundamentals of accounting systems design, including systems analysis and design techniques; surveys hardware and software considerations; analyzes accounting applications within functional areas of the firm; and studies the control of computerized systems in a business environment. Prerequisite: Accountancy 202 and Computer Science 105, or equivalent. 3 hours or $\frac{3}{4}$ unit.
332. **Introduction to Management Information Systems.** Same as Business Administration 391. Analyzes information systems from a management control perspective, emphasizing organization environment, technology, decision models and performance evaluation as determinants of information processing requirements; cases and design projects explore the management of information processing systems, major functional applications and impacts of information technology on individuals and society. Prerequisite: Computer Science 105 or equivalent, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
333. **Information Organization for Management Information Systems.** Same as Business Administration 392. See Business Administration 392.
334. **Management Information System Development.** Same as Business Administration 393. See Business Administration 393.
335. **Management Information and Control Systems.** Same as Business Administration 394. Integration of behavioral, quantitative, and system design concepts in relation to professional work in the management information systems area. Prerequisite: Business Administration 393 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
341. **Introduction to Auditing.** Surveys the auditing discipline encompassing issues common to external, internal (and operational) auditing; specific topics include auditing theory, evidential matter, principles of internal control, sampling, testing, and the impact of the computer. Prerequisite: Accountancy 211 and 331, and Economics 172. 3 hours or $\frac{3}{4}$ unit.
342. **Advanced Auditing Concepts and Practice.** Emphasizes the concepts and practice of professional auditing, including the application of generally accepted auditing standards, review of internal control, audit reporting practices, professional ethics, S.E.C. practices, statistical sampling, auditing EDP systems, and management advisory services practice. Prerequisite: Accountancy 341. 3 hours, or $\frac{3}{4}$ or 1 unit.
343. **Control and Audit of Computer Systems.** Considers the impact of the computer on the performance of the audit; studies the means by which the auditor adjusts the audit to an EDP environment; deals with both control issues and tests of activity, as well as computer security. Prerequisite: Accountancy 341, and Computer Science 105 or equivalent; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **Advanced Income Tax Problems.** Practical and theoretical training in the more common and important provisions of the federal income tax, advanced problems, and tax case research and preparation. Prerequisite: Senior standing; Accountancy 251. 3 hours, or $\frac{3}{4}$ or 1 unit.
361. **Public Sector Accounting.** Examines accounting, budgeting, auditing, and reporting principles and practices for municipalities and other not-for-profit organizations, including federal government, public schools, universities, hospitals, charities, religious organizations, and others. Prerequisite: Accountancy 200, 202, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
371. **Introduction to International Accounting.** Explores similarities and differences of accounting principles and procedures between the United States and other countries with special emphasis on worldwide and regional standardization; emphasizes consolidation of foreign subsidiaries, performance evaluation of foreign operations, statement analysis, translation, solutions to inflation accounting, and taxation of multinationals. Prerequisite: Accountancy 211 and 221, or equivalent; or Business Administration 460. 3 hours or $\frac{3}{4}$ unit.
401. **Accounting Analysis, I.** Uses of accounting information; collection, processing, and communication of accounting information; measurement of assets, liabilities, equities, and income; and accounting system design. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
402. **Accounting Analysis, II.** An in-depth study of accounting valuation processes, accounting income measurement, and special reporting problems of multiple-entity organiza-

- tions. Prerequisite: Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 403. Managerial Accounting.** Introduction to management accounting as part of the firm's information system, in terms of modern cost accounting and budgetary systems for planning and controlling business operations. Prerequisite: Credit or concurrent registration in Accountancy 401 or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 404. Auditing.** Introduction to conceptual and applied material in the field of auditing. Emphasizes the audit process, reporting, and professional responsibilities. Prerequisite: Credit or concurrent registration in Accountancy 402, or equivalent; enrollment in graduate degree program or consent of instructor. 1 unit.
- 405. Federal Taxation.** Introduction to historical and conceptual as well as applied material in the accounting area of federal taxation; emphasizes the provisions of the tax law relevant to accounting measurement methods. Prerequisite: Accountancy 401; enrollment in graduate degree program or consent of instructor. 1 unit. Students may not receive credit for both Accountancy 251 and Accountancy 405.
- 411. Concepts and Principles.** The fundamental structure of accounting theory developed through the study of concepts characteristic of accounting and an examination of the literature dealing with the concise formulation of accounting principles. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor; Accountancy 491. 1 unit.
- 417. Financial Statement Analysis.** Examines tools and techniques of financial statement analysis from the perspective of investors and creditors; emphasizes theoretical and empirical properties of financial ratios. Prerequisite: Business Administration 451, 460, and 472; or equivalent; and enrollment in graduate degree program or consent of instructor. 1 unit.
- 421. Management Accounting, I.** Examines recent conceptual and analytical developments in the area of management accounting; includes a study of modern and relevant planning and control techniques and their underlying concepts as applied to the various functional areas within the firm. Prerequisite: Enrollment in graduate degree program or consent of instructor; an undergraduate course in management accounting. The student's background in statistics, economics, and mathematics should be equivalent to the undergraduate requirements of the University of Illinois College of Commerce and Business Administration in these areas. 1 unit.
- 422. Management Accounting, II.** Development of the role and importance of accounting data in conjunction with modern quantitative methods in the process of industrial enterprise administration; attention focused on the use of existing accounting data in models and the demands on data accuracy and reliability as well as the necessity to develop additional data for the purpose of facilitating integrated planning, budgeting, and control processes. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 431. The Theory of Accounting System Design.** Problems and procedures in connection with designing and installing accounting systems. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 432. Information Systems and Inquiry Processes.** Investigates systems theory and methodology as a basis for generating knowledge useful in action to achieve social goals. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 450. Impact of Income Tax on Management Decisions.** Studies the impact of federal income tax law on management decisions; stresses awareness and recognition of the types of tax problems, so that the managers who are generalists will recognize situations where they will need to seek advice from specialists. Prerequisite: Business Administration 460 or consent of instructor. 1 unit.
- 451. Partnership Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving partnerships and their partners, including Subchapter S corporations and their shareholders. Prerequisite: Accountancy 251 or equivalent. 1 unit.

- 452. Corporate Income Taxation.** Analyzes the tax treatment, problems, planning techniques, and underlying governmental policies involving corporations and their shareholders; coverage includes formations, operations, distributions, liquidations, reorganizations, and affiliations. Prerequisite: Accountancy 351 or equivalent. 1 unit.
- 453. Selected Topics in Federal Taxation.** Seminar on federal tax topics of current interest in specialized areas; topics include international taxation, deferred compensation, problems of closely-held businesses, estate planning, taxation of trusts, and new developments. Prerequisite: Accountancy 351 or consent of instructor. $1/2$ to 1 unit. May be repeated to a maximum of 2 units. Additional topics will be offered for additional credit.
- 454. Microcomputer Applications in Taxation.** Emphasizes tax problem solving and tax planning using microcomputers. Students learn to use commercially available tax return and tax planning packages. In addition, students learn to create spreadsheets for special tax applications for which software is not available. Prerequisite: Accountancy 251. $1/2$ to 1 unit. Students who wish to take the course for less than 1 unit may do so by selecting topics they wish to cover.
- 456. Tax Research.** Provides the student with a working knowledge of tax research methodology utilized by accountants in public practice. Aims to develop the student's capacity for either solving or defending his/her position with respect to a particular tax issue. Prerequisite: Graduate standing or approval. 1 unit.
- 459. Income Tax Development.** A theoretical and historical approach to the study of the development of federal income taxation, together with some research on tax cases and critical appraisal of the current law and proposals for its revision. Prerequisite: Enrollment in graduate degree program or consent of instructor. 1 unit.
- 471. Multinational Enterprise Accounting.** Analysis of accounting for operations of multinational enterprises which are subject to a wide variety of regulatory, social, and environmental influences; emphasizes financial and managerial accounting systems and their functions as evaluative, control, and reporting tools; and examines social accounting, foreign taxation, and nonmonetary evaluation methods. Prerequisite: Undergraduate degree in accountancy or equivalent; or Business Administration 460 and consent of instructor. 1 unit.
- 472. Accounting Under Different Social Systems.** Analyzes and compares accounting systems under different social systems with emphasis on the impact of regulatory and political structures on accounting; compares both macro and micro accounting systems for politically centralized and decentralized planning. Prerequisite: Undergraduate degree in accounting. 1 unit.
- 481. Environments of the Accounting Profession.** Explores various environments that professional accountants must consider in the practice of their profession. Gives special attention to developing the individual's capacity to identify, analyze, evaluate and propose solutions for problem areas in such environments as: ethical, managerial, economics, legal, political, and social. Prerequisite: Final semester of master's program in Department of Accountancy. 1 unit.
- 485. Theoretical Constructs in Accounting Research.** Examines the role of information in economic and behavioral models of decision making under uncertainty; presents major paradigms underlying contemporary accounting research. Interdisciplinary approach; readings drawn from the accounting, behavioral, economics, and finance literature. Prerequisite: Mathematics 363, Accountancy 491, and Economics 402. 1 unit.
- 491. Methods and Practices in Professional Research.** Instruction in research methods, materials, and techniques together with individual practice in conducting and reporting specific professional research projects. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. 1 unit.
- 492. Accountancy Research Orientation.** Comparative study of alternative methodologies and conceptual frameworks and their application to selected current research issues central to the development of accounting thought, both theoretical and empirical. Prerequisite: Accountancy 411 and 421 and courses in behavioral science, mathematics, and economics; or equivalent background and admission to the accountancy Ph.D. program; or consent of instructor. 1 unit.

- 493. Special Research Problems.** Individual investigations or research projects selected by the students, subject to approval by the graduate adviser and the executive officer of the department. Prerequisite: Enrollment in graduate accounting degree program or consent of instructor. $\frac{1}{4}$ to 2 units.
- 494. Doctoral Research Seminar.** Seminars in various accounting areas designed to enhance the research abilities of doctoral students and to assist them in preparing research proposals; these include Behavioral Dimensions, Public Sector, Tax, Auditing, Managerial, and others announced in the *Timetable*. Prerequisite: Credit or concurrent registration in Accountancy 492 or consent of instructor. 1 unit. May be repeated.
- 495. Models of Decision and Choice.** Same as Psychology 434. See Psychology 434.
- 499. Thesis Research.** Individual direction and guidance in writing theses; seminar discussion of progress made. 0 to 4 units.

ADMINISTRATION, HIGHER, AND CONTINUING EDUCATION

Head of Department: Paul W. Thurston

Department Office: 333 Education Building, 1310 South Sixth Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 267. The American College.** A survey of the American college and university; its history, structures, problems, trends, and governance. Provides an opportunity to explore the nature and scope of higher education in the United States. 3 hours.
- 362. Adult Learning and Development.** Same as Educational Psychology 362. Theory of and research on adult learning and development; includes societal context, performance, physiology and health, personality, and learning; and considers stability and change during young adulthood, middle age, and old age. Prerequisite: Educational Psychology 311 or 312, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 363. Instructional Design.** Same as Educational Psychology 363. See Educational Psychology 363.
- 380. Continuing Education General Seminar.** Introductory analysis of literature and professional practice in continuing education of adults; for beginning graduate students majoring in continuing education and for nonmajors. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 418. Economics of Education, Health, and Human Capital.** Same as Economics 418. See Economics 418.
- 433. Clinical Supervision of Instruction.** Same as Curriculum and Instruction 416. See Curriculum and Instruction 416.
- 438. Instructional Supervision.** Methods, theories, and research applying to the supervision and evaluation of classroom instruction; includes analysis and application of research in effective teaching practices, formative and summative evaluation, staff development, data collection techniques, and alternative feedback methods. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 442. The Community College.** Same as Vocational and Technical Education 442. Community colleges and vocational-technical institutes: their purposes, function, and objectives; social forces related to their development and evaluation; characteristics and needs of students; educational programs and teaching strategies; and organization, control, and financing. 1 unit.
- 443. The College Student.** Study of the characteristics and development of college students, the institutional contexts in which they operate, and the interaction of students with the college environment. 1 unit.
- 448. Continuing Education Program Development.** Same as Curriculum and Instruction 402 and Vocational and Technical Education 448. Analysis of the process of planning and conducting continuing education programs for adults; includes theory, research, and practice regarding sponsors, need appraisal, objectives, selection and organization of learning activities, and evaluation. Recommended for majors in continuing education.

Prerequisite: Consent of instructor. Administration, Higher, and Continuing Education 362 is recommended, especially for majors in continuing education. 1 unit.

- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department head prior to enrollment. $\frac{1}{2}$ to 1 unit. May be repeated for credit with consent of adviser and department head.
- 450. Public Control and Administration of Education.** Provides the basic common understanding of theory and practice in operation and control of schools useful to teachers and other citizens; analyzes both formal and informal influences on governance; and serves as an introductory course for prospective administrative officers and supervisors. Not open to experienced administrators nor to students who have taken any of the following (or equivalents): Administration, Higher, and Continuing Education 430, 440, 461, 462, 463, 465, 466. 1 unit.
- 452. Current Issues in Higher Education.** Seminar on current issues, problems, and trends in higher education. Prerequisite: Two units in higher education or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 455. The Principalship in Elementary and Secondary Education.** Provides an overview and analysis of the administrative, supervisory, and leadership functions of building-level administrators; emphasizes the design and implementation of effective educational programs on a school-wide basis; analyzes administrative tasks and processes through case studies, interviews with practitioners, simulations, and readings. Prerequisite: Administration, Higher and Continuing Education 450 and teaching experience required. 1 unit.
- 461. School Improvement.** Study of major ideas on school improvement, past and present, and of emerging research on the condition of public education in the United States. In-depth examination of reform proposals for changing the organization of schools, the instructional program, and the roles of students, teachers, and school administrators. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 463. Organizational Theory and Administrative Leadership.** Study of theoretical perspectives and empirical research drawn from the social sciences relating to educational organizations and administrative leadership with an emphasis on application of theory to practice. Prerequisite: Administration, Higher, and Continuing Education 450 or consent of instructor. 1 unit.
- 464. Directed Field Experience in Administration.** Direct experience in the study of educational problems of concern to administrators; features an action component whereby the student is provided with opportunities for assuming responsibility for decision making in a live or simulated setting; each student works under the supervision of a professor, and where possible and appropriate, a practicing administrator. 1 to 3 units. May be repeated to a maximum of 3 units, with no more than 1 unit earned at the master's level.
- 465. Personnel Administration.** Principles, problems, and trends in the administration of professional public school personnel; organization of personnel; the legal framework of the personnel function; selection, evaluation and development of staff; collective bargaining, contract administration and personnel policy; and the personnel administrator's role as a catalyst for school improvement. Prerequisite: Administration, Higher, and Continuing Education 469 or equivalent or consent of instructor. 1 unit.
- 466. Public School Finance.** Advanced graduate study of financing public education systems in the United States; focuses on the social, economic, political, legal, and technical dimensions of developing school finance policy for federal, state, and local governments; relates theory and research in public school finance to administrative practice in budgeting and financial administration. Prerequisite: Graduate standing or consent of instructor. 1 unit.
- 467. Public School Financial Administration.** Role of financial administration in public schools; analysis of the budgetary and accounting systems used in American public

education agencies; examination of the principles of school fiscal administration, including organizing the fiscal function and intergovernmental fiscal relations; emphasizes the role of financial decision making in public school administration. Prerequisite: Administration, Higher, and Continuing Education 466 or consent of instructor. 1 unit.

- 468. The Political and Social Context of Schooling.** The political and social environment of public education in the United States; analysis of the power structure and its influence on educational policy making at the district level; examination of the evolving roles of state and federal agencies, the courts, private organizations, and interest groups in school governance. Studies the tension between the ideal of a democratically controlled public school system and the growing power of educational experts. Prerequisite: An undergraduate course in political science, or an introductory course in the politics of education such as Educational Policy Studies 309, or consent of instructor. 1 unit.
- 469. Legal Basis of Educational Administration.** Examines the range of federal and state constitutional and statutory sources that apply to the constituents (pupils, parents, teachers, administrators, and board members) engaged in public schools. Emphasizes development of legal analytical skills. Prerequisite: Administration, Higher, and Continuing Education 450 or consent of instructor. 1 unit.
- 470. Public School Fiscal Planning and Budgeting.** Research and theory relating to the planning function in public schools, advanced budgeting techniques, planning facilities and capital outlay, and techniques of planning and management. Prerequisite: Administration, Higher and Continuing Education 466 and 467, or consent of instructor. 1 unit.
- 471. State and Federal Educational Politics and Policies.** Examines the legislative and political processes in the formulation of current federal and state educational policies, together with the evaluation of policy and the formulation of policy alternatives. Prerequisite: Administration, Higher, and Continuing Education 469. 1 unit.
- 474. The American College and University.** Introduction to higher education as a subject: its history, purposes, leaders, and literature; attention to conceptual framework in which further development of this subject can progress. 1 unit.
- 477. Student Personnel Work in Higher Education.** Studies the theoretical foundations and principles underlying the practice of student personnel work; investigation of the role and function of student personnel workers in terms of their relationship to various goals, philosophies, issues, trends, and research. 1 unit.
- 478. The Administration of Student Personnel Work.** Structural arrangements for meeting student-oriented needs in the American college (including the junior college) and university; attention to the role of the chief administrative officer for student affairs. Prerequisite: Administration, Higher, and Continuing Education 477 or equivalent. 1 unit.
- 479. Organization and Control of Higher Education.** Organizational patterns whereby colleges and universities seek to accomplish their purposes; agencies involved in the control of higher education. Prerequisite: Administration, Higher, and Continuing Education 442 or 474, or equivalent. 1 unit.
- 480. Internship in the Administration of Higher Education.** Provides supervised direct experience in the administration of higher education; with the aid of the faculty, students select the institution and position most relevant to their career goals. Prerequisite: Consent of instructor. 1 unit. No more than 2 units may be given toward an advanced degree.
- 483. Societal Context of Continuing Education.** Analyzes the continuing education agency as a social system; includes learning group, planning committee, organizational relations with parent institution, and linkage with community; recommended for majors in continuing education. Prerequisite: A basic graduate course on social systems (such as Educational Psychology 413, Educational Policy Studies 315 or 385, Sociology 456 or 492, or Psychology 355). 1 unit.
- 484. Continuing Education Internship.** Supervised field experience. Prerequisite: Consent of instructor. 1 to 2 units. May be repeated to a maximum of 4 units.
- 485. Continuing Education Agency Administration.** Organization and administration of continuing education programs for adults; decision making, policy, finance, personnel,

- program, and community relations; analysis of theory, research, and practice; and emphasis on case analysis. Recommended for majors in continuing education. Prerequisite: Administration, Higher, and Continuing Education 483 and a basic administration course (such as Administration, Higher, and Continuing Education 450 or 479, Vocational and Technical Education 489, Library Science 405, or Business Administration 401). 1 unit.
- 486. Continuing Education Advanced Seminar.** Analyzes specialized topics related to continuing education of adults; for advanced students. Recommended for majors in continuing education. Prerequisite: Consent of instructor. $1/2$ or 1 unit. May be repeated to a maximum of 3 units.
- 490. Seminar for Advanced Students of Education.** Open only to persons who have been admitted for doctoral study in the Department of Administration, Higher, and Continuing Education. Prerequisite: Consent of instructor. 1 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Prerequisite: Consent of instructor. 1 to 2 units.
- 497. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Social Work 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ADVERTISING

Head of Department: Kim B. Rotzoll

Department Office: 103 Gregory Hall, 810 South Wright Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 281. Introduction to Advertising.** A survey of the economics, psychology, and philosophy of advertising; creative and media strategies; and organizational structure. This course requires limited participation as a subject in research. Not open to seniors unless enrolled in the College of Communications. Prerequisite: Sophomore standing and consent of department. 3 hours.
- 288. Persuasive Writing.** Same as Business and Technical Writing 271. See Business and Technical Writing 271.
- 291. Special Problems.** Special projects, research, and independent reading in advertising for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Written research proposal and consent of head of department. 2 or 3 hours.
- 309. Public Relations.** Publicity methods and public relations; representation of profit and nonprofit institutions to the public; use of communications research and media; product publicity reviewed, case studies utilized. Prerequisite: Junior standing in the College of Communications; consent of department. 3 hours or $1/2$ unit.
- 381. Advertising Research Methods.** Overview of basic concepts of research methodology with particular emphasis on advertising research. Computer analysis and interpretation of actual data sets; measurement with both structured and unstructured techniques; principles of survey and experimental design. Prerequisite: Advertising 281; junior standing; a specified course in statistical methods; consent of department. 3 hours or $1/2$ unit. No graduate credit is given to graduate majors in advertising.
- 382. Advertising Creative Strategy and Tactics.** Theory and practice of advertising message planning and creation for print and broadcast media; use of consumer and market surveys, and advertising readership studies. Prerequisite: Advertising 281; junior standing; consent of department. 3 hours or $1/2$ unit. No graduate credit is given to graduate majors in advertising.
- 383. Advertising Media Planning.** Analyzes the various advertising media in terms of markets served and factors to consider in the selection and evaluation of media. Prereq-

quisite: Advertising 281; junior standing; consent of department. 3 hours or $1\frac{1}{2}$ unit. No graduate credit is given to graduate majors in advertising.

390. **Advanced Creative Strategy and Tactics.** Planning and execution of advertising across media, with emphasis on the creation of campaigns. Prerequisite: Advertising 382; consent of department. 3 hours, or $1\frac{1}{2}$ or 1 unit.
391. **Advertising Management: Planning.** Application of analytical planning concepts to advertising planning and decision making; covers all of the decision making areas of advertising. Prerequisite: Advertising 381, 382, and 383; Mathematics 111 or 112, or equivalent; Business Administration 202; consent of department. 3 hours or $1\frac{1}{2}$ unit. No graduate credit is given to graduate majors in advertising.
392. **Advertising Management: Strategy and Tactics.** Application of advertising management decision criteria to actual communication problems involving advertisers; development of strategy and tactics. Prerequisite: Advertising 391. 3 hours or $1\frac{1}{2}$ unit. No graduate credit is given to graduate majors in advertising.
393. **Advertising in Contemporary Society.** Studies advertising as an institution and its role in communications, society, our economy, and business. Prerequisite: Advertising 281; senior standing; consent of department. 3 hours or $1\frac{1}{2}$ unit. No graduate credit is given to graduate majors in advertising.
450. **Foundations of Advertising.** Evaluation of key periods, events, and individuals having significant impact on the evolution of American advertising philosophy, structure, and performance. Prerequisite: Advertising 281 and 393, and consent of instructor. 1 unit.
482. **Research Methods in Advertising and Communications.** Same as Communications 482. A treatment of basic research concepts and procedures in the social sciences with emphasis on advertising and communications; examines both nonquantitative and quantitative methods. Prerequisite: Advertising 381, a basic course in statistical methods, and consent of department. 1 unit.
483. **Advertising as Communication.** Advertising messages from the perspective of attitude and persuasive communication theories; application of theory to advertising communication issues. Prerequisite: Advertising 381 or equivalent undergraduate research course; Advertising 482 or an equivalent graduate research course recommended. 1 unit.
484. **Advertising and Consumer Behavior.** Examines consumer behavior as a means of shaping the communications message; use of the behavioral sciences in creative communication strategy. Prerequisite: Advertising 391 and consent of department. 1 unit.
485. **Advertising Planning and Decision Making.** Same as Communications 485. Examines the theoretical foundations of decision theory as they relate to planning and decision making in advertising; reviews concepts of strategic planning and client side operations; case studies utilized extensively. Prerequisite: Advertising 391 and consent of department. 1 unit.
487. **Graduate Seminar.** Provides advertising students and faculty the opportunity to interact on current topics. Faculty will discuss work in progress. Students will be required to present. Prerequisite: Consent of department. $1\frac{1}{2}$ unit. Must be repeated by master's program graduate students for a total of 1 unit.
490. **Special Topics in Advertising.** Prerequisite: Consent of department. $1\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** Prerequisite: Graduate standing in advertising. 1 to 2 units.

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

Head of Department: Wayne C. Solomon

Department Office: 101 Transportation Building, 104 South Mathews Avenue, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
212. **Aerodynamics, I.** Quasi-one-dimensional flow; conservation of mass, momentum, and energy; steady flow with variable area; steady, constant area flow with friction, heat addition, and mass injection; shock waves; nonsteady, one-dimensional flows; and two-

dimensional flow, oblique shock waves, and Prandtl-Meyer waves. Prerequisite: Mechanical Engineering 207; Theoretical and Applied Mechanics 150 and 212; credit or concurrent registration in Mathematics 280. 4 hours.

213. **Aerodynamics, II.** Equations of motion for a viscous, heat-conducting fluid; exact solutions of the Navier-Stokes' equations; boundary layer theory; inviscid approximations, vorticity, and circulation; potential flow; solutions of potential flow equations, sources, sinks, and Prandtl-Meyer flow; thin airfoil and slender body theory; and method of characteristics. Prerequisite: Aeronautical and Astronautical Engineering 212. 4 hours.
224. **Flight Structures, I.** Development of fundamental concepts of elasticity as related to stress, strain, equilibrium, compatibility, and material properties; applications to flight vehicle structural problems in unsymmetric bending, torsion, thick-walled cylinders, rotating discs, shear flow, and shear center problems. Prerequisite: Mathematics 285; Theoretical and Applied Mechanics 150 and 212. 4 hours.
225. **Flight Structures, II.** Energy concepts with applications to indeterminate flight structures, sandwich beams, and shear flow; elastic and plastic buckling of columns and plates; and membrane theory of shells. Prerequisite: Aeronautical and Astronautical Engineering 224. 4 hours.
233. **Aircraft Propulsion.** Fundamentals of air breathing jet propulsive devices; prediction of thrust, specific fuel consumption, and operating performance; ramjets; turbojets; turbopumps; turboprops; aerothermodynamics of inlets, combustors, and nozzles; compressors, turbines, and propellers; and component matching. Prerequisite: Aeronautical and Astronautical Engineering 212 or first course in gas dynamics. 3 hours.
241. **Flight Vehicle Design.** Introduction to preliminary design of airplanes, missiles, and space vehicles; further development of concepts in orbital mechanics, hypersonic aerodynamics, and aerodynamic heating. Prerequisite: Aeronautical and Astronautical Engineering 213, 225, 233, and 255; Computer Science 101. 3 hours.
254. **Aerospace Dynamic Systems, I.** Modeling of linear dynamic systems; Laplace transforms and linear feedback control systems; stability criteria and design techniques; introductory aircraft flight stability and control. Prerequisite: Mathematics 285 and Theoretical and Applied Mechanics 150 and 212. 4 hours.
255. **Aerospace Dynamic Systems, II.** Examines particle kinematics and dynamics; fundamentals of orbital mechanics; Lagrange's equations; vibration of multiple degree of freedom systems and continuous elastic structures; rotational kinematics and dynamics of rigid bodies. Prerequisite: Aeronautical and Astronautical Engineering 254 and Mathematics 225. 4 hours.
260. **Aerospace Laboratory, I.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on fluid dynamics, aerodynamics, thermal, combustion and propulsion phenomena. Prerequisite: Aeronautical and Astronautical Engineering 213 and 233. 2 hours.
261. **Aerospace Laboratory, II.** Examines theory and application of experimental techniques in aeronautical and astronautical engineering with emphasis on structural mechanics, vibrations, dynamics, and systems. Prerequisite: Aeronautical and Astronautical Engineering 225 and 255. 2 hours.
281. **Introduction to Renewable Energy Sources.** The technology of renewable energy sources: wind power and the performance of large and small wind turbine systems; ocean thermal energy conversion and ocean wave power; solar thermal electric power; solar cells; the elements of design and sizing of solar heating and cooling systems; hydroelectric power; biomass fuels; hydrothermal-reservoir and dry-rock geothermal energy; energy storage; on-site energy systems; the concept of appropriate technology; and the economics of renewable energy systems. Prerequisite: Mathematics 132, and Physics 102 or 108; or consent of instructor. 3 hours.
292. **Seminar.** Reports and discussions of recent developments in the fields of aerodynamics, flight mechanics, power plants, structures, and maintenance and operations as related to airplanes, missiles, and space vehicles. Prerequisite: Senior standing. 1 hour.
296. **Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

- 297. Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 303. The Effect of Space Environment on Satellite Motion.** Free molecule aerodynamics; gravity gradient and solar radiation torques on satellites; interaction of on-board magnetic dipoles with the earth's magnetic field; solar wind; cosmic dust and micrometeoroid torques; lifetime problem and density determination; and utilization of these various environmental effects in satellite attitude control. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 306. Orbital Mechanics.** Analysis of orbits in an inverse-square gravitational field; elementary rocket dynamics, impulsive orbit transfer and rendezvous, and Lambert's Theorem with applications; patched-conic trajectories, planetary swing-by maneuvers, and linearized orbit theory with application to simplified analytical models; perturbations. Prerequisite: Aeronautical and Astronautical Engineering 255 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 311. Aerodynamics of Compressible Fluids.** Methods of solution of fluid flow problems in subsonic, transonic, and supersonic flight regimes. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 313. Aerodynamics of Incompressible Fluids.** Governing equations for incompressible flow; vorticity, circulation, and Kelvin's, and Helmholtz's theorems; velocity potential and stream function; three-dimensional steady and nonsteady flows, d'Alembert's paradox, and apparent mass; two-dimensional steady flows, complex potential and velocity, and mapping of flows; two-dimensional airfoils and Joukowski transformation and airfoils; and thin airfoil theory. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 314. Aerodynamic Heat Transfer.** Thermal boundary layers; turbulent heat transfer; aerodynamic heating; and radiative heat transfer. Prerequisite: Aeronautical and Astronautical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 316. Applied Aerodynamics.** Two-dimensional and finite wing theory with emphasis on the mechanisms of lift and drag generation; Reynolds number and Mach number effects; drag analysis; high-lift wing systems; propeller and rotor aerodynamics; control surface design; and application of V/STOL aerodynamics. Prerequisite: Aeronautical and Astronautical Engineering 213 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 319. Aircraft Flight Mechanics.** Steady and quasi-steady aircraft flight performance; take-off and landing, climbing and diving, cruise, level turn, and introduction to energy methods; longitudinal, directional, and lateral static stability and control; and introduction to longitudinal and lateral motion and dynamic stability. Prerequisite: Aeronautical and Astronautical Engineering 213, 233, and 255, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 320. Finite Element Methods in Aerospace Structures.** Finite element methods in the analysis of aerospace structures; includes treatment of different types of elements in the analysis of static, dynamic, and stability problems; and emphasizes structures most commonly used in aerospace applications. Introduction to NASTRAN program use. Prerequisite: Computer Science 101 and Aeronautical and Astronautical Engineering 225. 3 hours, or $3/4$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 326. Fundamental Concepts of Deformable Body Mechanics.** Same as Theoretical and Applied Mechanics 351. See Theoretical and Applied Mechanics 351.
- 327. Deformation and Fracture of Polymeric Materials.** Same as Theoretical and Applied Mechanics 327. See Theoretical and Applied Mechanics 327.
- 328. Composite Materials.** Same as Theoretical and Applied Mechanics 328. See Theoretical and Applied Mechanics 328.

- 333. Electric Propulsion.** Elements of propulsion as applied to deep space missions; physics of ionized gases; plasmadynamics; electrothermal, electromagnetic, and electrostatic acceleration of gases to high velocity; high-impulse thruster design and performance; and the resistojet, arcjet, ion engine, MPD arc, and plasma gun. 3 hours or 1 unit.
- 334. Rocket Propulsion and Rocketry.** Basic principles of rocket propulsion and rocketry, propellants and their influence on design of rockets, internal and external ballistics, combustion processes, design of components, flight performance, and rocket testing. Prerequisite: Aeronautical and Astronautical Engineering 212 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 351. Aeroelasticity and Aeroelasticity.** Advanced fundamental treatment of aerodynamic and dynamic structural phenomena associated with flexible airplanes and missiles; divergence of linear and nonlinear elastic lifting surfaces; effect of elastic and inelastic deformations on lift distributions and stability; elastic flutter of straight and swept wings; equations of disturbed motion of elastic and inelastic aircraft; dynamic response to forces, gusts, and continuous atmospheric turbulence; creep divergence of lifting surfaces; flutter in the presence of creep; and effect of temperature on inelastic divergence and flutter. Prerequisite: Aeronautical and Astronautical Engineering 255. 3 hours or 1 unit.
- 381. Wind Power Technology.** Aerodynamic, electromechanical, and structural design of wind power systems; classical windmills; modern wind power generators; wind characteristics and distribution; instrumentation and measurement; energy storage considerations; socioeconomics of wind power systems; performance of large and small scale wind turbines; and current design approaches. Prerequisite: A fluids course, an electrical course, and a course in mechanics, all at the 200 level or higher; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 391. Special Problems.** Special problems relating to the theory, design, testing, operation, maintenance, or production of airframes or aircraft power plants. Prerequisite: Senior standing in engineering; consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 404. Optimization of Aerospace Systems.** Formulation of parameter and functional optimization problems for dynamic systems; applications of optimization principles to the control and performance of aerospace vehicles, including optimal flight paths, trajectories, and feedback control. Prerequisite: Aeronautical and Astronautical Engineering 255 or equivalent. 1 unit.
- 406. Advanced Orbital Mechanics.** Circular restricted three body problem; surfaces of zero velocity, libration points, halo orbits; perturbed two body motion; Gauss and Lagrange planetary equations, Hamilton's principle, canonical equations and the Delaunay variables, application to artificial Earth satellites; orbit determination. Prerequisite: Aeronautical and Astronautical Engineering 306 or consent of instructor. 1 unit.
- 412. Aircraft Dynamic Stability and Control.** Study of dynamic stability and control of rigid aircraft; small disturbance theory, linearization of equations of motion; uncontrolled motion characteristics, longitudinal and lateral natural modes; open loop control response; introduction to closed-loop response. Prerequisite: Aeronautical and Astronautical Engineering 319, or consent of instructor. 1 unit.
- 414. Boundary Layer Theory.** Theories of the boundary layer of a compressible fluid and their solutions, laminar and turbulent; boundary layer in hypersonic flows. Prerequisite: Aeronautical and Astronautical Engineering 213. 1 unit.
- 415. Wing Theory.** Theoretical analysis of the aerodynamic characteristics of two- and three-dimensional wings and multiple-body systems in subsonic and supersonic flows. Prerequisite: Mathematics 346 or equivalent. 1 unit.
- 417. Fundamentals of Gas Kinetics.** Fundamental concepts required to study gas dynamic problems from the viewpoint of kinetic theory; derivation of the Boltzmann equation from classical mechanics; reduced and truncated distribution functions and the BBGKY hierarchy; molecular collisions; flux vectors and equations of change; moment equations; summational invariants; H-theorem and Maxwellian distribution; inclusion of the effect of solid surfaces in kinetic theory; existence theory for the Boltzmann equation; iteration procedures; moment methods; Chapman-Enskog procedure; and first and second ap-

- proximations to the distribution function, heat flux vector, and stress tensor. Prerequisite: Aeronautical and Astronautical Engineering 213 or equivalent, or consent of instructor. 1 unit.
- 418. Theory of Rarefied Gas Flows.** Application of kinetic theory to rarefied gas flow problems; free-molecule flow; near free-molecule flow; linearized problems; and flows with appreciable deviation from equilibrium. Prerequisite: Aeronautical and Astronautical Engineering 417. 1 unit.
- 428. Theory of Large Deformations in Nonlinear Continuous Media.** Fundamental concepts of large deformations in nonlinear elasticity and inelasticity with applications: generalized tensors, finite deformations, stress-strain relations in terms of strain energy functions, solutions of tension, shear and bending problems, finite plane strain, theory of successive approximations, fiber-reinforced beams, plates and cylinders, thermodynamics of deformable media, stability considerations, and constituent relations for inelasticity. Prerequisite: Aeronautical and Astronautical Engineering 326 or equivalent. 1 unit.
- 429. Theory of Linear and Nonlinear Viscoelasticity.** Same as Theoretical and Applied Mechanics 429. Fundamental concepts of viscoelasticity with applications: elastic-viscoelastic analogies, creep and relaxation functions, thermomechanical reciprocity relations, variational principles, model fitting, shear center motion, thick-walled cylinders under pressure and inertia loads with material annihilation, sandwich plates, propagation of viscoelastic waves, vibration of bars, plates and shells, nonlinear elastic-viscoelastic analogy, properties of nonlinear viscoelastic stress-strain laws, creep rupture, and torsion of nonlinear bars and shells. Prerequisite: Aeronautical and Astronautical Engineering 326 or consent of instructor. 1 unit.
- 434. Aerodynamic Heating.** Theory of convective aerodynamic heating in high-speed flow and laminar and turbulent flows; ablation, transpiration cooling, and mass transfer cooling; aerodynamic heating in hypersonic flow, real gas effects, and effect of pressure interactions and vorticity interactions; and heat transfer in rarefied gas flows. Prerequisite: Aeronautical and Astronautical Engineering 414 or equivalent. 1 unit.
- 438. Fundamentals of Combustion.** Same as Mechanical Engineering 403. Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex detonation waves; and supersonic burning. Prerequisite: Aeronautical and Astronautical Engineering 213 or Mechanical Engineering 305. 1 unit.
- 452. Stochastic Structural Dynamics.** Same as Theoretical and Applied Mechanics 417. Structural dynamics problems treated from a probabilistic point of view; theory of probability and random processes introduced as mathematical tools; response of structures under random excitation is studied in order of increasing complexity; and probability of failure for such structures is discussed. Prerequisite: Aeronautical and Astronautical Engineering 255, Theoretical and Applied Mechanics 314, or equivalent. 1 unit.
- 490. Seminar.** Presentation by graduate students, staff, and guest lecturers of current topics in the field of aeronautics and astronautics. Prerequisite: Graduate standing in aeronautical and astronautical engineering. 0 units.
- 493. Special Problems.** Theoretical and experimental investigations of problems in airplane, missile, and space flight engineering. $\frac{1}{4}$ to 1 unit.
- 499. Thesis Research.** Research in the various areas of the aeronautical and astronautical engineering sciences. 0 to 4 units.

AFRICAN STUDIES

Director of Center: Donald E. Crummey

Center Office: Room 210, International Studies Building, 910 South Fifth Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. Introduction to Modern African Literature.** Same as Comparative Literature 210 and English 211. Significant contemporary African writings depicting the history and cultural traditions of African peoples. 3 hours.
- 211. Elementary Lingala, I.** Same as African Languages 211. See African Languages 211.
- 212. Elementary Lingala, II.** Same as African Languages 212. See African Languages 212.
- 213. African Oral Literature.** Same as Anthropology and Comparative Literature 213. Examines the oral literature of the African continent in all its varieties (tales, myths, songs, proverbs, etc.), in translation. Places the literature in its many contexts (historical, cultural, religious, political, legal, sociological, etc.). Explores the process of oral transmission, unique to oral literature, with particular reference to the continuity between African and Afro-American oral literature. 3 hours.
- 214. Introduction to African Folklore.** Examines a variety of folklore forms in sub-Saharan Africa; introduces and familiarizes students with certain traditional expressive arts which provide the backbone for nearly all forms of African cultural expression. Provides a wide range of folk materials, as an entree toward a better understanding and appreciation of the cultural diversity within Africa, including verbal arts (narrative, proverb, song), kinesic (greetings, gestures), material culture (arts and crafts), and conceptual form (folk religion and beliefs). 3 hours.
- 222. Introduction to Modern Africa.** Same as Anthropology, Political Science, and Sociology 222. An interdisciplinary introduction to Africa dealing with basic themes and problems in the politics, economics, sociology, anthropology, and history of Africa. 3 hours.
- 231. Elementary Swahili, I.** Same as African Languages 231. See African Languages 231.
- 232. Elementary Swahili, II.** Same as African Languages 232. See African Languages 232.
- 241. Elementary Wolof, I.** Same as African Languages 241. See African Languages 241.
- 242. Elementary Wolof, II.** Same as African Languages 242. See African Languages 242.
- 310. Modern African Fiction.** Same as Comparative Literature and French 310 and English 370. Examines selected major African novels along thematic and formal lines; literary responses to colonialism and political independence and the crises that accompanied both in Africa; and study of critical approaches to the African novel and African characteristics of and contribution to the novel as a genre. Readings in English. Prerequisite: African Studies 210 or 222, or junior standing. 3 hours or 1 unit.
- 313. Intermediate Lingala, I.** Same as African Languages 313. See African Languages 313.
- 314. Intermediate Lingala, II.** Same as African Languages 314. See African Languages 314.
- 325. Southern Africa: Race and Power.** Same as History 325 and Political Science 333. An interdisciplinary survey of both the internal and international dimensions of the changing situation in Africa south of the Zambezi; focuses on the historical background to, and a political, economic, and social analysis of current events in the Republic of South Africa, Mozambique, Namibia, and Zimbabwe, emphasizing the central significance of race and power in this region. Prerequisite: History 216 or African Studies 222. 3 hours or 1 unit.
- 333. Intermediate Swahili, I.** Same as African Languages 333. See African Languages 333.
- 334. Intermediate Swahili, II.** Same as African Languages 334. See African Languages 334.
- 335. Advanced Swahili, I.** Same as African Languages 335. See African Languages 335.
- 336. Advanced Swahili, II.** Same as African Languages 336. See African Languages 336.
- 343. Intermediate Wolof, I.** Same as African Languages 343. See African Languages 343.
- 344. Intermediate Wolof, II.** Same as African Languages 344. See African Languages 344.
- 354. Social Structure of Southern Africa.** Same as Sociology 354. See Sociology 354.
- 450. Seminar on Selected Topics in African Studies.** Topics vary with the disciplinary focus. Prerequisite: Consent of instructor. $1\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
- 499. Thesis Research.** Individual direction in research and guidance in writing theses for advanced degrees. 0 to 2 units. May be repeated to a maximum of 2 units.

AFRO-AMERICAN STUDIES

Director of Program: Dianne M. Pinderhughes

Program Office: 606 South Gregory Street, Urbana

100. **Introduction to Afro-American Studies.** An interdisciplinary introduction to the basic concepts and literature in the disciplines covered by Afro-American studies; surveys the major approaches to the study of Afro-Americans across several academic disciplines including economics, education, psychology, literature, political science, sociology and others. 3 hours.
161. **Black Folk Culture.** Same as Anthropology 161. See Anthropology 161.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
224. **Humanistic Perspectives of the Afro-American Experience.** Presents the Afro-centric world view as it was manifested in traditional African society and in the Afro-American slave community. Shows that this world view merged with European notions of art and humanity, as revealed in modern Afro-American literature, art, and music. Prerequisite: Afro-American Studies 100 or consent of instructor. 3 hours.
234. **Afro-American Bibliography.** Provides information and practice in the identification and use of Afro-American research materials. Emphasizes the Black experience in the United States; also the experience of Afro-Americans in the rest of the western hemisphere. 3 hours.
244. **Social Science Perspectives in Afro-American Studies.** Focuses on unique aspects of Afro-American life through a review of social science perspectives. An interdisciplinary analysis of racial inequalities will emphasize trends in white and black racial attitudes and related social psychological issues. Critically reviews traditional Black American literature and compares it with Afro-centric perspectives. Prerequisite: Afro-American Studies 100 or equivalent; or an introductory course in sociology, economics, anthropology, political science, or history; or consent of instructor. 3 hours.
250. **Black Women: Histories and Cultures.** Same as Women's Studies 250. See Women's Studies 250.
253. **Afro-American History to 1877.** Same as History 253. See History 253.
254. **Afro-American History Since 1877.** Same as History 254. See History 254.
259. **Afro-American Literature, I.** Same as English 259. See English 259.
260. **Afro-American Literature, II.** Same as English 260. See English 260.
261. **Afro-American Societies and Cultures.** Same as Anthropology 261. See Anthropology 261.
298. **Special Topics in Afro-American Studies.** Advanced seminar on selected topics with particular emphasis on current research trends. Prerequisite: Junior status and one of the following: Afro-American Studies 224, or History 253 or 254, or English 259 or 260. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
327. **Black Political Participation in the American Political Process.** Same as Political Science 327. See Political Science 327.
368. **The South in American History.** Same as History 368. See History 368.
379. **Slavery and Race Relations in Latin America.** Same as History 379. See History 379.

AGRICULTURAL COMMUNICATIONS

Head of Office: J. F. Evans

Office: 67 Mumford Hall, 1301 West Gregory Drive, Urbana

106. **Functional Writing.** Instruction and practice in functional writing related to unique interests of students in the College of Agriculture; designed primarily to be taken with freshman rhetoric by students with special needs for improvement in their use of English. Prerequisite: Restricted to students in the College of Agriculture. 2 hours.

- 110. Introduction to Agricultural Communications.** Introduces agricultural communications as a professional field; examines the development, role, and potential of the professional agricultural communicator. Prerequisite: Registration in agricultural communications curriculum, or consent of instructor. 1 hour.
- 114. Agricultural Communications Media and Methods.** Same as Journalism 114. Introduction to mass media in our society and particularly their use in conveying agricultural information. Emphasis on basic skills used to communicate through these media, with particular emphasis on writing skills. Prerequisite: Completion of rhetoric requirement. 3 hours.
- 214. Educational Campaign Planning.** Same as Journalism 214. Coordinated approach to planning and carrying out information campaigns using a variety of communications media; students contact and work with an agency interested in running a communications campaign, plan an information strategy, and produce a variety of information materials related to the campaign topic. Prerequisite: Agricultural Communications 114 or consent of instructor. 4 hours.
- 240. Photography in Agriculture.** Application of visual communications principles to agriculture using the photograph as medium; emphasizes communicative, creative, and technical aspects. See *Timetable* for approximate cost of materials. Prerequisite: Consent of instructor. 4 hours.
- 270. Agricultural Sales Communications.** Role, dynamics, and principles of personal sales communications as related to food and agriculture; methods for analyzing, setting objectives, planning, conducting and evaluating sales communications efforts; individual observation of principles applied by agricultural sales professionals. Prerequisite: Junior standing; enrollment preference to students in the College of Agriculture. 3 hours.
- 280. Leadership Development.** Same as Human Resources and Family Studies 280. Examines leadership theory, styles and roles of leaders; includes exercises and activities to improve functional leadership skill, as adapted to career interests of the individual class member. Prerequisite: Rhetoric 105 and Speech Communication 101; or equivalent. 3 hours.
- 290. Professional Seminar.** Professional developments and issues in agricultural communications; the agricultural communicator today; and avenues for continuing professional growth. Prerequisite: Junior-senior standing in agricultural communications. 1 hour.
- 300. Special Problems in Agricultural Communications.** Special projects, research, and independent study in agricultural communications. Prerequisite: Agricultural Communications 114 or equivalent; written consent of instructor and authorized departmental approval prior to advance enrollment and registration; not open to students on probation. Specific approval of the associate dean is required in advance of registration for a second and/or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this academic unit subject to approval of the instructor. 1 to 5 hours, or 0 to 2 units.
- 310. Agricultural Information Systems.** Critical examination of role, value, and uses of information in U.S. agriculture; social structures for information delivery; changing information and communication technologies; and emerging agricultural information issues. Prerequisite: Introductory social science course or Agricultural Communications 114. 3 hours or 1 unit.
- 320. Rural-Urban Communications.** Analysis of rural-urban relationships and the role of communications from the political, historical, philosophical, and communications perspectives; concepts and skills for improving interactions that involve U.S. agriculture and the food system. Prerequisite: 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 330. Promotion of Farm Products.** Studies producer-sponsored efforts to promote consumption of farm products; includes consumption trends and forces, current promotion activities, uniqueness and effects of commodity promotion, funding and organization, export promotion, and principles in promotion planning. Prerequisite: Economics 101 or Agricultural Economics 100; Agricultural Communications 114. 3 hours or $\frac{3}{4}$ unit.
- 460. Teaching of College-Level Agriculture.** Analysis and preparation for the problems encountered in the effective teaching of college-level agriculture and home economics;

systems approach, including instructional objectives, preassessment of students, instructional strategies, materials, and student performance evaluation; and detailed study of individual problems supplements class work. Prerequisite: Master's standing. $1\frac{1}{2}$ unit.

- 461. Extension Communications Management.** Analysis and management of effective extension communications based on present communication and educational concepts. 1 unit.

AGRICULTURAL ECONOMICS

(Including Rural Sociology)

Head of Department: David L. Chicoine

Department Office: 305 Mumford Hall, 1301 West Gregory Drive, Urbana

Agricultural Economics

- 100. Introductory Agricultural Economics.** Principles of microeconomics; demand, production, supply, elasticity, markets, and trade are presented and used in the analysis of decisions of individuals relating to agriculturally oriented problems such as: growth and development; resources; trade; environment; and income. Macroeconomic concepts are also introduced. 4 hours. Students may not receive credit for both Agricultural Economics 100 and Economics 102.
- 161. Microcomputer Use in Agriculture and Human Resources and Family Studies.** Studies selection and agricultural applications of microcomputer hardware and software; includes instruction and practice in solving data-related problems with microcomputers and general purpose software packages. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Problems in Agricultural Economics.** Individual research work under the supervision of senior members of the staff in the following fields: agricultural credit and finance; agricultural law; agricultural marketing; agricultural policy; agricultural prices; farm management; land economics; rural organization; and statistical analysis. Students may receive credit for research in preparing for intercollegiate debating and speaking on problems in agricultural economics when such opportunities exist. Prerequisite: Not open to students on probation; written consent of instructor and authorized departmental approval are required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.
- 201. The World Food Economy.** Examines global food production, consumption, and trade; problems of hunger and population; the role of agricultural development, trade, and aid in relieving hunger. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
- 203. Farm Taxation.** Federal, state, and local taxation with emphasis on their application to farm income, farm property, farm property transfers, and agricultural cooperatives; introductory material on the uses and sources of revenue. 2 hours.
- 210. Economics of Agriculture and the Environment.** Economic issues surrounding agriculture's relationship to the environment, including: water and land use; air and water pollution; waste disposal; chemicals and food safety; property rights; and related government policies. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
- 220. Farm Management.** Economic principles applied to management of farms; budgeting; crop and livestock systems; record analysis; financial management; farm leases; and problems in resource appraisal and business reorganization. Field trip required; see *Timetable* for approximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. 3 or 4 hours. 3 hours credit without home farm problem or 4 hours credit with home farm problem.

- 230. Marketing of Agricultural Products.** Examines factors affecting the size of the market for agricultural products and the scope of marketing activities; functions and services performed; pricing agricultural products, including the nature and causes of price fluctuations; and costs of marketing and efforts to reduce costs and improve the marketing system. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours.
- 238. Food and Agribusiness Management.** Provides an overview of management in the food and agribusiness sector. Major topics covered include: introduction to the food and agribusiness sector; the environment of the firm; fundamentals, structural design, and change in organizations; leadership, motivation, communication; and planning and control. Coverage is at the introductory level with a focus on textbook material and current issues. Prerequisite: Sophomore standing; Agricultural Economics 100 or Economics 101 or Economics 102 and Agricultural Economics 161. 3 hours.
- 239. Agribusiness Market Planning.** Examines important aspects in the development of a business plan and marketing plan for a new or existing product or service in the agribusiness sector. Includes development of a complete business plan for a specific firm or segment with special attention to the organization of the firm and the markets in which the firm will operate. In addition, a marketing plan will be developed for a chosen product including: market analysis; business strategy and goals; implementation; financial analysis; monitoring and contingency planning. Computerized planning packages and presentation packages are used in the development of the final presentation. Prerequisites: Agricultural Economics 238, or consent of instructor. 3 hours.
- 250. Agricultural Economics Internship.** A supervised, off-campus experience in a field directly pertaining to a subject matter in agricultural economics; typically the internship is with an agriculturally-oriented firm or governmental agency. Prerequisite: Junior standing, cumulative grade-point average of 3.4 or above at the time the internship is arranged, and consent of instructor. 1 to 4 hours.
- 261. Agricultural Economic Statistics.** Statistical methods applied to agricultural economics, including descriptive statistics, index numbers, statistical inference, hypothesis testing, sampling, introduction to analysis of variance, linear regression and correlation, multiple regression, time series analysis, and nonparametric methods. Prerequisite: Mathematics 124 or 125. 4 hours. Students may not receive credit for both this course and Economics 172 and 173, Agronomy 340, or Statistics 100.
- 301. Economics of Agricultural Development.** The economics of agricultural development and the relationships between agriculture and other sectors of the economy in developing nations; agricultural productivity and levels of living in the less developed areas of the world; and studies of agricultural development in different world regions including Africa, Asia, and Latin America. Prerequisite: Economics 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 302. Agricultural Finance.** Introduction to agricultural finance including study of financial markets and institutions providing debt and equity capital to agricultural firms, development of skills in applying principles and methods of financial management to agricultural firms. Prerequisite: Agricultural Economics 220 or Accountancy 201, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 303. Agricultural Law.** Relation of common-law principles and statutory law to land tenure, farm tenancy, farm labor, farm management, taxation, and other problems involving agriculture. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 304. Intermediate Agricultural Finance.** Examines finance principles applied to commercial agriculture at an intermediate level; farm financial and investment analysis, risk and liquidity analysis, capital structure and leasing in agriculture; and organization, structure, and analysis of rural financial markets and institutions. Prerequisite: Agricultural Economics 302 and 261, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 305. Agricultural Policies and Programs.** The problems of agriculture as an industry; analysis of past and current federal and state governmental policies and programs affecting agriculture; objectives and development of policies; the use of economic concepts in evaluating possible future agricultural policies and programs; and forces in policy formation. Field trip; see *Timetable* for approximate cost. Prerequisite: Economics 101. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 312. Rural Real Estate Appraisal.** Same as Soils 312. Valuation methods and value bases of rural real estate; legal aspects of property rights, appraisal theory and procedures, condemnation appraisal, characteristics of the rural land market, soil identification and productivity, and other legal, economic, agronomic, and engineering aspects of real estate valuation. Laboratory field trips, including a practice appraisal; see *Timetable* for approximate cost. Prerequisite: Soils 101 and Agricultural Economics 220, or equivalent. 3 hours, or $3/4$ or 1 unit.
- 317. Introduction to Natural Resource Economics.** Same as Environmental Studies and Forestry 317. Examines economic aspects of natural resources and their implications for public policy development; discusses economic growth, resource scarcity, property rights, stock vs. flow resources, conservation, investment decisions, discounting, and the institutional framework for decision-making; and applies the above to agricultural problems. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $3/4$ unit.
- 319. Regional Environmental Management Simulation.** Same as Civil Engineering 341, Environmental Studies 341, Geography 341, and Urban and Regional Planning 375. See Civil Engineering 341.
- 324. Decision-Making for Farm Operators.** Analyzes decision procedures for common farm operation problems, decision making under uncertainty, control procedures for the farm firm, evaluation of farm investments, and labor management. Prerequisite: Agricultural Economics 220; credit or concurrent registration in Agricultural Economics 302. 3 hours, or $3/4$ or 1 unit.
- 326. Professional Farm Management.** Examines principles of farm management applied to problems of those managing farms for others as a profession; business practices and procedures; professional ethics; relationships with clients and farm operators; division of inputs and returns between owner and operator; and direct operation of farms with hired labor. Case studies and field trips; see *Timetable* for approximate cost. Prerequisite: Credit or concurrent registration in Agricultural Economics 324. 3 hours or $3/4$ unit.
- 330. Economics of Commodity Marketing.** Examines the structure, operations and efficiency of grain and livestock markets; product demand and linkages between grain and livestock; problems in transportation and quality standards; price discovery and market performance; role of world trade and government policy in markets. Prerequisites: Economics 101 and Agricultural Economics 230. 4 hours or 1 unit.
- 335. Economics of Food Marketing.** Same as Food Science 335. Economic performance of food system; marketing margins; transportation, processing, advertising, and retailing of food products; structure, conduct, and performance of food marketing firms and industries; government and public interest in the food system. Prerequisite: Economics 101; Agricultural Economics 230 recommended. 4 hours or 1 unit.
- 338. Strategic Marketing in Food and Agribusiness.** Same as Business Administration 338. Examines the application of the strategic marketing process to the food and agribusiness sector; integrates methods and models with analysis of socioeconomic variables that affect strategic decision making in that sector; emphasizes the dynamic nature of the decision environment in the agribusiness sector. Prerequisite: Agricultural Economics 238, Business Administration 202, or Agricultural Economics 230; or consent of instructor. 3 hours or $3/4$ unit.
- 339. Practicum in Food and Agribusiness Management.** Same as Business Administration 339. Provides students the opportunity to develop and experiment with analytic and process skills necessary for effective decision making in the agribusiness sector. Identification and analysis of strategic issues in the sector are emphasized. In-depth dialogue with executives-in-residence from the agribusiness sector is an integral part of the experience. Prerequisite: Agricultural Economics 338 and consent of instructor. 4 hours or 1 unit. Course cannot be taken credit/no credit.
- 340. Commodity Futures Markets and Trading.** Development of futures trading; operation and governance of commodity exchanges; economic functions of futures trading; operational procedures and problems in using futures markets; public regulation of futures trading; evaluation of market performance. Field trips required; see *Timetable* for ap-

- proximate cost. Prerequisite: Agricultural Economics 100 or Economics 101. 3 hours or $\frac{3}{4}$ unit.
342. **Agricultural Prices.** Studies the factors affecting prices of agricultural products: long-time, cyclical, seasonal, and other price movements; sources of information relating to production and demand factors; government activities as they relate to prices of agricultural products; and methods and problems in price analysis and forecasting. Prerequisite: Economics 101 and Agricultural Economics 261; or equivalents. 3 hours or $\frac{3}{4}$ unit.
352. **Economic Development in Latin America.** Same as Economics 352. See Economics 352.
353. **Economic Development in India and Southeast Asia.** Same as Economics 353. Analysis of plans and progress toward economic development in India and southeast Asia; economic characteristics of the area and their significance for economic development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
354. **Economic Development of Tropical Africa.** Same as Economics 354. Types of African economies and growth of the exchange economy; development of natural resources, industry, trade, finance, and education; analysis of economic integration, governmental planning, and development projects; and demographic, land tenure, and institutional influences on development. Prerequisite: Economics 101 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **International Agricultural Trade.** Examines trends and patterns of exports and imports of major agricultural commodities, and evaluates the economic and institutional factors having a bearing on this trade. Prerequisite: Economics 101 or equivalent. 3 hours or $\frac{3}{4}$ unit.
361. **Agricultural Surveys and Statistical Analysis.** Reviews methods of survey statistics used with agricultural producers and others in agriculture; studies survey instruments, interviewing, coding, sample design, sampling, survey statistics, and tests of significance; and includes a class problem survey conducted by students. Field trip to the Illinois Crop Reporting Service; see *Timetable* for approximate cost. 8 week course. Prerequisite: Agricultural Economics 261. 2 hours or $\frac{1}{2}$ unit.
362. **Applications of Regression Models in Agricultural Economics.** Emphasizes the application of single equation regression methods to problems in agricultural economics; techniques include ordinary least squares, maximum likelihood estimators, estimators with heteroskedastic, serially correlated, and multicollinear data; and uses of binary independent variables. Prerequisite: Agricultural Economics 261 and Mathematics 134, or equivalent. 2 hours or $\frac{1}{2}$ unit.
363. **Optimization Methods in Agricultural Economics.** Application of mathematical programming methods to discrete models in agricultural economics; Kuhn-Tucker theorem, Lagrange multipliers, duality, simplex method as applied to linear and quadratic programming, and input-output analysis models in agriculture. Prerequisite: Mathematics 124 and 134. 2 hours or $\frac{1}{2}$ unit.
370. **Family Economics.** Same as Economics 346 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
390. **Advanced Agricultural Marketing.** Examines applied research methodology and topics in risk management; allocational and locational problems; international trade; market structure; consumer demand; product quality; price analysis. Prerequisite: Economics 300; Agricultural Economics 261; and Agricultural Economics 330 or 335. 3 hours or $\frac{3}{4}$ unit.
401. **International Comparative Agriculture.** Agricultural and food problems of the world and of selected countries viewed in the world setting; resources and institutional factors affecting production; and national and international policies and plans for developing agricultural production and improving levels of living. Emphasizes a comparative approach to agricultural development of countries on different economic levels. 1 unit.
402. **Agricultural Finance.** Financial planning applied to farms and farm-related firms and sectors; financial aspects of risks and risk management in the food production/distribution system and related financial markets; and cash flow, capital budgeting, and liquidity management. Prerequisite: Agricultural Economics 302 or consent of instructor. 1 unit.
405. **Economic Policies and Programs Affecting Agriculture.** Economic analysis of state, national, and international policies and programs, including proposed legislation having

important bearing on the well-being of farm people. Prerequisite: One semester of graduate work or consent of instructor. 1 unit.

406. **Research Methodology in Agricultural Economics.** The use of theory and observations in the formulation and resolution of research problems in agricultural economics, including criteria for choice in modeling options and observational methods. Prerequisite: Economics 300 or 301, or equivalent and Agricultural Economics 362. $\frac{1}{2}$ unit.
425. **Microeconomics of Agricultural Production.** Examines analysis of agricultural production at the enterprise or farm level; theory, estimation, and utilization of response analysis in agricultural production; estimation of firm production functions; evaluation of firm costs and size economies in agriculture; optimal replacement of durable assets; and theory of leasing and utilization of optimization techniques in firm level analysis. Prerequisite: Economics 300, and an introductory knowledge of multiple regression and linear programming. 1 unit.
436. **Problems in Marketing Agricultural Products.** Examines selected economic problems in marketing agricultural products and discusses relevant theory and empirical methodologies for analyzing and interpreting research results; topics include: operational efficiency in marketing firms and industries; efficient allocation over space, form, and time; price making institutions; and research in demand stimulation and selected issues in trade. Prerequisite: Agricultural Economics 362 and 363, and Economics 400; or equivalent. 1 unit.
437. **Public Issues in Food Marketing.** Analyzes structure and economic behavior in food processing and distribution, including consideration of marketing costs, competition, food safety, consumer protection, and public regulation of the food industries. Prerequisite: Economics 400 or equivalent. 1 unit.
442. **Agricultural Price Analysis.** Studies the methods used to analyze factors affecting agricultural prices; analyzes agricultural prices and price movements with respect to time, space, and form; and examines methods of price forecasting and techniques of time series analysis. Prerequisite: Agricultural Economics 362 or Economics 471, and Economics 400; or equivalent. 1 unit.
463. **Natural Resource Economics.** Same as Economics, Environmental Studies, and Forestry 463. Emphasizes the role of public policy in natural resource use: theory of allocating renewable and nonrenewable natural resources over time; effects of institutions on resource use; causes and consequences of technological change; natural resources and economic growth; and applications of concepts to current natural resource issues. Prerequisite: Economics 300 or equivalent. 1 unit.
464. **Environmental Economics: Theory and Applications.** Same as Economics and Environmental Studies 464. See Economics 464.
470. **Seminar in Family and Consumption Economics.** Same as Family and Consumer Economics 470. See Family and Consumer Economics 470.
491. **Seminar and Special Topics.** All graduate students majoring in agricultural economics must register in the noncredit section of this course. In addition, students may register for credit for individual research or group instruction on special topics under the supervision of one or more staff members. 0 to 2 units.
499. **Thesis Research.** Individual research under supervision of members of the graduate teaching staff in their respective fields. 0 to 4 units.

Rural Sociology

110. **Introduction to Rural Society.** Basic concepts for understanding and analyzing rural society; topics include changes in major rural institutions, impacts of technological change on rural people and communities, demographic patterns and trends, migration, rural minorities and subcultures, the city-countryside relationship, emerging controversies and conflicts in rural areas, and cross-cultural comparisons of rural life. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
270. **Population Issues.** Same as Sociology 270. See Sociology 270.

- 277. The Social Context of Agriculture.** Same as Sociology 277. Study of agriculture as it shapes and is affected by changes in society; topics include U.S. agriculture and its consequences for society, agricultural development in third world countries, food and hunger, and agriculture and environmental problems. Prerequisite: Sociology 100, Rural Sociology 110, or Agricultural Economics 100. 3 hours.
- 343. Social Change in Developing Areas.** Same as Sociology 343. Description and analysis of recent social and cultural changes occurring in new nations and developing economies; special attention given to problems of traditional social structure undergoing modernization; and social factors in economic growth, caste and class, nation-building, urbanization and population composition, education, family, and religion. Prerequisite: Sociology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies, Forestry, Landscape Architecture, Leisure Studies, and Urban and Regional Planning 344. See Environmental Studies 344.
- 346. Energy, Environment, and Society.** Same as Environmental Studies 346. See Environmental Studies 346.
- 347. Environmental Sociology.** Same as Environmental Studies and Sociology 347. See Environmental Studies 347.
- 378. Sociocultural Factors in African Economic Development.** Same as Anthropology 378. See Anthropology 378.
- 407. Techniques in Demographic Analysis.** Same as Sociology 407. See Sociology 407.
- 440. Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Landscape Architecture, Leisure Studies, and Urban and Regional Planning 440. See Environmental Studies 440.
- 477. Seminar on Community Organization.** Same as Sociology 477. See Sociology 477.
- 487. Special Problems in Rural Sociology.** Same as Sociology 487. Prerequisite: One unit of graduate credit in sociology; consent of instructor. $\frac{1}{2}$ or 1 unit.

AGRICULTURAL EDUCATION

Head of Department: E. W. Osborne

Department Office: 124 Mumford Hall, 1301 West Gregory Drive, Urbana

- 120. Agricultural Education Programs and Principles.** Introduction to agricultural education programs and delivery systems; state and federal policies; the nature of teaching in school and nonschool settings; types and purposes of agricultural education; program components; approaches to teaching; teacher characteristics; community relationships; educational change and innovation; trends and developments in agricultural education; and reflective teaching. 3 hours.
- 150. Observation and Program Analysis in Agricultural Education.** Early field experience in agricultural education, including observation and analysis activities in public schools, extension programs, or other selected settings; participation in clinical field experience activities; examination of educational program development and operation, teaching and learning processes, contextual factors in learning, evaluation of student learning; and professionalism. Approximately 45 hours of early field experience will be acquired. Off-campus observation begins the first week of January. Agricultural education programs in both school and nonschool settings are examined. Prerequisite: Agricultural Education 120. 1 hour.
- 280. Pre-Internship in Agricultural Education.** Supervised experience during the late spring and summer months; conducting summer program activities; supervising students' agricultural experience programs and projects; identifying community characteristics; becoming acquainted with internship programs, facilities, and personnel; gathering other information needed to successfully complete the internship experience. Approximately 60 hours of early field experience must be completed. Prerequisite: Agricultural Education 150 and concurrent registration in Agricultural Education 310. 1 hour.

- 285. Delivery and Evaluation of Agricultural Education Programs.** Students complete this course during their 12-week internship experience (either Agricultural Education 290 for noncertification students or Educational Practice 242 for certification students). Written assignments will focus on development of teaching plans, program initiation and improvement plans, and actual evaluation studies of Agricultural Education programs. Instruction will be provided during on-site faculty visits and by cooperating personnel. Prerequisite: Agricultural Education 310 and concurrent registration in Agricultural Education 290 or Educational Practice 242. 4 hours.
- 290. Internship in Agricultural Education.** Supervised educational experience in extension, agribusiness, community, or other settings for a 12-week period; includes experience in planning and conducting programs, individual and group teaching, managing facilities and equipment, supervising field experiences of students, counseling students, advising youth organizations, evaluating teaching and learning, and determining program effectiveness. Restricted to Agricultural Education majors. Prerequisite: Agricultural Education 310 and concurrent registration in Agricultural Education 315 and 285. 8 hours. Students may not receive credit for Agricultural Education 290 and Educational Practice 242, Section AG.
- 310. Methods of Teaching Agriculture.** Review of principles of teaching and learning as they influence teaching activities; psychological aspects of learning; using problem-solving teaching; teaching methods; course planning and development; developing teaching plans; laboratory teaching; evaluating student learning; maintaining discipline; motivating students; and examining personal teacher behaviors that influence learning. Prerequisite: Agricultural Education 150, Educational Psychology 211, and concurrent registration in Agricultural Education 280. 3 hours or $\frac{3}{4}$ unit.
- 315. Agricultural Education Seminar.** Analysis of teaching and learning processes, program evaluation and improvement strategies, curriculum development and modification, professional development, facility development, using community resources, program management, and discussion of trends and issues in agricultural education. Meets last five weeks of semester. Prerequisite: Senior standing and concurrent registration in Agricultural Education 290 or Educational Practice 242. 1 hour or $\frac{1}{4}$ unit.

AGRICULTURAL ENGINEERING

(Including Agricultural Mechanization)

Head of Department: Roscoe L. Pershing

Department Office: 338 Agricultural Engineering Science Building, 1208 West Peabody Drive, Urbana

Agricultural Engineering

- 100. Introduction to Agricultural Engineering.** Introduction to Agricultural Engineering discipline and career opportunities; class activities include familiarization with the laboratories, computer facilities, and network software available to Agricultural Engineering students. Classes emphasize and practice technical communication and problem solving skills as well as career planning. 1 hour.
- 126. Engineering in Agriculture.** The role of agricultural engineering in the development and use of water and soil resources, diesel engine dynamometer testing, field equipment operations and calibrations, electric motors and controls, biosensors, psychrometrics, crop drying and storage, bin loads, structural beam and column design, ventilation, heat loads, solar energy, food engineering topics, and microcomputer simulations and spreadsheet usage. Prerequisite: Credit or concurrent registration in Mathematics 120. 4 hours. Students may not receive credit for both Agricultural Mechanization 100 and Agricultural Engineering 126.

- 127. Production Systems in Agriculture.** Mathematical models of equipment performance; analysis of operational, power, weather, and economic constraints; and elementary design of equipment systems using concepts of probability and optimization. Prerequisite: Agricultural Engineering 126 and credit or concurrent registration in Computer Science 101. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 236. Machine Characteristics and Mechanisms.** Design and development concepts of agricultural and industrial machines; analysis and synthesis of tillage, planting, harvesting, and material handling mechanisms. Includes laboratory. Includes laboratory. Prerequisite: Agricultural Engineering 127 and Theoretical and Applied Mechanics 212. 3 hours.
- 256. Surveying Agricultural and Forest Lands.** Same as Forestry 256. Basic surveying procedures as applied to practices in soil and water conservation engineering, forest management, and forest engineering; water routing design. Includes laboratory. Prerequisite: Mathematics 114 and sophomore standing. 3 hours.
- 271. Transport Phenomena in Food Process Design.** Fundamental principles of momentum, heat, and mass transfer processes applied to food process design. Overall balances, steady and unsteady state heat and mass transfer, examples and design problems will emphasize applications in food processing and biological systems. Prerequisite: Mathematics 285. 2 hours.
- 277. Design of Agricultural Structures.** Design of timber, concrete, and steel agricultural structures; engineering properties of wood, concrete, and steel materials; design of compression members, tension members, beams, and connections; complete design of a few structural frames. Includes laboratory. Prerequisite: Credit or concurrent registration in Civil Engineering 261. 3 hours.
- 287. Environmental Control for Plants and Animals.** Application of engineering and biological principles to controlling agricultural building environments. Design of environments to meet specific biological requirements are developed through the integration of fluids and thermodynamics principles for environmental control with the properties of animals and plants and their related biological needs. Includes laboratory. Prerequisite: Agricultural Engineering 127. 3 hours.
- 296. Honors Project.** A special problem in engineering is selected for bibliographical, theoretical, and/or experimental research. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 298. Undergraduate Seminar.** Professional engineering concepts; design methods; preparation and presentation of an undergraduate design thesis proposal. Thesis to be completed in Agricultural Engineering 299. Field trip. Prerequisite: Junior standing in engineering. 1 hour.
- 299. Undergraduate Thesis.** The agricultural engineering problem selected in Agricultural Engineering 298 is investigated and a detailed engineering report is prepared. Prerequisite: Agricultural Engineering 298; senior standing in engineering. 2 to 4 hours.
- 311. Instrumentation and Measurements.** Static and dynamic measurements; design of measurement systems; error and noise control; analog and digital signal processing; telemetry; measurement of agricultural and biological quantities. Prerequisite: Electrical and Computer Engineering 220 or 260. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. (Credit for optional lab is 1 hour or $\frac{1}{4}$ unit.) Credit is not given for both Agricultural Engineering 311 and either General Engineering 234 or Mechanical Engineering 261.
- 336. Engineering Design Projects for Agricultural Industries.** Open-ended, industry sponsored design projects related to agriculture which utilize principles of machine design, engineering analysis, and functional operation of engineering systems. Projects are selected, design teams formed, concepts visualized, alternatives evaluated, and geometry created using CAD systems. Emphases on communication skills, technical writing, and interaction with industry representatives. Prerequisite: Agricultural Engineering 236, Theoretical and Applied Mechanics 235, or Chemical Engineering 371; or credit or concurrent registration in Mechanical Engineering 270; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 340. Introduction to Applied Statistics.** Same as Agronomy, Animal Science, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
- 345. Statistical Methods.** Same as Animal Science and Forestry 345. See Animal Science 345.
- 346. Tractors and Prime Movers.** Engineering aspects of design and application of tractors for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; operator environment. Includes laboratory. Prerequisite: Mechanical Engineering 209 or equivalent. 3 hours or $3/4$ unit.
- 356. Soil and Water Conservation Structures.** Hydrology, hydraulics, design, construction and cost estimating of structures for the conservation and quality control of soil and water resources; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality control of soil and water for agriculture. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $3/4$ or 1 unit.
- 357. Land Drainage.** Design, construction, performance, and maintenance of surface, subsurface, and open ditch agricultural drainage systems. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours, or $3/4$ or 1 unit.
- 383. Engineering Properties of Food Materials.** Physical properties of foods and biological materials; design of processing equipment and the sensing and control of food processes; thermal, electromagnetic radiation, rheological, and other mechanical properties. Includes laboratory. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 and Chemical Engineering 371; or Theoretical and Applied Mechanics 221, Theoretical and Applied Mechanics 235, and Mechanical Engineering 209 or Mechanical Engineering 213; or consent of instructor. 3 hours or $3/4$ unit.
- 385. Food and Process Engineering Design.** Design of equipment, processes, and facilities for food, pharmaceutical, biotechnology, and related process industries. Prerequisite: Agricultural Engineering 383. 2 hours or $1/2$ unit.
- 387. Grain Drying and Conditioning.** Psychrometric principles of air modification for dehydration and conditioning of moist products, emphasizing the drying of cereal grains; design of drying, cooling, and aeration systems. Includes laboratory. Prerequisite: Agricultural Engineering 127 or consent of instructor; Mechanical Engineering 209 recommended. 3 hours or $3/4$ unit.
- 396. Special Problems.** Individual investigation and report of any phase of agricultural engineering approved by the department. Prerequisite: Senior standing in engineering. 1 to 4 hours, or $1/4$ to 1 unit. May be repeated to a maximum of 16 hours or 4 units.
- 400. Research Orientation.** Discussion of the philosophy and methods of research thesis preparation, and publication of research findings in Agricultural Engineering. 0 units.
- 434. Computer Aided Kinematics.** Advanced study of kinematic and driving constraints, singular configurations of mechanical systems, constrained two dimensional motion of multi-body systems and the dynamic response of those systems; emphasis on modeling and numerical techniques for simulating machines and machine components. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 345 or equivalent; and Theoretical and Applied Mechanics 314 or consent of instructor. 1 unit.
- 436. Dynamics of Farm Machine Elements.** Advanced study of the dynamics of farm machine elements with specific reference to functional operation, stresses, and fatigue life. Includes laboratory. Prerequisite: Agricultural Engineering 236 and 336, or equivalent. 1 unit.
- 490. Seminar.** Presentation and discussion of current research and literature in agricultural engineering. $1/4$ unit.
- 496. Topics in Agricultural Engineering.** Individual investigations or studies of any phases of agricultural engineering selected by the student and approved by the advisor and the faculty member who will supervise the study. Prerequisite: Consent of instructor. $1/4$ to 1 unit. May be repeated to a maximum of 4 units.
- 499. Thesis Research.** 0 to 4 units. May be repeated.

Agricultural Mechanization

- 100. Engineering Applications in Agriculture.** Examples, problems, discussions, and laboratory exercises pointing to present and potential engineering applications in agriculture; emphasis on farm power and machinery, soil and water control, farm electrification, and farm structures. Includes laboratory. Prerequisite: Mathematics 104, 111, or 112, or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Agricultural Mechanics Shop: Construction Technology.** Selection, use, and maintenance of hand and power tools; shop safety; selection of building and roofing materials; concrete masonry construction; farm surveying. Includes laboratory. Priority is given to students in agricultural occupations and agricultural mechanization majors. Prerequisite: Junior standing and consent of instructor. 3 hours.
- 202. Welding Processes, Metallurgy, and Materials.** Selecting and using metal-arc, inert-gas, submerged arc, oxyacetylene welding and cutting processes for construction and maintenance of agricultural equipment. Includes laboratory. See *Timetable* for materials charge. Prerequisite: Chemistry 101; junior standing or consent of instructor. 3 hours.
- 203. Electric Wiring, Motors, and Controls.** Selecting and using wiring materials, electric motors and controls in agricultural lighting, heating, ventilation, and materials handling problems. Includes laboratory. See *Timetable* for materials charge. Prerequisite: Physics 140 or Agricultural Mechanization 100; junior standing or consent of instructor. 3 hours.
- 221. Farm Power and Machinery Management.** Performance, costs, application, selection, and replacement of farm tractors and field implements; optimization of mechanized agricultural field operations. Includes laboratory. Prerequisite: Agricultural Mechanization 100. 4 hours.
- 250. Agricultural Mechanization Internship.** Supervised off-campus learning experience with a business firm engaged in production or technological service to agriculture. Prerequisite: Junior standing with a 3.0 cumulative grade-point average; Agricultural Mechanization 221, 252, 272, or 281; and consent of the coordinator of program. 2 hours.
- 252. Mechanics of Soil and Water Conservation.** Principles of planning, constructing, and adapting soil conservation and drainage practices for Illinois farms, and the application of surveying to these practices. Includes laboratory. Prerequisite: Agricultural Mechanization 100 or 200. 3 hours.
- 271. Engineering Applications in Residential Housing.** Same as Family and Consumer Economics 276 and Interior Design 271. Study of principles and practices in residential housing; space planning, house types, structures, materials, utilities, environmental control, energy conservation, remodeling, and economic influences. Prerequisite: Interior Design 160, Agricultural Mechanization 100, or consent of instructor. 3 hours.
- 272. Farm Buildings.** Planning principles for agricultural storage buildings and animal housing; building space planning, structural designs, ventilating systems, construction materials, costs, and livestock waste systems; includes laboratory. Prerequisite: Agricultural Mechanization 100 or 200, or consent of instructor. 3 hours.
- 281. Grain Drying, Handling, and Storage.** Grain drying fundamentals, air-moisture relationships, grain drying systems for efficient energy use, fans, grain-handling devices and systems, planning of grain handling systems, grain standards, moisture measurement, grain storage, fungi and insect problems, aeration, processing and milling of corn and soybeans. Includes laboratory. Prerequisite: Junior standing. 3 hours.
- 299. Agricultural Mechanization Seminar.** The role of the mechanization of agriculture in society and the part of the individual graduate in this role; directed toward the study of the interplay of developments in agriculture and agricultural mechanization; topics selected from technical and popular journals. A tour of farms, industry, and business is required. Prerequisite: Junior standing. 1 hour.
- 300. Special Problems.** A technical agricultural problem is selected for study, investigation, and report, wherein a satisfactory solution does not require a background of engineering education. Prerequisite: Minimum grade-point average of 3.5; consent of instructor. 1 to 4 hours, or $1/4$ to 1 unit.

- 331. Farm Machinery Technology.** The role of forces, motions, and strengths in the operation and performance of common farm machinery mechanisms; study of mechanism illustrations, machinery testing, service problems, and other aspects of the equipment distribution industry. Includes laboratory. Prerequisite: Physics 101 recommended. 4 hours or 1 unit.
- 333. Agricultural Chemical Application Systems.** Hydraulic principles; liquid application systems including pumps, controls, and agricultural spray nozzles; granular application systems; safe storage, handling, and disposal of pesticides and fertilizers; federal and state legal requirements. Includes laboratory. Prerequisite: Agricultural Mechanization 221; Agronomy 326; or Horticulture 242 or 262; or Plant Pathology 305 or 377; or Entomology 319 or 322. 3 hours or $3/4$ unit.
- 341. Engine and Tractor Power.** Construction, performance and maintenance of internal combustion engines, power trains, and hydraulic systems for powered equipment; methods and equipment for performance testing. Includes a laboratory. Prerequisite: Agricultural Mechanization 221 or consent of instructor. 3 hours or $3/4$ unit.
- 372. Livestock Waste Management.** Principles and practices of managing wastes from livestock production facilities; includes collection, storage, transport, runoff control, odor control, aerobic and anaerobic treatment, utilization, crop nutrients, animal nutrients, fuels, and regulations. Prerequisite: Junior standing and one 200-level animal production course. 3 hours or $3/4$ unit.
- 381. Electrical and Microcomputer Controls for Agriculture.** Microcomputer and electrical control applications; electrical fundamentals; solid-state devices; relays; sensors; motor types and characteristics; three-phase power; logic devices; analog/digital converters; single-board microprocessors and interfacing for agricultural control applications. Includes laboratory. Prerequisite: Agricultural Mechanization 100; or consent of instructor. 3 hours or $3/4$ unit.

AGRICULTURE

Program Administrator: W. R. Gomes

Program Office: 104 Mumford Hall, 1301 West Gregory Drive, Urbana

- 100. Agriculture in Modern Society.** Analysis of agriculture in contemporary society and introduction to problems and challenges related to agriculture; includes a brief orientation to the University and the College of Agriculture. Required of all freshmen in agriculture. 2 hours.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Human Resources and Family Studies 268. Introduction to the organization, philosophy, financing, personnel, clientele, and programs of cooperative extension. Prerequisite: A course in the principles of psychology or sociology or consent of instructor. 3 hours.
- 269. Cooperative Extension: Summer Experience.** Same as Human Resources and Family Studies 269. Field experience to provide opportunity for students to become acquainted with the roles of county personnel, office organization, and programs in cooperative extension. A living allowance is paid to students during the course. Prerequisite: Agriculture 268 or consent of instructor. 4 hours. Offered in the summer session only.
- 298. International Experience.** Same as Human Resources and Family Studies 298. An international experience in agriculture or home economics related areas involving foreign travel and study without enrollment in another institution. Experience must be planned and approved in advance through consultation with a College of Agriculture faculty member. Prerequisite: Written consent of instructor; junior standing; not open to students on probation. 1 to 4 hours.
- 299. Agriculture Study Abroad.** Provides campus credit for study at accredited foreign institutions. Final determination of credit granted is made upon the student's successful

completion of work. Prerequisite: Consent of major department, college, and Study Abroad Office. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 36 hours within one calendar year.

350. **Education for Rural Development in Low Income Countries.** Same as Vocational and Technical Education 350. See Vocational and Technical Education 350.
369. **Educational Programs in Cooperative Extension.** Same as Human Resources and Family Studies 369. The design and development of informal educational programs for youth and adults in an out-of-school setting. Prerequisite: Agriculture 268 or consent of instructor. 3 hours or 1 unit.

AGRONOMY

(Including Soils)

Head of Department: Gary H. Heichel

Department Office: W-201 Turner Hall, 1102 South Goodwin Avenue, Urbana

Agronomy

121. **Principles of Field Crop Science.** An introductory course; kinds, origin, taxonomy, morphology, and physiological and ecological bases of growth, reproduction, improvement, and utilization of corn, soybeans, small grains, forage crops, and sorghums; cropping and tillage practices and principles; and field-crop production hazards. 4 hours.
190. **Field-Crop Scouting.** Workshop on the scouting of field crops for major pests and physiological problems; identification of major weeds, diseases, and insects of field crops. Lecture and lab. 1 hour. Offered during spring break.
220. **Plant and Animal Genetics.** Same as Animal Science 220 and Horticulture 220. The principles of heredity in relation to plant and animal improvement. Prerequisite: Biology 110 and 111, or Plant Biology 100 and Biology 104. 4 hours.
221. **Biotechnology in Agriculture.** Basic introduction to the techniques and application of biotechnology to a wide range of agricultural areas, and specific examples are given. May serve as either a terminal course explaining the techniques or as an introductory base for future studies. Prerequisite: Any 100-level biology course. 3 hours.
290. **Undergraduate Agronomy Seminar.** The course includes reports and discussions of crops and soils research. Prerequisite: Senior standing. 1 hour.
299. **Undergraduate Thesis.** Individual research problems in agronomy under the direction of a faculty member in agronomy. Normally the student enrolls during the summer between the junior and senior years and during the fall semester of the senior year, or during both semesters of the senior year. Recommended for those who plan to do research and/or graduate study. Thesis problems should be discussed with the supervising faculty member in the semester preceding enrollment and must be approved by the Agronomy Undergraduate Thesis Committee before enrollment. An approved thesis must be presented for credit to be given. Prerequisite: Junior standing; minimum grade-point average of 4.0; consent of instructor. 2 to 5 hours. A maximum of 5 hours may be counted toward graduation.
300. **Advanced Special Problems.** Individual problems in crops or soils. Graduate students majoring in agronomy do not receive graduate credit. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor. Approval of the agronomy teaching coordinator is required prior to advance enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours, or $\frac{1}{4}$ to 2 units.
315. **Genetics of Higher Organisms.** Contemporary advances in molecular genetics are integrated with classical genetic principles and concepts. Topics include linkage, recom-

bination, restriction fragment length polymorphisms, allelism, gene interactions, and extranuclear inheritance. Examples are taken from higher organisms such as plants, animals and humans. Prerequisite: Agronomy 220 or Biology 210 or consent of instructor. 3 hours or $3/4$ unit.

- 318. Crop Growth and Production.** Crop production and management as influenced by environment, plant species, and cropping system; relates plant growth processes to management practices. Prerequisite: Soils 101 and Agronomy 121 or equivalent, or consent of instructor. 3 hours or $3/4$ unit.
- 319. Environment and Plant Ecosystems.** Same as Environmental Studies and Forestry 319. See Forestry 319.
- 321. Biological Control of Insect Pests.** Same as Entomology 321. See Entomology 321.
- 322. Forage Crops and Pastures.** Forages, their plant characteristics, ecology, and production; grasslands of farm and range as related to animal production and soil conservation. Prerequisite: Agronomy 121. 3 hours or $3/4$ unit.
- 323. Principles of Plant Breeding.** Same as Horticulture 323. Genetic and cytological variation in crop plants; the production and control of such variation in developing varieties and hybrids; and the maintenance of high quality seed stocks. Field trips; see *Timetable* for approximate cost. Prerequisite: Plant Biology 100; Agronomy 220 or equivalent. 4 hours or 1 unit.
- 324. Plant Breeding Methods.** Discussion of the application of current scientific tools and methods available to plant breeders for improving plants; emphasis on actual use of plant breeding methods and production of high quality seed. Field trip; see *Timetable* for estimated cost. Prerequisite: Agronomy 323. 2 hours or $1/2$ unit. Offered Summer Session only.
- 326. Weeds and Their Control.** Methods of introduction, dissemination, reproduction, and control of weeds; includes laboratory discussion. Prerequisite: Agronomy 121 or Horticulture 100. 3 hours or $3/4$ unit.
- 330. Plant Physiology.** Same as Plant Biology 330. See Plant Biology 330.
- 332. Genetic Toxicology.** Same as Environmental Studies and Microbiology 332. See Environmental Studies 332.
- 333. Plant Physiology Laboratory.** Same as Plant Biology 333 and Horticulture 333. See Plant Biology 333.
- 336. Perennial Grass Ecosystems.** Same as Horticulture 336. See Horticulture 336.
- 337. Ecology of Cropping Systems.** Examines the dynamics and function of agricultural ecosystems and reviews fundamental concepts of ecology. Agricultural systems will be compared on the basis of energy flow, nutrient cycling, diversity, stability and required inputs. Term papers required. Prerequisite: Agronomy 121 and Plant Biology 100 or 102, and Soils 101, and either Ecology, Ethology and Evolution 212 or Forestry 316 or Plant Biology 318; or consent of instructor. 3 hours of $3/4$ unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Animal Sciences, Food Science, Forestry, and Horticulture 340. Statistical methods involving relationships between populations and samples; collection, organization, and analysis of data; and techniques in testing hypotheses with an introduction to regression, correlation, and analysis of variance limited to the completely randomized design and the randomized complete-block design. Prerequisite: Mathematics 104, 112, or equivalent. 4 hours or $3/4$ unit.
- 368. Biological Modeling.** Same as Biology 368 and Geography 368. See Geography 368.
- 377. Diseases of Field Crops.** Same as Plant Pathology 377. See Plant Pathology 377.
- 400. Seminar.** Discussions of current literature in crops and soils. Required of all graduate majors in agronomy. Prerequisite: Graduate standing. 0 or $1/4$ unit.
- 418. Crop Growth and Development.** Study of the physiological processes involved in growth and development of crop plants and the interaction of physiological processes and the environment that influences productivity. Prerequisite: Agronomy 318 or 330. 1 unit.
- 422. Forage Quality and Utilization.** Nutritional chemistry of forage plants and the genetic, environmental, and postharvest factors that influence it. Emphasis placed in the evaluation of forage quality using laboratory methods and feeding experiments. Prerequisite: Agronomy 322 and Biochemistry 350. 1 unit. Offered in alternate years.

- 423. Cytogenetic and Evolutionary Basis of Plant Breeding.** Nature and origin of crop species; genetic and cytogenetic basis for developing special plant materials and the use of such materials in breeding programs; and emphasis on discontinuous variation. Prerequisite: Agronomy 323 or equivalent, or consent of instructor. 1 unit.
- 424. Plant Biochemistry.** Same as Plant Biology 424 and Horticulture 424. Enzymes and pathways involved in plant intermediary metabolism. Basic cell physiology, bioenergetics, and hormonal regulation of metabolism. Prerequisite: Plant Biology 330 and Biochemistry 350. 1 unit. Offered in alternate years.
- 425. Membrane Transport and Mineral Nutrition in Plants.** Same as Horticulture and Plant Biology 425. Consideration of biochemical mechanisms for solute movement across plant cell membranes as related to nutrient acquisition, assimilation, and partitioning. Prerequisite: Agronomy 330; Biochemistry 350 recommended. $\frac{3}{4}$ unit. Offered in alternate years.
- 426. Herbicide Behavior in Plants.** Study of the various chemicals used to inhibit plant growth, including mode of action, mechanisms of selective toxic action, relationship of chemical structure to toxicity, and fate and behavior in soils. Prerequisite: Agronomy 330 and 326. 1 unit. Offered in alternate years.
- 440. Design and Analysis of Biological Experiments.** Statistical methods as tools for research; principles of designing experiments and methods of analysis for various kinds of designs, including factorial experiments, are considered from the viewpoint of when and how to use them. Prerequisite: Agronomy 340 or equivalent. $\frac{3}{4}$ unit.
- 441. Advanced Design and Analysis of Biological Experiments.** Same as Animal Sciences 441. Design and analysis of complex experiments; considers confounded factorials, lattices, and other incomplete block designs in terms of their characteristics, usefulness in biological research, and methods of analysis; and computational aspects of both regression and analysis of variance. Prerequisite: Agronomy 440 or equivalent. $\frac{3}{4}$ unit. Offered in alternate years.
- 442. Environmental Plant Physiology.** Same as Plant Biology 442. See Plant Biology 442.
- 444. Quantitative Aspects of Plant Breeding.** Studies the theoretical bases for plant breeding procedures with special emphasis on the relationship between type and source of genetic variability, mode of reproduction, and effectiveness of different selection procedures. Prerequisite: Agronomy 323 and 440, or equivalent. 1 unit.
- 445. Biochemical Genetics of Higher Plants.** The biochemical description of genetic phenomena including genetic systems, mutagenesis, selection methods, mutant characterization, evolution, maternal inheritance, ploidy, heterosis, tumors, and tissue culture genetics. Prerequisite: Agronomy 220 and Biochemistry 350, or equivalent. 1 unit. Offered in alternate years.
- 446. Plant Gene Regulation.** Same as Forestry 446 and Horticulture 436. Current topics and literature concerning the function and regulation of higher plant genes with particular emphasis on transposable elements, their effect on gene expression and variation, and uses in gene tagging; the developmental, tissue specific, or environmental regulation of plant genes; use of genetic engineering to explore the regulation of plant genes or to alter traits of agricultural importance. Prerequisite: Agronomy 220, Biochemistry 350, or consent of instructor. $\frac{1}{2}$ unit. Offered first half of semester.
- 447. Gene Expression During Seed Development.** Same as Forestry 447 and Horticulture 437. Comprehensive examination of current knowledge of gene expression and macromolecule synthesis in the developing plant seed; emphasis on: genetic control of synthesis and accumulation of storage reserves, aspects of gene structure and expression, and structural organization of proteins and carbohydrates at the subcellular level. Prerequisite: Agronomy 220, Biochemistry 350, or consent of instructor. $\frac{1}{2}$ unit. Offered last half of semester.
- 450. Recombinant DNA Technology Laboratory.** Intensive instruction in methodologies involving recombinant DNA technology. Students will generate and analyze recombinant DNA clones, isolate plasmid and plant DNA, and perform southern blot analysis of plant DNA. Prerequisite: Agronomy 220 or Biochemistry 350; Agronomy 446 or 447 or equivalent and consent of instructor. $\frac{1}{2}$ unit.

- 493. Advanced Studies in Agronomy.** Directed and supervised detailed study of selected problems or topics. Prerequisite: Consent of instructor. Study may be in any one of the following fields: (a) soil chemistry; (b) soil fertility; (c) soil physics; (d) soil classification and pedology; (e) soil mineralogy; (f) soil microbiology; (g) plant breeding and genetics; (h) plant physiology; (i) weed control; (j) crop morphology; (k) crop production and ecology; or (l) statistical techniques and data processing. $1/4$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

Soils

- 101. Introductory Soils.** The nature and properties of soil including origin, formation, and biological, chemical, and physical aspects. Prerequisite: Chemistry 100 or equivalent. 4 hours.
- 206. Soil Evaluation.** An eight week lab and field based course involving description, interpretation, and classification of soil profiles. Overnight field trip; students pay costs which reflect actual expenses. Prerequisite: Soils 101 or consent of instructor. 1 hour. May be repeated to a maximum of 3 hours. May not be taken concurrently with Soils 306.
- 301. Pedology.** An introduction to soil genesis, classification, and morphology. Includes the factors of soil formation; properties and methods used in distinguishing soils; organization of natural soil knowledge; interpretation of soil profiles and soils stratigraphy, causes of soil variability and impact upon soil management, land use decisions, and the environment. Prerequisite: Soils 101 or consent of instructor. 3 hours or $3/4$ unit.
- 302. Soil Testing Practicum.** Chemical procedures useful in assessing soil/plant relationships for field crops; involves lectures on agronomic principles, field work on sampling, and laboratory time to perform soil tests, interpret the analytical results, and formulate a nutrient management program. Field trip; see *Timetable* for approximate cost. Prerequisite: Soils 101. 2 or 3 hours, or $1/2$ or $3/4$ unit. 3 hours or $3/4$ unit credit requires additional laboratory work and consent of instructor.
- 303. Soil Fertility and Fertilizers.** Factors affecting the supply of available major, secondary, and minor elements in soils and their influence on crop production; evaluating fertilizer and lime needs; and fertilizer manufacture, sources, and application methods. Prerequisite: Soils 101. 3 hours or $3/4$ unit.
- 304. Soil Conservation and Management.** Application of principles of soil conservation and management to the solution of land-use problems; influence of soil characteristics on erosion control, cropping intensity, water management, and land-use planning. Field trip; see *Timetable* for approximate cost. Prerequisite: Soils 101. 3 hours or $3/4$ unit.
- 305. Soil Microbiology.** Metabolic processes leading to chemical transformations in soil and water environments; implications for soil fertility and environmental pollution. Prerequisite: Microbiology 100; Chemistry 102. 3 hours or $3/4$ unit.
- 306. Field Pedology.** A laboratory and field based course emphasizing the fundamentals of understanding, describing, identifying, mapping, interpreting, and classifying soils and soil-landscapes; emphasizes impact of soil variability on use and management of soils. Trips to map and classify soils locally and regionally; students pay travel costs which reflect actual field expenses. Prerequisite: Credit or concurrent registration in Soils 301. 2 hours or $1/2$ unit.
- 307. Soil Chemistry.** Emphasizes the inorganic reactions involved in soil development and plant nutrition in soils; topics discussed include colloid systems, properties of water, ion exchange equilibria, plant nutrient forms, and methods of analyses. Prerequisite: Soils 101; Chemistry 102. 3 hours or $3/4$ unit.
- 308. The Physics of the Plant Environment.** The physics of transport processes in the soil and aerial environment of plants; exchanges of energy and gases in crop canopies and the retention of flow of water, gases, solutes, and heat in soils. Prerequisite: Physics 101 or 106; one semester of calculus; and Soils 101 or consent of instructor. 4 hours or 1 unit.
- 311. Laboratory Methods for Soils Research.** Uses traditional wet chemical and instrumental techniques in the characterization of soil properties; includes atomic absorption spectroscopy.

copy, gas chromatography, specific ion electrodes, and other techniques in the study of soils. Lecture and laboratory. Prerequisite: Soils 101 and Chemistry 102. 3 hours or $3/4$ unit. Offered in alternate years.

312. **Rural Real Estate Appraisal.** Same as Agricultural Economics 312. See Agricultural Economics 312.
313. **Soil Mineralogy.** Description and identification of common soil minerals and weathering of minerals; relationships of soil mineralogy to soil development, plant and animal ecology, and agricultural and technological use of soil. Prerequisite: Soils 101; Geology 101 or 107. 3 hours or $3/4$ unit.
402. **The Chemistry of Soil Fertility.** The chemistry of the essential plant nutrients in soils, their reactions, and their quantitative relationship to plant growth. Prerequisite: Soils 101; Chemistry 122. 1 unit. Offered in alternate years.
403. **Genesis, Morphology, and Classification of Soils.** Historical review of soil genesis and classification; morphology and genesis of diagnostic soil horizons and features; soil genesis processes and reactions; classification of soils; and characteristics, geography, and production potentials of major soil groups of the world. Prerequisite: Soils 301 or consent of instructor. 1 unit. Offered in alternate years.
411. **Soil Physics.** The derivation and application of the fundamental physical principles and laws which govern the behavior of soils; emphasis on transport phenomena and physical characteristics of soils. Prerequisite: Mathematics 345, Soils 308, or consent of instructor. 1 unit. Offered in alternate years.
412. **Soil Organic Matter.** Basic considerations in organic matter transformation; geochemistry of organic matter; nature and origin of humic substances; and reactions of organic matter in soils and sediments. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
414. **Physical Chemistry of Clays and Soils.** Same as Ceramic Engineering and Materials Science and Engineering 425. The application of physical-chemical principles and concepts to surfaces and adsorption on surfaces; emphasis on silicate surfaces and water adsorption. Prerequisite: Chemistry 245 or 344, or consent of instructor. 1 unit. Offered in alternate years.

AIR FORCE AEROSPACE STUDIES

Head of Department: Thomas T. Cavanagh

Department Office: 223 Armory Building, 505 East Armory Avenue, Champaign

NOTE: As of the printing of this catalog, the Air Force Aerospace Studies leadership laboratory is out of compliance with the University's policy of nondiscrimination based on sexual orientation.

102. **Leadership Laboratory.** A progression of experience designed to develop each student's leadership potential and serve as an orientation to the U.S. Air Force active duty. Prerequisite: Consent of instructor. 0 hours. May be repeated.
111. **The Air Force Role in National Security, I.** First-year survey designed to familiarize the student with the organization and mission of the U.S. Air Force and its relation to the total defense structure; examines resources and function of the United States strategic forces, general-purpose forces, and aerospace support organizations. 1 hour.
112. **The Air Force Role in National Security, II.** Continuation of Air Force Aerospace Studies 111. Examines resources and functions of United States general-purpose military forces. Examines related fields, such as defense policy, terrorism, flight, and military facilities. Prerequisite: Air Force Aerospace Studies 111 or consent of instructor. 1 hour.
121. **The Development of U.S. Air Power, I.** Introduces the history of air power development; the impact of technology, politics, controversy, and military conflict on the evolution of doctrine and concepts for military air power from man's first flights through the organization of a separate Air Force in 1947. Prerequisite: Air Force Aerospace Studies 112 or consent of instructor. 1 hour.
122. **The Development of U.S. Air Power, II.** Continues the history of U.S. air power development; the peaceful uses of air power; the doctrine, concepts and role of U.S. air power

- in conflicts since 1947; and the international significance of the U.S. Air Force today. Prerequisite: Air Force Aerospace Studies 121 or consent of instructor. 1 hour.
231. **Leadership and Management for the Professional, I.** Studies communication skills and their application in the Air Force; the human element in the work and military environment; management principles; problem solving; and management tools, practices, and controls. Prerequisite: Air Force Aerospace Studies 122 or consent of instructor. 3 hours.
232. **Leadership and Management for the Professional, II.** Continuation of Air Force Aerospace Studies 231. Studies military leadership and management fundamentals using case studies to examine Air Force leadership/management situations; ethical theory and its application to the military environment; and the meaning of professionalism and professional responsibilities. Prerequisite: Air Force Aerospace Studies 231, or consent of instructor. 3 hours.
241. **National Security Forces in Contemporary American Society, I.** Studies the military as a profession; military ethics; civil-military interaction; laws of armed conflict; the actual use of governmental and military power; the evolution of National Security Policy in the U.S.; the actors from military to Congress and the President in the making of foreign policy and security policy; development of strategy; DOD planning / budgeting; effective communication in the Air Force. Prerequisite: Air Force Aerospace Studies 232, or consent of instructor. 3 hours.
242. **National Security Forces in Contemporary American Society, II.** In depth study of military justice system; Air Force organization and policy decision making system; Air Force operational organizations; acquisition systems; new officer orientation; effective communication techniques for Air Force officers. Prerequisite: Air Force Aerospace Studies 241 or consent of instructor. 3 hours.

ANIMAL SCIENCES

Head of Department: Dennis R. Campion

Department Office: 328 Mumford Hall, 1301 West Gregory Drive, Urbana

100. **Introduction to Animal Sciences.** A survey of beef and dairy cattle, companion animals, horses, poultry, sheep, and swine. Includes the importance of product technology and the basic principles of nutrition, genetics, physiology, and behavior as they apply to breeding, selection, feeding, and management. Lecture and lab. 4 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students.
106. **Introduction to Horses.** Introductory class for non-Animal Sciences majors and Animal Sciences majors not in the Companion Animal Specialization; provides information for students interested in horses and who have a primary species interest not related to companion animals; elementary material for students with a casual or recreational interest in horses; topics include gaits, breeds, uses, equipment, feeding, housing, and health care. 2 hours. Students may not receive credit for both Animal Sciences 106 and 206.
109. **Meat Purchasing and Preparation.** A general approach to meat utilization with emphasis on selecting, grading, cutting, and pricing meat for the home, restaurant, and food service industry; includes laboratory. When appropriate, field trips are taken to area commercial establishments; see *Timetable* for approximate cost. 2 hours.
119. **Meat Technology.** Student participation in the transformation of live animals through slaughter and carcass fabrication into food products for human consumption; includes laboratory. Purchase of personal equipment and a field trip are required, see *Timetable* for approximate cost. Prerequisite: Consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Individual research in animal science. Prerequisite: Minimum grade-point average of 3.5; not open to students on probation; consent of instructor and head of department. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 5 hours.

201. **Principles of Dairy Production.** Surveys the dairy industry; examines principles of breeding, selection, reproduction, feeding, milking and management dairy cattle. Prerequisite: Animal Sciences 100. 3 hours.
202. **Domestic Animal Physiology.** A study of the basic physiology of domestic animals in relation to husbandry practices. Prerequisite: Animal Sciences 100 or one semester of animal biology, or equivalent. 4 hours.
203. **Behavior of Domestic Animals.** Same as Ecology, Ethology, and Evolution 203. Introduction to concepts of animal behavior with emphasis on domestic animals; lecture and lab. Prerequisite: Biology 104 and Animal Sciences 100, or equivalent. 3 hours. Credit is not given for both Animal Sciences 203 and Ecology, Ethology, and Evolution 346.
204. **Dairy Cattle Evaluation.** Evaluation of physical traits of dairy cattle in relation to economic value and genetic improvement; sire selection, mating systems, and breed families in relation to the organization of genetic improvement programs for dairy cattle; and lecture and laboratory. Prerequisite: Animal Sciences 100 or consent of instructor. 3 hours.
206. **Horse Management.** Focus on the principles of managing horses from birth through breeding; topics include reproductive physiology, breeding management, nutrition, diseases, parasites, herd health programs, genetics, facility design and exercise physiology. Prerequisite: Animal Sciences 220, 231, and credit or concurrent registration in Animal Sciences 221. 3 hours. Students may not receive credit for both Animal Sciences 106 and 206.
207. **Companion Animal Management.** Biological management of companion animals emphasizing the dog and cat as well as others such as the rabbit, the bird, and fish; subject matter includes anatomy, breeds and breed types, selection, nutrition, reproduction, genetics, training, health and disease, equipment needs, and showing of small animals. 3 hours.
209. **Meat Animal and Carcass Evaluation.** Principles and techniques of meat animal and carcass evaluation and their relationship to current practices in industry; includes demonstrations and student participation. Students planning to enroll in Animal Sciences 210 and 212 should take Animal Sciences 209 in their sophomore year. Prerequisite: Animal Sciences 100. 3 hours.
210. **Meat Selection and Classification.** Characteristics associated with the value of carcasses and wholesale cuts from meat animals; grading and classification. Field trips to meat packing plants are required; see *Timetable* for approximate cost. Prerequisite: Animal Sciences 209. 2 hours.
211. **Breeding Animal Evaluation.** The application of current scientific tools, methods, and performance programs available to livestock breeders for improving beef cattle, swine, sheep, and horses; emphasis on the changing nature of modern breeds of livestock as influenced by selection, economics, and consumer and market trends. Prerequisite: Sophomore standing; credit or concurrent registration in Animal Sciences 209 required for the food animal section only. 3 hours.
212. **Advanced Livestock Evaluation.** Advanced instruction in evaluating meat animals for slaughter and selection of breeding animals; laboratory-discussion. Prerequisite: Animal Sciences 211 or consent of instructor. 3 hours.
213. **Horse Appraisal.** Advanced course for students interested in improving their performance and conformation evaluation skills; provides exposure to the horse show industry and the career opportunities associated with this facet of the horse industry; students may compete in intercollegiate judging contests. Prerequisite: Animal Sciences 211. 1 hour. May be repeated to a maximum of 2 hours.
220. **Plant and Animal Genetics.** Same as Agronomy 220 and Horticulture 220. See Agronomy 220.
221. **Animal Nutrition.** Principles of animal nutrition and their application to farm livestock and man. Prerequisite: Chemistry 102 or equivalent. 4 hours. Credit is not given for both Animal Sciences 221 and 325.
231. **Comparative Physiology of Reproduction, Lactation, and Growth.** Introduces the growth, reproduction, and lactation of domestic animals with application to livestock production. Prerequisite: One course in animal biology, and Animal Sciences 100. 3 hours.

- 250. Animal Sciences Internship.** Supervised off-campus learning experience in an animal-related enterprise. Prerequisite: Junior standing in animal sciences or agricultural sciences with animal sciences emphasis; good academic standing; consent of department head; Animal Sciences 100 and a 200-level course in animal sciences. 2 to 4 hours.
- 283. Beef Cattle and Swine Management.** Examines basic principles of beef cattle and swine management for students other than animal sciences majors. Prerequisite: Animal Sciences 100. 3 hours. Credit is not given for both Animal Sciences 283 and Animal Sciences 301 or 303.
- 290. Introduction to Metabolism in Domestic Animals.** Principles and regulation of metabolism in animals, emphasizing energy derivation and its relationship to domestic animal production. Prerequisite: Chemistry 102 and credit or concurrent registration in Animal Sciences 221. 3 hours.
- 298. Undergraduate Seminar.** Presentations and discussion of employment opportunities, departmental research activities, and topics relevant to animal agriculture. Prerequisite: Sophomore standing. 1 hour.
- 299. Animal Management Field Studies.** Field studies of farms and service industries; discusses and demonstrates management practices on commercial farms. Trip normally taken during spring break; see *Timetable* for approximate cost. Prerequisite: Credit or concurrent registration in Animal Sciences 100. 1 hour. May be repeated to a maximum of 4 hours.
- 300. Dairy Herd Management.** The technology of modern milk production practices; application of principles in nutrition, physiology, economics, health and hygiene, waste management, and facilities design for efficient dairy herd management systems. See *Timetable* for approximate cost of field trip. Appropriate for students in veterinary medicine interested in large animal practice. Prerequisite: Animal Sciences 221 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 301. Beef Production.** The principles of feeding and management of beef cattle; financial aspects of beef production; and diseases, parasites, and breeding difficulties of beef cattle. Lectures, demonstrations, and discussions. Prerequisite: Animal Sciences 221 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ or $\frac{3}{4}$ unit).
- 302. Sheep Science.** A study of the sheep as a biological entity and of factors which influence its responses; examination of the industry which utilizes the sheep's productive potential and of the role of sheep and the industry in animal agriculture and world welfare. Prerequisite: Animal Sciences 221 or equivalent. 3 or 4 hours, or $\frac{3}{4}$ unit. Students may register for 3 hours credit without laboratory, or 4 hours or $\frac{3}{4}$ unit with laboratory.
- 303. Pork Production.** Applies science and technology to the selection, breeding, feeding, housing and management of swine in a production enterprise; emphasizes use of research findings in decision making. Prerequisite: Animal Sciences 220, 221, and 307; and Animal Sciences 230 or 330. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Animal Sciences 283 and 303.
- 304. Poultry Management.** The application of science and technology in solving the breeding, feeding, housing, and various management problems encountered in commercial egg and poultry meat production. Prerequisite: Animal Sciences 221 or 325, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ unit. Students may register for 3 hours credit without, or 4 hours or $\frac{3}{4}$ unit with, individual study and conference.
- 305. Genetics and Animal Improvement.** Principles of heredity and their application to the problems of animal improvement. Prerequisite: Agronomy 220 or equivalent. 3 hours or $\frac{3}{4}$ unit (summer session, $\frac{1}{2}$ unit).
- 306. Equine Science.** Readings in scientific and trade publications on topics related to horse production and management. Emphasis on current research in exercise physiology, nutrition, and reproductive physiology. Prerequisite: Animal Sciences 202 and 206. 2 hours or $\frac{1}{2}$ unit.
- 307. Environmental Aspects of Animal Management.** Animal-environmental interactions (including thermal, air, microbial, photic, sound, and behavioral factors) as bases for prescribing practical environments for production of animals. Prerequisite: Animal Sciences 202. Courses in physiology, nutrition, microbiology, and genetics respectively are recommended. 3 hours or $\frac{3}{4}$ unit.

308. **Physiology of Lactation.** Examines the anatomy, development, and physiology of the mammary gland; environmental, endocrine, and biochemical factors that affect milk yield and composition. Prerequisite: Animal Sciences 231. 4 hours or 1 unit.
309. **Meat Science.** Fundamental biological principles that influence growth, composition, processing, preservation, and quality of meat and meat products. Prerequisite: Chemistry 102; Microbiology 100 and 101, or 200 and 201. Field trip required; see *Timetable* for approximate cost. 4 hours or 1 unit.
310. **Immunogenetics and Immunophysiology.** Same as Biology 310 and Veterinary Pathobiology 310. Blood groups, genetics of immunoglobulins, the T-cell receptor, immunoevolution, lymphocyte differentiation, the major histocompatibility complex, disease resistance, immune-endocrine interactions, and involvement of the immune system in fertility, nutrition, and aging. Prerequisite: Biology 210 and 307 and Animal Sciences 202. 4 hours or 1 unit.
316. **Population Genetics.** Same as Biology 316. Mathematical theory of the genetics of populations: estimation of gene frequency, Hardy-Weinberg principle, systems of mating, relationship between relatives, and forces that change gene frequency; applications to man, animals, and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of population genetics. Prerequisite: Agronomy 220, or Biology 210 and college algebra, or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
317. **Quantitative Genetics.** Same as Biology 317. The mathematical theory of the genetics of quantitative traits: properties of random-mating populations; estimation of repeatability, heritability, and genetic correlation; genetic results of selection; selection methods; correlated response; and selection for more than one trait. Application to animals and plants. Students desiring 4 hours or 1 unit credit do additional work in some area of quantitative genetics. Prerequisite: Animal Sciences 316; and credit or concurrent registration in Animal Sciences 345, or Agronomy 440; or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
320. **Nutrition and Digestive Physiology of Ruminants.** Physiology and microbiology of digestion in the ruminant, and biochemical pathways of utilization of the absorbed nutrients for productive purposes. Prerequisite: Animal Sciences 221. 3 hours or $\frac{3}{4}$ unit.
325. **Principles of Animal Nutrition.** Principles of animal nutrition and their application to veterinary practice; designed primarily for students in veterinary medicine. Lecture and laboratory. Prerequisite: Biochemistry 350, or equivalent. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Animal Sciences 325 and 221.
331. **Physiology of Reproduction in Domestic Animals.** Examines anatomy and physiology of reproduction and application to animal production: discusses topics that include endocrinology, ovarian and testicular function, estrous cycles, fertilization, implantation, pregnancy, and environmental and management factors influencing reproduction. Prerequisite: Animal Sciences 231 or equivalent. 3 hours or $\frac{3}{4}$ unit.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Food Science, Forestry, and Horticulture 340. See Agronomy 340.
341. **Human Evolution, II.** Same as Anthropology 341. See Anthropology 341.
345. **Statistical Methods.** Same as Agricultural Engineering 345 and Forestry 345. Design and analysis of experiments: multiple regression, method of fitting constants, factorial experiments with unequal subclass numbers, analysis of covariance, experimental design; computer applications to agricultural experiments using statistical packages. Prerequisite: Agronomy 340, or Mathematics 263, or equivalent. 4 hours or 1 unit.
346. **Animal Behavior.** Same as Anthropology and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
385. **Gastrointestinal and Methanogenic Microbial Fermentations.** Fundamental aspects of the ecology of microorganisms and their biochemical activities related to the anaerobic degradation of organic matter; emphasizes anaerobic ecosystems of the mammalian gastrointestinal tract and methanogenic organic residue fermentations (animal wastes, sediments). Prerequisite: Biochemistry 350 or Biochemistry 352 and 353, and Microbiology 100; or Microbiology 200 or 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
401. **Animal Bionomics.** Discussion of the current literature and research techniques pertaining to adaptation of domestic animals to their environments. Prerequisite: Animal Sciences 307 or consent of instructor. $\frac{1}{2}$ unit.

- 402. The Microbiology and Physiology of Ruminant Nutrition.** Physiological and microbiological aspects of ruminant digestion and their influence on the metabolism of the extraruminal tissues; interpretation of nutritive requirements in terms of rumen microbial activities; and evaluation of research techniques. Prerequisite: Biochemistry 350 or equivalent. $\frac{3}{4}$ unit. Offered in alternate years.
- 403. Techniques in Animal Nutrition Research.** Discusses and applies methods of laboratory analysis and animal experimentation frequently used in nutrition research. Prerequisite: Courses in nutrition, physiology, and biochemistry and consent of instructor. $\frac{3}{4}$ unit.
- 404. Concepts in Nonruminant Nutrition.** A review of current literature in nonruminant nutrition. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 408. Physiology and Biochemistry of Milk Secretion.** Biological structure and function of lactating mammary tissue, ruminant and nonruminant; emphasizes mammary secretory cell biochemical pathways, ultrastructure, and transport mechanisms pertaining to milk synthesis. Prerequisite: Animal Sciences 308 and Biochemistry 350, or equivalent; or consent of instructor. $\frac{3}{4}$ unit.
- 409. Muscle Biology.** Microstructure and chemical composition of muscle tissue; chemistry and biosynthesis of muscle and connective tissue proteins; and biochemical aspects of muscle contraction and rigor mortis. Prerequisite: Biochemistry 350 and 355. $\frac{1}{2}$ unit.
- 410. Current Topics in Nutritional Research.** Same as Food Science and Nutritional Sciences 410. See Nutritional Sciences.
- 411. Chemistry of Nutritional Processes.** Same as Food Science 411 and Nutritional Sciences 411. See Nutritional Sciences 411.
- 412. Advanced Endocrinology.** Same as Physiology 412 and Veterinary Biosciences 412. See Physiology 412.
- 414. Computing Techniques in Animal Breeding.** Computing strategies; setting up and solving mixed linear model equations, including very large systems; and estimation of dispersion parameters by REML via the EM algorithm and derivative free methods. Discusses models with multiple traits, missing data, multiple design matrices, heterogeneous variances, and relationship matrices. Strategies include sparse storage methods and iterative procedures for solving equations. Implementation in FORTRAN. Prerequisite: Computer Science 101; Animal Sciences 345. Credit in Animal Sciences 415 is recommended or consent of instructor. 1 unit.
- 415. Linear and Nonlinear Statistical Models for Biologists.** Same as Forestry 415. Studies advanced statistical methods: survey sampling; fixed, random, and mixed linear models with unequal numbers; categorical data; nonlinear deterministic and stochastic models; growth curves and time series. Examines applications to biology and agriculture. Prerequisite: Mathematics 130 and Animal Sciences 345, or equivalent. 1 unit. Offered in alternate years.
- 416. Statistical Genetics and Breeding Plans.** Selection theory, including maternal effects, multivariate selection, constrained and nonlinear cases, and retrospective indexes; estimation of genetic parameters from mixed and random models, including the unbalanced case; and applications to economic and laboratory species. Prerequisite: Animal Sciences 317 or Agronomy 440; and Mathematics 315 or consent of instructor. $\frac{3}{4}$ unit. Offered in odd-numbered years.
- 417. Advanced Quantitative Genetics.** Same as Biology 417. Advanced theory of the genetics of quantitative traits; lectures, student presentations, and discussions on selected readings; and application to biological systems. Prerequisite: Animal Sciences 317 or Agronomy 444; or consent of instructor. 1 unit. Offered in alternate years.
- 420. Comparative Protein and Energy Nutrition.** Physiological aspects of protein and amino acids, fats and fatty acids, and carbohydrates as applied to higher animals; includes classification, digestion, absorption, utilization, metabolism, and dietary deficiencies and excesses. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. $\frac{3}{4}$ unit.
- 421. Minerals and Vitamins in Metabolism.** Nutritional implications and metabolic roles of minerals and vitamins in animal metabolism. Prerequisite: Biochemistry 350 or equivalent and a course in nutrition. 1 unit.

- 431. Advanced Reproductive Endocrinology.** Same as Physiology 431 and Veterinary Biosciences 431. The reproductive endocrinology of domestic and laboratory animals. Topics include neuroendocrinology; chemistry, metabolism, and action of hormones; regulation of gonadal function; endocrine changes during puberty, aging, pregnancy, and parturition; external factors affecting reproduction; infertility; and hormones and behavior. Prerequisite: Animal Sciences 331, Physiology 312, Biochemistry 350, or equivalent. $\frac{3}{4}$ unit.
- 432. Advanced Reproductive Physiology.** Comparative physiology of production of domestic and laboratory animals, including gametogenesis, fertilization, embryonic development, and factors influencing reproduction. Prerequisite: Animal Sciences 331 and Biochemistry 350; or equivalent. $\frac{3}{4}$ unit.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Physiology 433 and Veterinary Biosciences 433. Laboratory methods used in reproductive physiology studies, such as blood sampling, large animal surgery, collection of tissues and gametes, embryo recovery, in vitro fertilization, tissue culture, hormone measurements, and directed individual research problems. Prerequisite: Animal Sciences 431 or 432. $\frac{1}{4}$ to $\frac{3}{4}$ unit.
- 441. Advanced Design and Analysis of Biological Experiments.** Same as Agronomy 441. See Agronomy 441.
- 444. Immunobiological Methods.** Same as Veterinary Pathobiology 444. See Veterinary Pathobiology 444.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Biophysics and Veterinary Biosciences 463. See Veterinary Biosciences 463.
- 481. Animal Biochemical Laboratory Techniques.** Theory and application of biochemical laboratory techniques to research in the animal-oriented biological sciences; isolation, characterization, and analysis of biological compounds including enzymes, metabolic intermediates, and cellular components; and determination of metabolic pathways and processes. Prerequisite: Biochemistry 355 and consent of instructor. 1 unit. Offered in even-numbered years.
- 490. Animal Sciences Seminar.** Discussions of current research and literature. Registration for 0 to $\frac{1}{2}$ unit each semester is expected for animal sciences graduate students. 0 to $\frac{1}{2}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit for master's students and 1 unit for PhD students.
- 492. Advanced Topics in Animal Science.** Selected topics associated with teaching, research, and production related to the animal industry. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 493. Research Studies in Animal Sciences.** Directed and supervised study of selected research topics in Animal Sciences. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 1 unit.
- 499. Thesis Research.** 0 to 4 units.

ANTHROPOLOGY

Head of Department: Thomas J. Riley

Department Office: 109 Davenport Hall, 607 South Mathews Avenue, Urbana

- 102. Introduction to Anthropology: The Origin of Man and Culture.** An introduction to and survey of human origins and evolution, physical anthropology, race and racism, archaeology, and the beginning of human civilization. Recommended though not required to be taken with Anthropology 103 as a survey of the field of anthropology. 4 hours.
- 103. Introduction to Cultural Anthropology.** Survey of cultural anthropology; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are manifest in contemporary traditional and Western societies; gives attention to distinctive theoretical anthropological approaches and to anthropological perspectives of culture change. 4 hours. Credit is not given for both Anthropology 103 and 104.

- 104. Introduction to Cultural Anthropology (Honors).** Survey of cultural anthropology for honors students; deals with the nature of culture and its various aspects including social organization, technology, economics, religion, and language, as these are seen among contemporary human societies with diverse ways of life; and also gives some attention to distinctive theoretical approaches and to problems of culture change. 4 hours. Credit is not given for both Anthropology 104 and 103.
- 105. Introductory World Archaeology.** Using archaeological data, traces our prehistoric heritage and the processes which led to the evolution of agriculture, settled villages, and civilization in many areas of the world; lectures range from the earliest humans to *Homo sapiens* and from Sumeria and Egypt to Mexico, Peru, and the United States. 3 hours.
- 107. Archaeology of Ancient Egypt.** Survey of Egyptian archaeology from prehistoric times through the New Kingdom; includes lectures on modern archaeological techniques developed in Egypt to presentations on the history, life, gods, and architecture of this ancient civilization. Prerequisite: Anthropology 102 or 105 is recommended. 3 hours.
- 108. Social Thought.** Same as Sociology 180. See Sociology 180.
- 115. Other Peoples' Calendars.** Reviews developments in the study of time, emphasizing archaeoastronomy, ethnoastronomy, and the comparative analysis of calendar systems and calendrical rituals. 3 hours.
- 141. Race: The Concept in Anthropology.** Examines the biological concept of race as applied and misapplied to *Homo sapiens* by anthropologists and others from the 18th century to the present and of the origin, nature, and significance of so-called racial variation. 3 hours.
- 143. Biological Bases of Human Behavior.** Same as Human Development and Family Studies 143. Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. 3 hours. Credit is not given for both Anthropology 143 and 144.
- 144. Biological Bases for Human Behavior (Honors).** Critical consideration of data and information bearing on current controversies and ideas concerning the antecedents of selected aspects of human behavior. Topics to be discussed include communication, social organization, and parental, sexual, and aggressive behavior. Special for honors students - emphasizes a "hands on" laboratory-demonstration approach. 3 hours. Credit is not given for both Anthropology 144 and 143.
- 146. Human Remains and the Law.** Surveys forensic anthropology, the application of physical anthropology and ancillary biological sciences in the identification of human remains (or their traces) when standard means (e.g., fingerprints) fail. Readings will include case studies; students will be involved in data gathering and analyses. 3 hours. Students may not receive credit for both Anthropology 146 and 356.
- 150. Novel Archaeology.** Designed for non-anthropology majors; survey course of prehistory as seen through the eyes of novelists, science fiction writers, as well as visual media; covers 2 million years of prehistory examining what happened in the past as well as the interface between fact and fiction and past and present. 3 hours.
- 157. The Archaeology of Illinois.** Traces the prehistory of Illinois from the first entry of people into the region more than 13,000 years ago until the 17th century and the beginning of historical records; examines subsequent cultural changes up to the 19th century and statehood from an archaeological and ethnohistorical perspective. 3 hours.
- 161. Black Folk Culture.** Same as Afro-American Studies 161. A topical introduction to Pan-Africanist thought and ideology as expressed in the folklore, literature, music, and sociocultural movements of Afro-Americans in the New World. 4 hours. May be repeated to a maximum of 8 hours.
- 168. Indian Civilization and Society.** Same as History 168. See History 168.
- 179. Culture and Ecology in Human Health.** An overview of health and illness in human societies emphasizing interactions among stress, adaptability, and culture. Case studies of differing cultural and ecological settings, past and present, and of differing health care systems are related to alternative theories of health and illness, including contemporary cosmopolitan medicine. 3 hours.

- 182. Peoples and Cultures of South America.** South America considered as a theater of conflict and cultural experimentation among Native American, African, and Iberian peoples; their survival and transformation as reported in selected ethnographies and eyewitness sources; and some modern theories and controversies about their experience. 4 hours.
- 183. Archaeology and the Public.** An examination of the roles of archaeology in society; topics include public service archaeology, "colonial" and "national" archaeologies, the role of the archaeologist in Euro-American conceptions of the American Indian, and the archaeologist as creator and dispeller of myths. 3 hours.
- 186. Southeast Asian Civilizations.** Same as Asian Studies 186 and History 172. Overviews the cultural and institutional history of the Indianized states and Vietnam, with attention to dominant commercial, political, religious, artistic, and social traditions of Southeast Asia. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. Comparative Family Organization.** Same as Human Development and Family Studies 210. See Human Development and Family Studies 210.
- 213. African Oral Literature.** Same as African Studies and Comparative Literature 213. See African Studies 213.
- 220. Introduction to Archaeology.** An introduction to the problems of studying past cultures; special attention given to the ranges of techniques available and the adequacy of various methodologies as bases for sound inference about the structure of extinct cultures. Prerequisite: Anthropology 102, or consent of instructor. 3 hours.
- 221. Materials and Civilization.** Interdisciplinary treatment of the nature and role of materials from the Stone Age to the Renaissance; faculty and staff from the program on Ancient Technologies and Archaeological Materials share presentations with campus museums and materials laboratories; student projects emphasized. Prerequisite: Sophomore standing; student in Campus Honors Program; or consent of instructor and the Director of Campus Honors Program. 3 hours.
- 222. Introduction to Modern Africa.** Same as African Studies, Political Science, and Sociology 222. See African Studies 222.
- 230. Introduction to Social Anthropology and Ethnology.** An introduction to the anthropological study of contemporary human societies; emphasis on the comparative study of social organization, interpersonal relations, cultural ecology, and processes of sociocultural change, but also includes some consideration of the method and theory of ethnological field research. Prerequisite: Anthropology 103, or consent of instructor. 3 hours.
- 240. Introduction to Biological Anthropology.** The past and present evolution of man and his populational and individual biological variation; topics include genetic principles relevant to human evolution, primate phylogeny and behavior, fossil evidence for human evolution, and the origin and significance of biological diversity in modern man. Prerequisite: Anthropology 102, or 143; or an introductory life sciences course; or consent of instructor. 3 hours.
- 243. Natural History and Social Behavior of the Great Apes.** Same as Ecology, Ethology, and Evolution 243. Examines the social organization, mating patterns, and group structure of free-ranging chimpanzees, gorillas, and orangutans. Presents historical perspective focusing on misconceptions which have colored our understanding of ape social behavior; addresses questions concerned with learning potential, food sharing, social cooperation, aggressive behavior, self-awareness, and the appropriateness of the apes as models for understanding human behavior. Prerequisite: Anthropology 102, 143, or an equivalent course in animal behavior; or consent of instructor. 3 hours.
- 244. Anthropology of Play.** Same as Kinesiology 244. See Kinesiology 244.
- 246. Vertebrate Social Organization.** Same as Ecology, Ethology, and Evolution, Psychology, and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 250. Introduction to Primitive Technology.** Introduction to the technology of nonindustrial societies; relationships of technology to society; and influence of social and cultural

- factors on technological innovation. Uses ethnographic, historical, and archaeological data. 3 hours.
- 258. People of the Ice Age.** Explores a vast period of human prehistory—2 million to 10,000 years ago—before the first cities arose and before people domesticated plants and animals in the Old World; uses archaeological and paleoanthropological data to understand past life ways as well as reasons for change through time in human adaptation. Prerequisite: Anthropology 102. 3 hours.
- 259. Spanish-Speaking Peoples in the United States.** Introduction to the Spanish-speaking population of the United States, including demography, history, economics, and aspects of the sociocultural milieu; emphasis on Mexican-Americans and Puerto Ricans, although other Spanish-speaking groups are also considered. Prerequisite: Anthropology 103, or consent of instructor. 3 hours.
- 260. Peoples of the World: Introduction to Ethnography.** The study and criticism of ethnographic descriptions of exotic ways of life, both as scientific reporting and as a literary art form. Readings include examples from several major culture areas: Africa, the Americas, the Middle East, Oceania, southern and eastern Asia, and Western civilization. Prerequisite: Anthropology 102, 103, or consent of instructor. 3 hours.
- 261. Afro-American Societies and Cultures.** Same as Afro-American Studies 261. Designed to examine the breadth of the black Americas in South America, Central America, the Caribbean (including Spanish, Gallic, Dutch, and English subareas), and Canada, with specific comparisons to rural and urban United States; the African slave trade with reference to black-white relations in the trade; the development of Creole cultures in West Africa and in Spain and subsequent cultural elaboration in the New World; conditions of slavery, slave revolts, migrations of black people in the New World; and examination of selected ethnographic material. Prerequisite: Anthropology 102, 103, or consent of instructor. 4 hours.
- 262. Cultural Images of Women.** Same as Women's Studies 262. Perceptions of women, their perceptions of themselves, and their varying roles and statuses in several contemporary societies in diverse countries; supervised ethnographic observation of women's behavior. 3 hours.
- 263. Cultural Dynamics of Modern Asia.** Same as Asian Studies 263. Analyzes patterns of cultural and social continuity and change in major areas of contemporary life in East, South, and Southeast Asia; emphasis placed upon the social and cultural adjustments that the various Asian regions are making in the mid-20th century, viewed in light of their histories and their positions in contemporary global culture. 3 hours.
- 270. Introduction to Linguistic Anthropology.** Introduction to linguistic anthropology as a major subdiscipline within the field of anthropology; problems of elicitation and analysis of language as faced by anthropologists; and the role of language in the other major subdisciplines: biological, archaeological, and social anthropology. Prerequisite: Anthropology 103 or Linguistics 200, or consent of instructor. 3 hours.
- 278. Hunter-Gatherers Today.** Introduces students to contemporary hunter-gatherers with a particular emphasis on critical evaluation of ethnographic, ethnohistoric, and ethnoarchaeological sources; examines economic, social, and political aspects of this lifestyle in different environments, and emphasizes questions of cultural change. Prerequisite: Anthropology 103. 3 hours.
- 280. Personal Anthropology.** Anthropological approaches and methods related to the student's everyday life situation; explanation and use of ritual, ideology, myth, communication, media images, rites of passage, structure, symbols, and other concepts so that the student may develop a more critical understanding of contemporary American society and his or her position in it. 3 hours.
- 288. Religion in Asian Societies.** Same as Asian Studies, Religious Studies, and Sociology 288. See Asian Studies 288.
- 289. Comparative Muslim Societies.** Same as History and Religious Studies 289. See Religious Studies 289.

- 290. Individual Study.** Supervised reading and research on anthropological topics chosen by the student with staff approval. Especially (but not exclusively) for students who are preparing for a summer field-work project, or who have some justifiable reason for doing independent study, but who do not qualify for the honors (departmental distinction) courses. Prerequisite: Junior or senior standing; 12 hours in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 291 or 293.
- 291. Honors Individual Study.** Individual study and research projects for those students who are candidates for departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Preparation and completion of a senior honors thesis, research paper, or equivalent project for those students who are candidates for high or highest departmental distinction in anthropology. Prerequisite: Senior standing; 4.2 grade-point average in anthropology; consent of instructor. 2 to 4 hours. May not be taken concurrently with Anthropology 290. (Counts for advanced hours in LAS.)
- 296. Special Topics.** Topics are given on a one-time only, experimental basis. Faculty offer special topics in their areas of expertise that provide an opportunity for undergraduates to be exposed to some of the most current developments in faculty research. 1 to 3 hours. May be repeated.
- 297. Honors Seminar.** Each seminar considers a topic or issue of current interest in anthropology. Prerequisite: Anthropology 102 and 103, two additional anthropology courses, a grade-point average of 4.25 in anthropology courses, and consent of instructor. 3 hours. May be repeated as topics vary to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 300. Introduction to Linguistic Structure.** Same as Linguistics 300. See Linguistics 300.
- 307. Introduction to Mathematical Linguistics.** Same as Linguistics 307. See Linguistics 307.
- 308. Comparative Primate Anatomy.** Same as Veterinary Biosciences 307. See Veterinary Biosciences 307.
- 315. Area Studies in Ethnomusicology.** Same as Music 317. See Music 317.
- 316. Anthropology of Music.** Same as Music 316. See Music 316.
- 318. Anthropological Research Design.** Examines the design of anthropological research; covers the philosophical basis of research design, different approaches to framing questions and designing research, sampling, questionnaire design, data collection techniques, research ethics, coding, and general problems of measuring quantitative and qualitative data. Prerequisite: Anthropology 220, 230, 240, or 260 and a course in statistics; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 319. War and Peace in Cross-Cultural Perspective.** Examines theories and case studies of the causes, functions, meanings, and pursuit of war and peace, conflict and cooperation, in diverse cultures; gives attention to the roles of culture contact, ethnicity, imperialism, colonization, and emerging nationalism in promoting conflict and cooperation. Prerequisite: Anthropology 103. 3 hours or $3/4$ unit.
- 320. Political Anthropology.** The analysis of political behavior and the comparison of political systems from an anthropological perspective; emphasis on local-level political processes and the evolution of governmental forms. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 321. Social Organization and Structure.** An introduction to anthropological concepts of social organization and structure; considers kinship theory, descent and alliance systems, social stratification, nonkin association, social networks, group identification and boundaries, structural-functional interpretations of society, and the meaning of social or cultural structure. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 323. Economic Anthropology.** Covers the emergence of economic anthropology as a subdiscipline; considers various definitions of economics with their implications for the study of human society; emphasizes the relationship between social organization and

- economic life from the perspectives of classical studies in anthropology and their contemporary interpretations. Prerequisite: Anthropology 230. 3 hours or 1 unit.
328. **North American Archaeology.** Methods, techniques, and results of archaeology in North America; focuses on divergent approaches to the regional archaeology of North America; and surveys and synthesizes the archaeology of the subcontinent. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
329. **The Philosophy of Social Science.** Same as Philosophy 375 and Sociology 325. See Philosophy 375.
331. **Aboriginal North America.** Deals with three major topics: the nature and structure of aboriginal North America as a cultural province and its ecological base; distinctive and common features of American Indian cultures; and responses to the stresses of white contact. Selected type cultures and their adaptations to varying ecological situations are examined in detail. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
333. **South American Indians of the Andean Region.** A survey of Andean cultures at the time of the Spanish conquest, of their subsequent history, and of modern Indian culture in the Andean countries. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Ethnography of Local Cultures.** Same as Educational Psychology and Sociology 335. See Educational Psychology 335.
336. **Native Peoples and Cultures of Greater Amazonia.** Develops cross-cultural understanding of contemporary native peoples around the rim of and within Amazonia; examines culture history, history, and ecology prior to study of selected cases; deals with adaptive versatility of contemporary native peoples as well as with radical change. Prerequisite: Anthropology 103, 182, 230, or consent of instructor. 3 hours or 1 unit.
337. **Behavior Genetics Laboratory.** Same as Psychology 347 and Ecology, Ethology, and Evolution 352. See Psychology 347.
339. **Anthropological Theory in Contemporary Perspective.** An exploration of current theory in social and cultural anthropology, with emphasis on examining theories in the light of contemporary ideas about theoretical adequacy and of the historical development of anthropological thought; designed especially for anthropology majors and anthropology graduate students. Prerequisite: Anthropology 230 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
340. **Human Evolution, I.** Principles of evolution and a survey of the evolution of man and his progenitors from the early primates through the Pleistocene epoch; emphasis on evolutionary theory as applied to man and interpretation of the fossil record. Prerequisite: Anthropology 240 or an introductory life sciences course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Human Evolution, II.** Same as Animal Sciences 341. The principles of human genetics; anthropological aspects of race and race formation; and hereditary and environmental factors in the biological variation of modern man. Prerequisite: Anthropology 240 or an introductory life sciences course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
342. **Behavior-Genetic Analysis.** Same as Ecology, Ethology, and Evolution 350 and Psychology 342. See Psychology 342.
343. **Introduction to Primate Morphology and Behavior.** Same as Ecology, Ethology, and Evolution 344. Survey of primate social behavior and the classification, morphology, and distribution of living and extinct species; emphasis on interrelationships among, behavior, biology, and ecology. Prerequisite: Anthropology 240 or Ecology, Ethology, and Evolution 246; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
344. **Field and Laboratory Techniques in Biological Anthropology.** Supervised participation in biological anthropology research projects; techniques, methods, and procedures discussed and practiced under actual field or laboratory working conditions. Normally taken concurrently with Anthropology 345. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.

- 345. Analysis of Research Data in Biological Anthropology.** Analysis, interpretation, evaluation, and organization of field and laboratory data in biological anthropology; preparation of written reports on research. May be taken concurrently with Anthropology 344 or subsequently. Prerequisite: Anthropology 240 or equivalent; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 346. Animal Behavior.** Same as Animal Sciences and Ecology, Ethology, and Evolution 346. See Ecology, Ethology, and Evolution 346.
- 348. The Prehistory of Africa.** The study of cultural development in Africa from the appearance of hominids to the time of European domination. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 349. South American Culture History, I.** An examination of the factors influencing the initial peopling of South America; the spread and diversification of hunting and gathering economies; and the development and spread of the tropical forest cultural pattern. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 350. South American Culture History, II.** An examination of the factors leading to the rise of civilization in the central Andes, including the evolution of agricultural systems, the elaboration of technology, and the emergence of extensive and complex political units. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 351. Archaeological Surveying: Techniques and Applications.** Familiarization with methods used in the location and recording of archaeological sites, including techniques of mapping especially adapted to the needs of archaeology; attention given to means of presenting results and interpreting data derived from this work; and work both in the field and in the laboratory. Prerequisite: Anthropology 102 or consent of instructor. 3 hours or 1 unit.
- 352. Theory and Methods of Lithic Analysis.** Lecture and laboratory on the principles and techniques of stone and bone artifact manufacture, identification, classification, metrical analysis, interpretation, and integration with other classes of archaeological evidence. Emphasis on the use of lithics to test human behavioral models. Prerequisite: Anthropology 220. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 353. Field Work in Cultural Anthropology: Theory and Methods.** Major philosophical, theoretical, and methodological issues that arise in conducting cultural-oriented anthropological field work today; application of class knowledge to an actual field experience; emphasis on field work as a reflexive experience and as a mutually creative and frustrating endeavor. Prerequisite: Anthropology 230 or graduate standing. 3 hours or 1 unit.
- 354. Field Techniques in Archaeology.** Participation in archaeological excavations; techniques, methods, and procedures discussed and practiced under actual working conditions. Normally taken concurrently with Anthropology 355. Prerequisite: Anthropology 102, or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 355. Laboratory Techniques in Archaeology.** Laboratory work including processing, classifying, dating, interpretation, evaluation, and preparation of written reports of archaeological research. May be taken concurrently with Anthropology 354 or subsequently. Prerequisite: Anthropology 102 or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
- 356. Human Osteology.** Identification of human skeletal material and basic techniques of measurement; methods of determining age, sex, race, and stature from the human skeleton; and analysis of skeletal populations. Prerequisite: Anthropology 102 or a course in anatomy, physiology, or introductory life sciences and consent of instructor. 3 hours or 1 unit. Students may not receive credit for both Anthropology 356 and 146.
- 357. Midwestern Archaeology.** A detailed study of the midwestern archaeological area covering the broad cultures with regional variations considered chronologically and stressing their interrelationships. Prerequisite: Anthropology 220 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 358. Paleo-faunal Analysis.** Introduces students to the use of faunal remains as they pertain to archaeological research programs. Presents and critically assesses a number of approaches to the analysis of faunal remains as to their usefulness to particular research designs. Prerequisite: Open to Anthropology majors with senior or graduate standing. 4 hours or 1 unit.
- 359. Forensic Anthropology.** Examines current research and techniques in the application of physical anthropology to legal investigations, primarily in the identification of human skeletal material, but also in other characterization and identification of human remains and traces (e.g., footprints); also considers expert witness testimony and ethical issues in such application. Prerequisite: Anthropology 356, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 360. Peoples and Cultures of Oceania.** Same as Asian Studies 360. A survey of the Pacific Islands; regional geography, human ecology, culture history, and ethnography of Melanesia, New Guinea, Polynesia, New Zealand, Micronesia, and Australia; and some consideration of Pacific ethnohistory and the role of Oceania in the modern world. Prerequisite: Anthropology 102 and 103, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 361. Peoples and Cultures of Mexico and Guatemala.** A survey of the peoples and cultures of Middle America with special emphasis upon Mexico and Guatemala; begins by placing Middle America geographically, historically, and culturally within the broader Latin American scene; countries first viewed as a whole and then selected ethnographic studies of specific communities considered for comparative purposes. The Caribbean is not included in this survey. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 363. Religion in Anthropological Perspective.** Same as Religious Studies 363. An introduction to the study of magical and religious beliefs and practices in tribal and peasant societies; considers theories of the nature, origin, and function of magic and religion; myth, ritual, and symbolism; the relationship between great folk religious traditions; and socioreligious movements. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 364. Field Work in Cultural Anthropology.** Supervised participation in field research in ethnography, ethnology, linguistics, or social anthropology; techniques, methods, and procedures discussed and practiced under actual working conditions. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. Normally taken concurrently with Anthropology 365. 3 hours or 1 unit. May be repeated as topics vary. Usually offered in the summer session only.
- 365. Analysis of Field Data in Cultural Anthropology.** Analysis, interpretation, evaluation, and organization of field data in cultural anthropology; preparation of written reports on research in ethnography, ethnology, linguistics, or social anthropology. May be taken concurrently with Anthropology 364 or subsequently. Prerequisite: Anthropology 230 or 300; some knowledge of the language of the area concerned; consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
- 367. Cultures of Africa.** Culture and social organization in traditional African societies with emphasis on the politics, kinship, and religion of a small sample of societies illustrating the main cultural variations found in sub-Saharan Africa; some discussion of ecological factors and ethnic group relations in precolonial times. Prerequisite: Anthropology 230 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 368. Peoples and Cultures of India.** Same as Asian Studies 368. A description and analysis of the social, economic, and religious life of the tribal and peasant peoples of contemporary India considered against the background of Indian geography, population, language distribution, the caste system, and highlights of Indian cultural development. Prerequisite: Anthropology 168 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 369. Asian Systems of Social Stratification.** Same as Asian Studies 369. Explores the characteristics of traditional processes of social stratification in the principal regions of high civilization in Asia: South Asia (India, Sri Lanka, Nepal), Southeast Asia (Burma, Thailand, Vietnam, Indonesia), and East Asia (China, Japan, Korea). Prerequisite: Anthropology 168 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

370. **Language, Culture, and Society.** Same as Communications 370 and Linguistics 370. An examination of the social and cultural functions of language with particular emphasis on the application of linguistic methods and findings to selected problems in the social sciences. Prerequisite: Anthropology 230, or one course in communications or linguistics, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
372. **The Anthropological Study of Art.** A review of the anthropological approach to art with emphasis on structural analysis and the relationship of the artist to his culture; consideration of problems of stylistic development within the framework of cultural dynamics and a survey of the major art styles outside of the Western tradition and the Orient. Prerequisite: Three hours of anthropology or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
373. **Theory and Method in the Cross-Cultural Study of Individual Social Behavior.** Same as Psychology 373. See Psychology 373.
375. **The Prehistory and Archaeology of Mexico.** Discusses the ancient cultures and civilizations of Mexico as reconstructed from archaeological data; begins with the earliest evidence of human occupation and traces the development of agricultural societies and ultimately large urban civilizations to c. 1300 A. D. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
376. **The Aztec and Maya Civilizations.** Discusses two ancient civilizations, the Aztecs of Mexico and the Maya of Guatemala; uses archaeological data and documentary sources to reconstruct political and social organization, religion, writing systems, calendars, agricultural techniques, and aspects of the daily life of the people. Prerequisite: Anthropology 105 or 220; or consent of instructor. 3 hours or 1 unit.
378. **Emergence of Old World Civilizations.** Uses archaeological data to trace the transition from egalitarian hunter-gatherer societies to food producing hierarchical states in the Old World between 14,000 and 3,000 years ago; focuses on economic, social, and political change in Mesopotamia, Egypt, the Indus Valley, and China that gave rise to ancient empires. Prerequisite: Anthropology 102 or 105; Anthropology 220 or 258. 3 hours, or $\frac{3}{4}$ or 1 unit.
379. **Medical Anthropology: The Culture of Health and Illness.** An introduction to concepts and social aspects of health, illness, and curing in different cultures with consideration also of the interaction between folk and modern medicine in developing nations and the delivery of health care as an international social problem. Prerequisite: Anthropology 230 or 260, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
380. **Symbolic and Interpretive Anthropology.** Focus on recent developments in symbolic and interpretive anthropology; topics covered include writing the ethnographic text, subject-object relations, critical reflection on fieldwork, construction of the self, dialogism, practice, performance, narrative, power, and representation. Prerequisite: Anthropology 321 and 363, or similar courses in anthropology, the social sciences, or the humanities, and consent of instructor. 4 hours or 1 unit.
382. **Siberian Culture History and Ethnology.** Same as Geography 382. An ecological analysis of historic and present-day Siberian cultures, with comparisons to arctic America. 3 hours, or $\frac{3}{4}$ or 1 unit.
383. **Self and Society in Japan.** Same as East Asian Languages and Cultures 383. The lifecourse and the growth of the self in modern Japanese civilization. Prerequisite: Anthropology 230 or a course in East Asian history, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
385. **Anthropology of Education.** Same as Educational Psychology 385 and Educational Policy Studies 385. See Educational Policy Studies 385.
386. **Peoples and Cultures of Mainland Southeast Asia.** Same as Asian Studies 386. The culture, cultural history, and social systems of mainland Southeast Asia: Burma, Thailand, Cambodia, Vietnam, Laos, Assam Hills, upland southwestern China, and Malaya; emphasis on the interaction of complementary ethnic types in the context of local ecology and the Hindu-Buddhist systems of religion and politics of the lowland states. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
387. **Peoples and Cultures of Insular Southeast Asia.** Same as Asian Studies 387. A survey of the cultures and social systems of Indonesia, Malaysia, and the Philippines in the

context of the region's history and geographical, economic, political, and religious situation. Prerequisite: Anthropology 220 or 230, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

388. **Prehistory of Oceania.** Same as Asian Studies 388. Archaeology and physical anthropology of the Pacific Islands; early hominids in Australia and New Guinea; evolution and genetics of Oceania populations; origins of Pacific Islanders; traditional voyaging; and settlement and culture history of aboriginal Australia, Melanesia, Micronesia, and Polynesia. Prerequisite: Anthropology 220, 240, or 360. 3 hours, or $\frac{3}{4}$ or 1 unit.
389. **Hominid Evolution in East Asia.** Examines human evolution and prehistory in the Far East (China and Southeast Asia); considers paleontological, paleocultural, and geologic data in order to reconstruct the anatomical and paleocultural adaptation of Pleistocene hominids in Asia. Prerequisite: Anthropology 240. 3 hours or $\frac{3}{4}$ unit.
391. **Topics in Museum Studies.** Utilizes the facilities of the Museum of Natural History to introduce students to: research on collections; conservation; collections management; exhibit design and installation; public relations; and planning education programs. Emphasis will vary from year to year. Students participate in the on-going projects of the Museum of Natural History. Prerequisite: Anthropology 102 and 103. 4 hours or 1 unit. May be repeated to a maximum of 16 hours or 2 units.
394. **Human Paleopathology.** Comprehensive study of the evidence of human disease in antiquity, emphasizing diagnosis of skeletal pathologies, and the anthropological interpretation of historic and prehistoric disease patterns. Prerequisite: Anthropology 356, a course in human anatomy, or equivalent. 3 hours or $\frac{3}{4}$ or 1 unit.
398. **Combined Graduate and Undergraduate Seminar.** A research seminar on specialized topics in anthropology. Prerequisite: Consent of instructor. 4 hours or 1 unit. May be repeated.
400. **Introduction to General Linguistics.** Same as English as an International Language 402 and Linguistics 400. See Linguistics 400.
440. **Problems in Physical Anthropology.** A seminar designed to involve students in the theoretical and methodological approaches to problem areas in physical anthropology. May be repeated for additional credit. Prerequisite: Anthropology 340, 341, or 343; consent of instructor. 1 unit.
443. **Problems in Primate Behavior and Ecology.** Same as Ecology, Ethology, and Evolution 443. Group discussions and individual presentations of research reports and problems in fields of primate ethology, ecology, evolution, and related subjects; topics vary each semester. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated.
450. **Seminar in Anthropology.** Analysis of selected topics of special interest in anthropology. $\frac{1}{2}$ or 1 unit. May be repeated for up to 2 units per semester.
451. **Social Structure.** Intended to deepen training of advanced students in the descriptive techniques and methods of structural and functional analysis currently employed by social anthropologists. Prerequisite: Consent of instructor. 1 unit.
452. **Research Problems in Archaeology.** Seminar oriented to current research problems in archaeology, designed to acquaint students with theoretical and methodological aspects of particular problems and to develop a critical perspective of archaeological research. Prerequisite: Consent of instructor. 1 unit. May be repeated.
453. **The Formal Analysis of Kinship Systems.** A survey of a variety of the world's systems of kinship, marriage, and family organization; concentration on the distinctive properties of kinship systems as a species of social structure, on the formal apparatus for describing and understanding them and their functions, and on the theory of kinship that arises from the use of such formal apparatus. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.
454. **Ritual and Power in Social Life.** A systematic examination of the relationship between power structure and ritual by reference to anthropological theory and through consideration of select ethnographies; social stratification, social networks, cultural symbolism, and ethnicity. Prerequisite: Consent of instructor. 1 unit.

- 467. Kinship and Social Organization in Africa.** Explores a variety of systems of kinship and social organization in sub-Saharan Africa; covers classic statements on African kinship, which provide a foundation of modern kinship theory, as well as contemporary critiques. Then explores the nature of political authority and stratification systems; presents topical and theoretical issues as well as selected case studies. Prerequisite: Graduate standing. 1 unit.
- 470. Proseminar in Cognitive Science.** Same as Computer Science 449, Educational Psychology 471, Linguistics 470, and Psychology 471. An in-depth view of cognitive science: the study of mind and intelligence. Covers major areas of cognitive science including: anthropology, artificial intelligence, cognitive neuroscience, cognitive psychology, emotions, linguistics, and philosophy. Lectures focus on prominent questions and issues in each area highlighted by descriptions of current research. Also explores interconnections among these fields. Prerequisite: Minimally second semester graduate standing in a cognitive science discipline including: anthropology, computer science, educational psychology, electrical engineering, linguistics, philosophy, psychology, or consent of instructor. $\frac{1}{2}$ to 1 unit.
- 489. Readings in Anthropology.** Individual guidance in intensive readings in the literature of one or more subdivisions of the field of anthropology, selected in consultation with the adviser in accordance with the needs and interest of the student. Prerequisite: One semester of graduate work in anthropology; consent of adviser. $\frac{1}{2}$ or 1 unit.
- 490. Individual Topics in Anthropology.** Supervised individual investigation or study of a topic not covered by regular courses. The topic selected by the student and the proposed plan of study are approved by the adviser and the staff member who supervises the work. Prerequisite: Consent of instructor. 1 to 4 units.
- 499. Thesis Research.** Preparation of theses. 0 to 4 units.

ARCHITECTURE, SCHOOL OF

Director: R. Alan Forrester

School Office: 106 Architecture Building, 608 East Lorado Taft Drive, Champaign

- 171. Architectural Design, I.** Formal fundamentals of architectural design; formal vocabulary, principles, and concepts of architectural design; basic design methods; skills development in sketching, drafting, rendering, layout, diagramming, modeling, and lettering; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: General Professional Courses in Art and Design 187 or equivalent and sophomore standing. 3 hours.
- 172. Architectural Design, II.** Functional fundamentals of architectural design; functional vocabulary, principles, and concepts of architectural design; basic design and programming methods; skills development in drafting, modeling, layout, rendering, and sketching; and creative problem-solving in two- and three-dimensional exercises. Prerequisite: Architecture 171; General Professional Courses in Art and Design 188 or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Senior Honors in Architecture.** For candidates for honors in architecture. Independent guided study and research in a selected area of architecture. Prerequisite: Senior standing in architecture, a University grade-point average of 4.0 or, in special cases, consent of Director of School. 3 hours (summer session, 1 to 3 hours). May be repeated to a maximum of 6 hours with consent of Director of School.
- 210. Introduction to the History of Architecture.** Visual and cultural analysis of selected buildings, urban spaces, and cities, from ancient Greece to modern times; emphasizes the

architectural traditions of Western Civilization, especially as they affect the built environment of America and the Middle West. Prerequisite: Sophomore standing or consent of instructor. 3 hours.

220. **Introduction to Architectural Theory.** Overview of the purpose and means of architecture in relation to other human endeavors and the goals of society; professional alternatives; introduction to research, cognitive processes in design, information handling, communication, and evaluation. Prerequisite: Consent of instructor. 3 hours.
231. **Anatomy of Buildings.** First course in administration, communication, and technology; introduces building science and the profession of architecture; emphasizes the anatomy of buildings, including function, physical makeup, and working principles of various building systems, components and materials, their inter-relationships and design implications. Prerequisite: Sophomore standing or consent of instructor. 4 hours.
232. **Construction of Buildings.** Second course in administration, communication, and technology; emphasizing the processes of project execution from the initiation of design to completion of construction; includes in-depth study of construction of the building and its systems, materials and methods, and their implications for decision-making. Prerequisite: Architecture 231 or consent of instructor. 4 hours.
241. **Environmental Technology, I.** The integration of environmental control systems in architecture. Includes factors affecting comfort, health, safety, and energy conservation; the fundamentals of atmospheric conditioning of buildings and the equipment and controls systems for varying functions and sizes of buildings; and water supply, waste sewage, and storm-water disposal systems for buildings. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
242. **Environmental Technology, II.** The integration of environmental control systems in architecture. Includes the nature of light illumination and vision, quality and quantity, and sources; integration of illumination and architecture; power distribution systems and equipment; and the nature of sound and architectural acoustics, room acoustics, and sound isolation. Prerequisite: Architecture 232 or consent of instructor. 4 hours.
251. **Statics and Dynamics.** Introduction to basic statics and dynamics with emphasis on architectural applications. Prerequisite: One year of calculus and analytical geometry. 4 hours.
252. **Strength of Materials and Design Applications.** Introduction to strength of materials with emphasis on architectural applications. Prerequisite: Architecture 251. 4 hours.
271. **Architectural Design, III.** The building in its environmental setting; introductory building design and site planning theory; principles of energy efficient building design; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 172; General Professional Courses in Art and Design 189 or equivalent. 3 hours.
272. **Architectural Design, IV.** Buildings in the community setting; introductory urban design and site planning theory; man-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 271. 3 hours.
299. **Study in Versailles, France.** Study in the University of Illinois Architectural Program at Versailles, France. Prerequisite: Concurrent registration in the full-time program at Versailles through the Chicago or Urbana-Champaign Campus. 0 hours.
300. **Independent Studies in Urban Design.** The individual study of selected topics involving the history, design, and function of significant European cities. Prerequisite: One year of history of architecture or history of art; consent of instructor. 3 hours or $3/4$ unit.
301. **Independent Study.** Independent guided study and investigation in a selected area of architecture. Prerequisite: Junior standing in architecture, written proposal approved by sponsoring faculty member and approval of director of school. 0 to 4 hours, or 0 to 1 unit.
310. **Ancient Architecture.** Architecture and urban design in ancient Egypt, Greece, and Rome. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $3/4$ unit.
311. **Early Christian and Byzantine Architecture.** Architecture and urban design of the early Christian era, the Byzantine Empire, southeastern European lands under Byzantine

- cultural influence, and medieval Russia; from circa 300 to circa 1500. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
312. **Medieval Architecture.** The development of Romanesque and Gothic architecture and urban design. Prerequisite: Architecture 210, History of Art 111, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Renaissance Architecture.** Developments in architecture, urban design, and garden art in Italy and northern Europe in the fifteenth through the sixteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Baroque and Rococo Architecture.** Developments in architecture, urban design, and garden art in Italy, France, Germany, and England in the seventeenth and eighteenth centuries. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Modern European Architecture.** The evolution of continental and British architecture and urban planning from 1750 to the present; includes some allusion to Japanese and American architecture of the same period. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
316. **Modern American Architecture.** The development of American architecture and urban planning from the seventeenth century to the present. Prerequisite: Architecture 210, History of Art 112, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
317. **Seminar on Great Modern Architects and Their Work.** Seminar on selected topics addressing the philosophy, theory, personality, and work of famous architects since the mid-eighteenth century. Prerequisite: Architecture 210; and Architecture 315 or 316, or equivalent; and consent of instructor. 3 hours or 1 unit.
318. **History of the Urban Environment.** Examines the evolution of town planning and urban design in Western civilization from prehistory to the present; studies cultural and technical advancements affecting the form of the urban environment. 3 hours or $\frac{3}{4}$ unit.
319. **Historic Building Preservation.** Introduces historic preservation: legal, financial, and administrative assistance, graphic examination of restored buildings and sites, and application of conservation technology. 3 hours or $\frac{3}{4}$ unit.
323. **Social and Behavioral Factors for Design.** A research-oriented introduction to existing social and behavioral knowledge, methods, and tools for relating man to his physical and social environment, with implications for theories and a philosophy of architectural design. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
330. **Architectural Practice.** Roles of the architect and other participants in the design/construction process, conduct of professional practice, professional ethics, legal aspects of architectural practice and building construction, business and practice management, financial planning, cost control, administration of construction contracts, and construction management. Prerequisite: Senior standing in architecture and consent of instructor. 4 hours or 1 unit.
331. **Design Development and Construction Documents.** Network diagram scheduling of professional services; preliminary project investigations of site conditions and facilities, building law, and economic considerations; the integration of materials, structure, mechanical equipment, illumination, and acoustics; design development outline specifications and drawings; the production planning, scheduling, and budgeting for working drawings and specifications; and preparation of portions of these documents. Prerequisite: Architecture 241, 242, and 352. 3 hours or $\frac{3}{4}$ unit.
335. **Computer Applications in Architecture, I.** Introduces the application of computer-aided design to architecture: programming methods using FORTRAN, database concepts using the Relational Information Management (RIM) system, and basic computer graphics concepts using the Graphic Compatibility System (GCS) graphic package. Prerequisite: Computer Science 102 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.
336. **Computer Applications in Architecture, II.** Applies advanced computer-aided design to architecture: advanced programming methods using FORTRAN, advanced database

concepts using the Relational Information Management (RIM) system, and advanced computer graphics concepts using the Graphic Compatibility System (GCS) graphic package. Prerequisite: Architecture 335 or equivalent; junior standing or consent of instructor. 4 hours or 1 unit.

351. **Theory and Design of Metal Structures.** Analysis and design of structures in metal. Beams; open-web joists; metal deck; columns; riveted, bolted, and welded trusses; plate girders and connections; lateral loads and bracing; and design of a simple steel frame building. Prerequisite: Architecture 252. 4 hours or 1 unit.
352. **Theory of Reinforced Concrete.** Concrete materials; behavior of reinforced concrete construction; behavior and design of structural elements, one-way slabs, beams, and girders; columns; ACI code requirements; and introduction to continuity in reinforced concrete structures. Prerequisite: Architecture 252. 4 hours or 1 unit.
353. **Reinforced Concrete Design.** Selection, design, and comparison of reinforced concrete floor systems for buildings; study and design of columns and footings; and prestressed concrete. Prerequisite: Architecture 352. 4 hours or 1 unit.
354. **Structural Planning.** General problems in the selection and design of structural systems for buildings; methods of analysis; site explorations, soils, and foundations; bracing; and special systems. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
355. **Structural Analysis.** Advanced problems in the analysis of statically determinate structures; general theories and methods of analysis of statically indeterminate structures by geometric and energy methods; and introduction to theory of plastic design. Prerequisite: Architecture 351 and 352. 4 hours or 1 unit.
371. **Architectural Design V.** Intermediate building and environmental design; issue-oriented building problems; urban design theory; intermediate building design and site planning theory; human-environment relationships theory; and architectural design and presentation methods. Prerequisite: Architecture 272. 6 hours. No graduate credit.
372. **Architectural Design and Construction Documentation.** Schematic design, design development, and construction documents of a small scale (10,000 square feet) public building emphasizing the integration of the basic elements of building, structural, and environmental technologies. Prerequisite: Architecture 371; credit or concurrent registration in Architecture 241 and 242. 6 hours. No graduate credit.
373. **Architectural Design Studio.** Design studies of intermediate size building types; planned communities; civic and social facilities at the community and urban scale; and collaboration among the several disciplines involved in planning the human habitat: urban planning, landscape architecture, sociology, and economics. Prerequisite: Architecture 372. 6 hours or 1½ units.
374. **Architectural Design Studio.** Research and individual comprehensive design study for a selected architectural project; special emphasis on site development and the integration of construction technology, structure, and environmental systems. Prerequisite: Architecture 373, or consent of instructor. 6 hours or 1½ units.
398. **Directed Research in Architecture.** Participation in on-going research projects which may include energy management, environmental perception, facilities development, building science, and other topics. Prerequisite: Approval of written proposal by instructor and Director of School. 4 hours or 1 unit. Students may register in different sections of this course to a maximum of 8 hours or 2 units.
399. **Off-Campus Study.** Provides opportunity for approved off-campus study. A detailed proposal for study off campus must be submitted for approval to the appropriate committee in the School prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the Director of School. Prerequisite: Senior or graduate standing in architecture and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.
411. **Seminar in History of Ancient and Medieval Architecture.** Seminar on topics in ancient, early Christian, Byzantine, and Medieval Architecture. Prerequisite: Architecture 310, 311, or 312, or equivalent as determined by the instructor. 1 unit.

- 413. Seminar in History of Renaissance and Baroque Architecture.** Seminar on topics in European architecture from the fifteenth through the eighteenth centuries. Prerequisite: Architecture 313 and 314, or equivalent as determined by the instructor. 1 unit.
- 415. Seminar on the Architectural History of American Communities.** Advanced historic study of the architectural design and aesthetics of individual buildings and their relationship to each other in selected small-scale American communities. Prerequisite: Architecture 316 or equivalent, and consent of instructor. $1/2$ or 1 unit.
- 417. Seminar in the Development of Contemporary Architectural Thought.** An examination of the development of the philosophy of significant modern and contemporary architectural writers and architects in relation to their projects and executed work. Prerequisite: Architecture 315 and 316, or equivalent as determined by the instructor. 1 unit.
- 418. Recording Historic Buildings.** Examines techniques for recording historic buildings and sites: measuring, photographing, and drawing to Historic American Building Survey standards; taking field notes and investigating public records to document reports. Prerequisite: Architecture 319 and demonstrated ability in architectural graphics; or consent of instructor. $3/4$ unit.
- 430. Architectural Management Theory.** Application of the systems approach and organization theory to the study of organizational behavior in the architectural process; the sources and objectives of dynamic change in that process; and the effects of the change. 1 unit.
- 431. Administration of Construction.** Critical analysis of that phase of architectural practice related directly to the construction of buildings; the building industry; policy, organization, procedures, and techniques for construction management; the architect, engineer, management and cost consultants, contractor, and the owner; and administration of the construction contract and professional construction management. Prerequisite: Architecture 330 or consent of instructor. $3/4$ or 1 unit. Students taking the course for 1 unit are required to perform independent study which results in a written paper and formal class presentation.
- 434. Building Economics.** Principles of economics as they apply to individual and large-scale building projects; factors affecting the cost of buildings, including the building market, building investment and finance, land acquisition, government assistance, and taxation; first costs, operating costs, and ultimate costs; cost analysis and cost models; and construction costs, estimates, and cost control. Prerequisite: Architecture 330 or consent of instructor. 1 unit.
- 438. Architectural Problems in Organization Theory.** Individual or group examination and analysis of the application of the theory of complex organizations in the architectural process; analysis of the interaction of architectural and other building organizations as subsystems; and investigation of this interaction through research or project analysis. Prerequisite: Architecture 430 or consent of instructor. Concurrent registration in an architectural studio course not permitted. 1 or $1\frac{1}{2}$ units.
- 444. Anatomy, Function, and Design Integration.** An advanced course on designing buildings for greater functional performance, including: the anatomical variations in building systems and their architectural and functional implications; the workings of building subsystems and the underlying building physics; organizational and operational inter-system relationships and their design implications; and the strategies for successful design integration. Prerequisite: Graduate standing and consent of instructor. 1 unit.
- 445. Building Materials and Construction Technology.** An advanced course on designing buildings for greater constructability, including: the material alternatives and their architectural, performance, and construction implications; alternative construction methods and their design and economic implications; the effects of the specifics of design details on constructability and economy; and the strategies for designing buildings for greater constructability. Prerequisite: Graduate standing and consent of instructor. 1 unit.

- 447. Architectural Practice Studio.** Comprehensive building design emphasizing holistic building system integration for optimum performance and constructability with best possible economy under the realistic temporal, technical, legal, and budgetary limitations. The project, typically a real one, is executed to partial Construction Document Phase through collaborative design by the project teams. Prerequisite: Architecture 374, 434, 444, 445 or consent of instructor. 1¹/₂ units. May be repeated to a maximum of 3 units.
- 451. Advanced Structural Analysis.** Advanced theory and methods of analysis of statically indeterminate structures; secondary stresses; torsion; buckling and stability; and advanced theory and application of plastic design in building structures. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
- 452. Foundation Engineering.** Soil mechanics and site exploration; design of spread footings, combined footings, piles, and caissons; and foundation walls and retaining walls in reinforced concrete. Prerequisite: Architecture 355 or consent of instructor. 1 unit.
- 453. Advanced Reinforced Concrete Design.** Critical review of the analysis, methods, and specifications involved in the design and behavior of reinforced concrete structures for buildings, including tall buildings, plates, and shells; computer applications. Prerequisite: Architecture 355; credit or concurrent registration in Architecture 451 or consent of instructor. 1 unit.
- 454. Advanced Steel Design.** Advanced topics in the design of steel structures; critical study of the AISC specification; design of steel members and their connections; composite structures; and the analysis and design of continuous structures and tall buildings. Prerequisite: Architecture 451 or consent of instructor. 1 unit.
- 455. Prestressed Concrete Design.** Theory and design of prestressed concrete structures; and suspension shell structures. Prerequisite: Architecture 453 or consent of instructor. 1 unit.
- 456. Advanced Structural Planning.** Study of the loads, functional and spatial requirements, and construction problems in the selection and design of structural systems for buildings; cost estimates; and integration of mechanical and electrical equipment. Prerequisite: Architecture 452 and 453; credit or concurrent registration in Architecture 454 and 455, or consent of instructor. 1 unit.
- 461. Housing Environments Design Studio, I.** Emphasizes comprehensive design studies on individually selected housing problems; the study process includes programmatic development, environmental analysis, definitive design development and comprehensive project documentation. Prerequisite: Architecture 374 and 466. 1 to 2 units.
- 462. Housing Environments Design Studio, II.** Terminal design studio studies on individually selected housing problems; emphasizes definitive design development and process documentation for final project in the Master of Architecture Housing Environments option. Prerequisite: Architecture 461. 1 to 2 units.
- 463. Methods of Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 463. Introduction to methods and techniques of systematically generating social and behavioral information relevant to the programming, design, and evaluation of physical environments. Prerequisite: Graduate standing in architecture, landscape architecture, or urban and regional planning. 1 unit.
- 464. Conducting Social and Behavioral Research in Designed Environments.** Same as Landscape Architecture 464. See Landscape Architecture 464.
- 465. Design/Behavior Studio.** Same as Landscape Architecture 465. See Landscape Architecture 465.
- 466. Problems and Processes in Housing Design.** Analyzes issues confronting architects in the design of housing environments; emphasizing new and emerging problems; examines processes in problem solutions. Prerequisite: Concurrent registration in Architecture 374 or consent of instructor. 1 unit.
- 467. Critical Issues in Designing for the Elderly.** Examines issues related to the design of housing and community facilities for older people; stresses the development of strategies for design decision-making and a comprehensive theoretical knowledge base for understanding how the design of the environment affects the aged. Prerequisite: Architecture 374 or consent of instructor. 1 unit.

- 471. Architectural Design Studio.** Definitive design thesis focusing on design issues and various building types with optional choices related to the student's particular interests, talents, and capacities. Prerequisite: Architecture 374 or consent of instructor. 1 to 2 units.
- 472. Architectural Design Studio.** Continuation of Architecture 471. Prerequisite: Architecture 471 or consent of instructor. 1 to 2 units.
- 476. Architectural Design Seminar.** Presentations and discussions relative to various areas of architectural and environmental design concerns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 3 units.
- 477. Theory of Architecture.** A review of principles of architectural design; factors in programming architectural requirements; design development; and evaluation and criticism. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 478. Architectural Criticism.** Analysis and criticism of selected buildings; individual reports and discussions. Prerequisite: Architecture 477 or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 481. Urban Design Studio, I.** Same as Landscape Architecture 481. Design of large building types, building complexes and communities, involving collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 374; credit or concurrent registration in Urban Planning 326 or consent of instructor. 1 to 2 units.
- 482. Urban Design Studio, II.** Same as Landscape Architecture 482. Design studies of central business districts, residential communities and other urban development projects; collaboration with other disciplines in research related to urban development. Prerequisite: Architecture 481, Urban Planning 326, or consent of instructor. 1 to 2 units.
- 488. Urban Design Seminar.** Analysis and criticism of urban development projects; individual reports and discussions. Prerequisite: Architecture 374, Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 1 unit.
- 491. Special Problems in Architectural History and Preservation.** Individual investigation of the work of particular architects, of specific buildings, and of the architecture of periods or regions; comparative studies; and aesthetic problems. Prerequisite: 12 hours of architectural history or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 493. Special Problems in Architectural Administration and Building Construction.** Studies of building projects at large and small scales; investigations in feasibility and cost control, material and system selection, construction techniques and processes, legal and business procedures, and related aspects of professional practice; and independent study or study in conjunction with architectural and urban design projects. Prerequisite: Consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 495. Special Problems in Structural Theory and Design.** Individual or group investigation and study in architectural engineering application; research in economy and design in correlation with architectural, mechanical, and structural requirements. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 3 units. May be repeated to a maximum of 3 units.
- 496. Special Problems in Housing Environments.** Individual investigation or research in housing environments involving special issues such as energy conscious design, human-environmental relations, aesthetic theory, government policy, and cultural patterns. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
- 497. Special Problems in Architectural Design.** Individual investigation of building types and systems, aesthetic theories, design thesis programming and other problems in architectural design. Prerequisite: Architecture 374 or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 4 units.
- 498. Special Problems in Urban Design.** Individual investigation of problems at the community and urban scale; collaboration with other disciplines. Prerequisite: Credit or concurrent registration in Architecture 481 or Urban Planning 326, or consent of instructor. $\frac{3}{4}$ to 3 units. May be repeated to a maximum of 3 units.
- 499. Thesis Research.** Prerequisite: Consent of instructor and graduate program coordinator. 0 to 4 units. May be repeated to a maximum of 4 units.

ART AND DESIGN, SCHOOL OF

(Including Introduction to Art and Design, General Professional Courses in Art and Design, Art Education, Cinematography, Crafts, Graphic Design, History of Art, Industrial Design, Painting, Photography, Printmaking, and Sculpture)

Director of School: Theodore Zernich

School Office: 143 Art and Design Building, 408 East Peabody Drive, Champaign

Introduction to Art and Design

103. **Introduction to Studio Arts.** Introductory studio experiences with a variety of art materials and techniques accompanied by visitations to artists' studios and museum tours. Not open to students majoring in art and design. 3 hours. Credit is not given for both Introduction to Art and Design 103 and 190.
105. **Introduction to Watercolor Painting.** A basic watercolor class that includes an introduction to the tools, materials, and techniques of the medium; landscape, still life, and figure experiences. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
106. **Introduction to Oil Painting.** Elementary oil and acrylic painting and sketches from still life and landscape; includes basics such as stretching canvas, preparing surfaces, and varied painting techniques. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
107. **Elementary Drawing.** A basic drawing course using a variety of media and techniques, including charcoal, conte, pencil, pen and india ink, and studies in perspective, line, value, composition, and the figure. Not open to students majoring in art and design. 3 hours. May be repeated to a maximum of 6 hours.
108. **Ikebana: The Japanese Art of Flower Arrangement.** Introduces Japanese arts and cultural heritage through Ikebana (Japanese flower arranging). 2 hours.
109. **Sumi-E (Japanese and Chinese Black-ink Painting).** Introduction to the ancient abstract Chinese art of black-ink painting; through the study and practice of Chinese and Japanese Sumi-E students discover the foundation of twentieth-century visual arts and discuss the philosophy of Chinese and Japanese art. 2 hours.
140. **Introduction to Art.** A broadly based conceptual foundation for a critical understanding of the visual arts in contemporary society. Not open to students in art and design and architecture. 3 hours.
150. **Beginning Sculpture.** Clay modeling from the human figure; casting in plaster and other materials as well as production of sculpture involving materials other than plaster and clay. Not open to students majoring in art. 2 hours.
185. **Design, I.** Design elements and principles with emphasis on color and painting exercises; uses a variety of media to explore the different aspects of design, emphasizing two-dimensional problems. Not open to students majoring in art and design. 3 hours.
186. **Design, II.** A second course in design with emphasis on graphic communication; students gain experience using modern graphics equipment. Not open to students majoring in art and design. Prerequisite: Introduction to Art and Design 185. 3 hours.
190. **Recreational Crafts, I.** Introduction to design and execution in crafts particularly adapted to work with children in schools, playgrounds, and summer camps. Primarily for recreation majors in physical education. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
209. **Japanese Tea Ceremony and Zen Aesthetics.** The tea ceremony and culinary arts of Japan practiced as the physical discipline necessary for Zen aesthetic experience. Prerequisite: Introduction to Art and Design 108 or 109. 2 hours. May be repeated to a maximum of 4 hours.
301. **Children's Artistic Development.** Historical and contemporary perspectives on children's artistic development emphasizing relationships between general intellectual

growth and the ability to create and respond to works of art. Prerequisite: Junior standing, and Psychology 100 and Educational Psychology 211. 3 hours, or $\frac{3}{4}$ or 1 unit.

General Professional Courses in Art and Design

113. **Orientation to Art and Design.** An overview of art and design professions in today's society. 0 hours.
117. **Drawing, I.** Theory and practice in the elements of drawing. Prerequisite: Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
118. **Drawing, II.** Continuation of General Professional Courses in Art and Design 117. Theory and practice in the elements of drawing. Prerequisite: General Professional Courses in Art and Design 117. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
119. **Design, I.** Theory and practice in the elements of two-dimensional design and the study of color. Prerequisite: Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
120. **Design, II.** Theory and practice in the elements of three-dimensional design. Prerequisite: General Professional Courses in Art and Design 119. Open only to students in fine and applied arts, interior design, and apparel design. Only students in curricula that specifically require this course may advance enroll. 3 hours.
121. **Drawing Theory.** Orthographic, oblique, and isometric projections and perspective. 2 hours.
122. **Drawing Theory.** Continuation of General Professional Courses in Art and Design 121, including the science of shades, shadows, and reflections in perspective drawing. Prerequisite: General Professional Courses in Art and Design 121. 2 hours.
187. **Freehand Drawing.** For students in architecture: drawing three dimensional form and space. Intense investigation of perspective in freehand drawing; drawing in class and outside sketchbook assignments from nature, including the human figure in pencil, pen, and other media. Prerequisite: Enrollment in Architecture curriculum. 2 hours.
188. **Watercolor.** For students in architecture. Introduction to watercolor and color theory; continued practice of freehand drawing, composition, and outside sketching from nature. Prerequisite: General Professional Courses in Art and Design 187 and enrollment in architecture curriculum. 2 hours.
189. **Art Studio.** For students in architecture. Introduction to ideas in art, different media, art experiences from representational to abstract; flat and three dimensional; continued work in sketchbook from nature. Prerequisite: General Professional Courses in Art and Design 188; enrollment in architecture curriculum. 2 hours.
191. **Unit One Studio/Seminar in Art and Design.** Topics vary; consult *Timetable* or Unit One office. 1 to 3 hours. May be repeated as topics vary.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
391. **Individual Studio Problems.** Directed independent creative activity or research. Prerequisite: Junior or graduate standing; consent of instructor, student's adviser, and Associate Director of the School. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
398. **Art and Design Workshop.** An intensive course requiring full-time effort for a period of one to four weeks; see *Timetable* for medium/topic. Prerequisite: Junior, senior, or graduate standing in art and design, or consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topics vary.
493. **Seminar: Introduction to Methods and Criticism.** Prerequisite: Graduate standing in art. $\frac{1}{4}$ to 1 unit.

Art Education

203. **Art in the Elementary Grades, I.** Introductory laboratory experiences with the elements of design in the visual arts and with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. 3 hours.
204. **Art Education Laboratory.** Examines methods and studio activities for elementary and secondary schools with a variety of appropriate materials and processes; includes techniques, art activities and practical application for teaching exceptional students, including learning disabled. 2 hours. Must be repeated for a total of 4 hours.
205. **Art in the Elementary Grades, II.** A continuation of laboratory experiences begun in Art Education 203 with processes, materials, and activities appropriate for the elementary grades. Not open to students majoring in art. Prerequisite: Art Education 203. 3 hours.
206. **Practicum in Teaching Art.** Supervised teaching of art to children augmented by a seminar; includes classroom preparation and evaluation. Prerequisite: Consent of instructor. 4 hours.
207. **Art Curriculum Development and Practicum in the Elementary Schools.** Early field experience in local elementary schools one half day weekly; includes identification, instruction, methods, and practicum on the psychology of the exceptional child. Prerequisite: Art education major; sophomore standing. 3 hours.
208. **Organization of Public School Art Programs.** The selection and arrangement of content for different educational levels; study and evaluation of curricula, equipment, and supplies; and program supervision. Prerequisite: Art Education 207 or junior standing in art, or consent of instructor. 3 hours.
280. **Professional Seminar in Art Education.** Examines responsibilities, methods, and techniques specific to teaching art in elementary and secondary schools; includes the psychology of the exceptional child in conjunction with methods of instruction and student teaching experience. Prerequisite: Art Education 204 and 207; concurrent registration in Educational Practice 238 and 242, art education sections only. 4 hours.
290. **Senior Honors in Art Education.** Independent guided research and study for honors. Prerequisite: Senior standing in art education, a cumulative grade-point average of 4.0; and consent of instructor, adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Problems in Art Education.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
390. **Advanced Art for Elementary Grades.** Advanced laboratory experiences in two-dimensional visual art techniques for elementary teachers, supervisors, and principals. Prerequisite: Art Education 205 or consent of instructor. 2 to 4 hours, or $1\frac{1}{2}$ or 1 unit. May be repeated for a maximum of 4 hours or 2 units.
489. **Issues in Art Education.** A study of fundamental issues affecting education in the visual arts; examines and explores the educational implications of the nature and value of art, the nature of the artist, and the development of the child as an artist and connoisseur. 1 unit.
490. **Curriculum Development in Art.** An analysis of curriculum organization in the visual arts; particular emphasis given to a range of curriculum positions in education and general research related to curriculum design. Prerequisite: Consent of instructor. 1 unit.
491. **Special Problems in Art Education.** Individual direction in research and in creative activity; thesis. $1\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in art education. 0 to 4 units.

Cinematography

180. **Introduction to Cinematography.** Introduction to the principles and techniques of cinematography as applied to individual expression. 3 hours.

280. **Basic Cinematography.** Fundamentals of the theory and practice of motion pictures as an art form, with emphasis on principles, tools, and techniques. Prerequisite: Cinematography 180 or consent of instructor. 3 hours.
291. **Individual Cinematography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
380. **Cinematography.** Theory and practice of motion pictures as an art form; emphasis on individual creative production. Anticipated cost to the student for each semester is \$75 to \$200. Costs should be discussed with the instructor before enrollment. Prerequisite: Cinematography 280 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 12 hours or 4 units.
491. **Special Problems in Cinematography.** Directed individual creative activity or research. Prerequisite: Cinematography 380. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Crafts

160. **Jewelry/Metals, I.** Design and execution of jewelry and related objects through fabrication, focusing on surface embellishment, joining, and finishing processes; exploring metal as a medium of personal aesthetic expression. Sophomore standing or consent of instructor. 3 hours.
161. **Jewelry/Metals, II.** Additional experience and experimentation in designing and executing jewelry and related objects through fabrication, refinement of surface embellishment, joining, and finishing skills; further exploration of metal as a medium of personal aesthetic expression. Prerequisite: Crafts 160. 3 hours.
170. **Ceramics, I.** The design and production of pottery by hand methods. Work covers the basic processes of forming, decorating, and firing. Prerequisite: Sophomore standing or consent of instructor. 2 hours.
171. **Ceramics, II.** Advanced work in studio pottery, including expanded experience in forming methods and glaze compounds. Prerequisite: Crafts 170. 2 hours.
260. **Jewelry, III.** The design and production of jewelry and metal work for majors in crafts with further experience in manipulative techniques such as casting, electroforming, surface decoration, enamelling, complex construction and forming. Prerequisite: Crafts 160 and enrollment in the crafts curriculum. 3 hours.
261. **Jewelry, IV.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style through advanced techniques of holloware, complex construction, enamelling, electroforming and plating, forging and the use of varied materials. Prerequisite: Crafts 260. 3 hours.
262. **Metal Technology.** Understanding of the working properties of a number of nonferrous metals, their alloys, and their patination; such areas as electroforming on organic and inorganic materials, working with rigid and thermosetting plastics, and experimentation with little known processes of metalwork to be subjects of individual research. Prerequisite: Junior standing in crafts or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
264. **Jewelry, V.** Expands the general techniques of Crafts 260 with emphasis on experimentation and development of personal style and ability to work independently with regular faculty consultation. Prerequisite: Crafts 261. 5 hours.
265. **Jewelry, VI.** Continuation of Crafts 264; emphasis on experimentation and development of personal style, a portfolio, and a senior exhibition. Prerequisite: Crafts 264. 5 hours.
270. **Ceramics, III.** Introduction to ceramic design for developing basic skills in designing and producing clay products by various hand processes including throwing, handbuilding, and casting. Prerequisite: Junior standing in curriculum in crafts. 3 hours.
271. **Ceramics, IV.** Introduction to ceramic glaze calculation; concern with the understanding and application of the knowledge of glaze calculation in a creative way and with

- applications of creative experiments in glaze and clay bodies. Prerequisite: Crafts 270. 3 hours.
- 274. Ceramics, V.** The application of the combined skills of throwing and creative glaze procedures to produce thrown ceramic products with the emphasis on creative experimentation; also covers plaster and mold making as a creative procedure in producing clay products. Prerequisite: Crafts 271. 5 hours.
- 275. Ceramics, VI.** Technical and creative research in ceramic design, with emphasis on reappraisal of the traditional media and the traditional limited production method used by artist potters. Prerequisite: Crafts 274. 5 hours.
- 288. Glass, I.** The design and production of glasswork by the offhand methods; work covers the basic processes of blowing and molding. Prerequisite: Industrial Design 134; junior standing in art or consent of instructor. 2 hours.
- 289. Glass, II.** Advanced work in glassworking by the offhand methods including blowing, casting, fuming, and acid etching. Prerequisite: Crafts 288. 2 hours.
- 290. Senior Honors in Crafts.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in crafts, a cumulative grade-point average of 4.0; and consent of instructor, adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Crafts Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 364. Metal.** For graduate students not specializing in crafts; an additional creative experience for students who are aesthetically advanced in another medium. Prerequisite: Consent of instructor and associate director of School; open only to seniors and graduate students in art and design curricula other than crafts. 2 hours or $1/2$ unit. May be repeated to a maximum of 2 units.
- 374. Ceramics.** Ceramic design with emphasis on the development of professional style and personal expression. Prerequisite: Consent of instructor. 2 to 4 hours, or $1/2$ to 2 units. May be repeated to a total of 6 hours.
- 384. Glass.** Advanced glass design with emphasis on professional development and personal style. Prerequisite: Consent of instructor. 2 to 4 hours, or $1/2$ to 1 unit.
- 491. Special Problems in Crafts.** Directed individual creative activity or research. Prerequisite: Graduate standing in crafts. $1/2$ to 2 units. May be repeated to a maximum of 5 units.
- 498. Ceramic-Glass-Metal Laboratory.** Individually directed research and personal expression in ceramic, glass, or metal medium. Prerequisite: Enrollment in the M.F.A. program with a major in ceramics, glass, or metal, or consent of departmental graduate committee. $1/2$ to 2 units. May be repeated.

Graphic Design

- 100. Design History Survey.** Studies the history of design from 1850 to the present, showing the relationships between graphic design, industrial design, interiors, and architecture; gives attention to major historical movements as well as to the emergence of modern and contemporary design. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 120 by students in graphic design. 3 hours.
- 120. Visual Organization.** Introduces the discipline and function of graphic design; explores the organization and structure of two-dimensional space as context for visual communication; includes practical exercises in visual perception, visual organization, and visual communication. Prerequisite: Sophomore standing in graphic design curriculum or consent of instructor; concurrent registration in Graphic Design 100 by students in graphic design. 3 hours.
- 130. Production.** Basic information and current methods in the production of multiple printed communications, including printing processes, papermaking, binding and other practices, and the preparation of art work for the various methods of reproduction; field trips

- required. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 140 by students in graphic design. 3 hours.
140. **Typography.** Introduces the discipline, function, and tradition of typography as it relates to visual/verbal communication; explores both technical and formal aspects. Prerequisite: Graphic Design 120 or consent of instructor; concurrent registration in Graphic Design 130 by students in graphic design. 3 hours.
210. **Photo/Graphics.** Explores the design potential of photographic and related processes in the generation of imagery for visual communication, employing in-camera, darkroom, and graphic arts equipment manipulations. Prerequisite: Concurrent registration in Graphic Design 230 or 240. 3 hours.
220. **Image Making.** The understanding and application of the image making process in graphic design, with emphasis on hand-generated images; covers historical, cultural, and technological influences on concept, content, and visual style. Prerequisite: Graphic Design 130 and 140; concurrent registration in Graphic Design 230 or 240. 3 hours.
230. **Advanced Typography.** Further exploration of typographic form and manipulation of variables which affect content, stresses the importance of typographic composition as an integral component of contemporary visual communication design. Prerequisite: Junior standing in graphic design curriculum, and Graphic Design 130 and 140. 3 hours.
240. **Methodology.** Goal-directed graphic design problem-solving with emphasis on the methods of thinking and research which precede the making of design; development of systems for objective problem-solving. Prerequisite: Graphic Design 230. 3 hours.
290. **Senior Honors in Graphic Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in graphic design, a cumulative grade-point average of 4.0; and consent of instructor, adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Graphic Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
370. **Advanced Graphic Design, I.** Research in, and analysis and synthesis of, complex visual problems; emphasizes modular sequence, symbolic systems, and image making for visual communication. Students prepare comprehensive portfolio and consider professional requirements encountered by the designer in the visual communications industry. Prerequisite: Graphic Design 240; for graduate credit, consent of graphic design program chair. 3 hours or $3/4$ unit.
380. **Advanced Graphic Design, II.** Continuation of Graphic Design 370. Prerequisite: Graphic Design 370; for graduate credit, consent of graphic design program chair. 3 hours or $3/4$ unit.
467. **Graphic Design Laboratory.** Individually directed research in the studio with concentration in graphic design. Prerequisite: Enrollment in the M.F.A. program in graphic design or consent of departmental graduate committee. $1/2$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 3 units.
491. **Special Problems in Graphic Design.** Directed individual creative activity or research. Prerequisite: Graduate standing in graphic design. $1/2$ to 2 units. May be repeated to a maximum of 5 units.

History of Art

101. **Introduction to Non-Western Art: East Asia.** Cultural analysis of the interrelated fields of architecture, sculpture, and painting, and other humanistic studies of East Asian civilizations; emphasizes India, China, and Japan. 3 hours.
110. **Introduction to Non-Western Art: Africa, the Americas, and Oceania.** Highlights of visual arts traditions in black Africa, pre-Columbian America, and the South Pacific; a cross-cultural analysis of non-Western aesthetic systems and forms with a focus on thematic problems rather than style surveys. 3 hours.

111. **Ancient and Medieval Art.** The development of the visual arts in Western Europe and the Near East in their cultural contexts from prehistoric times until the early fifteenth century; includes Egyptian, Greek, Roman, and medieval art and architecture. 4 hours.
112. **Renaissance and Modern Art.** The development of the visual arts in Western Europe and the United States in their cultural contexts from the early fifteenth century to the present. 4 hours.
115. **Art Appreciation.** A broad introduction to the visual arts; surveys media representing the major cultural and historical periods, both Western and non-Western. In addition to required lectures and readings, campus art collections and exhibitions are visited periodically. 3 hours.
116. **Masterpieces of Art.** Studies selected Western and non-Western masterpieces of art and architecture, considered both as aesthetic objects and as expressions of the ideals and beliefs of the societies for which they were created. 3 hours.
210. **African Art and Society, I.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multi-media framework and a social-religious context; surveys the art styles of the Dogon, Senufo, Mende, and Ashanti peoples. 3 hours.
211. **African Art and Society, II.** Introduces the arts of Black Africa, i.e., dance, drama, songs, and poetry, as expressed in a multi-media framework and a social-religious context; focuses on Yoruba art and surveys the art traditions of southeastern Nigeria, Cameroon, Gabon, Central Africa, and East Africa. 3 hours.
215. **Greek Art.** Same as Classical Civilization 217. Survey of architecture, sculpture, and painting of the Greek world from the geometric period to the beginning of the Christian era. 3 hours.
216. **Roman Art.** Same as Classical Civilization 218. Survey of architecture, sculpture, and painting of the Roman world from republican times to the age of Constantine, with brief treatment of later Roman art leading to Byzantine. 3 hours.
217. **The Development of the Ancient City.** Same as Classical Civilization 231. See Classical Civilization 231.
218. **Ancient Greek Sanctuaries.** Same as Classical Civilization and Religious Studies 232. See Classical Civilization 232.
219. **The Classical Tradition in Art from the Renaissance to the Modern Age.** Examines the effect of the art of classical antiquity upon the works of some of the greatest artists from the Renaissance to the modern age; discusses works of art as much as possible in the language of comparison employed by their creators and the poets and critics of their time. 3 hours.
222. **Medieval Art.** The arts of Byzantium and Western Europe from the early Christian era to the Renaissance. 3 hours.
230. **Italian Renaissance Art.** Architecture, painting, sculpture, and minor arts of Italy during the Renaissance. 3 hours.
231. **Northern Renaissance Art.** Architecture, painting, sculpture, and minor arts of Europe outside Italy in the fifteenth and sixteenth centuries. 3 hours.
235. **Baroque and Rococo Art.** Studies European painting, sculpture, and graphic work during the period 1580 to 1750 with emphasis on major masters such as Bernini, Caravaggio, Poussin, Rembrandt, Rubens, Velazquez, and Watteau. 3 hours.
240. **Art of the Nineteenth Century.** Architecture, painting, sculpture, and minor arts of France, Germany, Spain, and England in the nineteenth century. 3 hours.
241. **Twentieth-Century European Art.** A survey of the major artists and artistic movements in European painting and sculpture from postimpressionism to the present. 3 hours.
250. **American Art.** Surveys American art and architecture from the colonial period to the present. 3 hours.
289. **Senior Honors in Art History-BA.** Independent guided research and study in a selected area of art history for candidates for the Bachelor of Arts in Art History with departmental distinction. Prerequisite: Senior standing in the art history curriculum; a cumulative grade-point average of 4.25; an art history grade-point average of 4.5; and consent of instructor, department adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours. (Counts for advanced hours in LAS.)

290. **Senior Honors in Art History-BFA.** Directed independent research and study for honors. Prerequisite: Senior standing in FAA art history, a cumulative grade-point average of 4.0, and consent of instructor, adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Art History Topics.** Directed independent research or creative activity. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
301. **Chinese Art.** History of Chinese art from earliest times to the present. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Japanese Art.** History of Japanese art from earliest times to the twentieth century. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
303. **Intellectual Artists of China.** Studies selected artists including struggling recluses, fantastics, eccentrics, and individualists; examines the aesthetic and expressive content of their works within the content of their social and intellectual environment. 3 hours, or $\frac{3}{4}$ or 1 unit.
304. **Space and Design in Japanese Art and Architecture.** Studies basic design principles in Japanese painting, pottery, costumes, architecture, gardens, and other crafts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
310. **West African Art and Ideas.** A study in depth of West African art styles in time perspective and cultural context, with a special interest in the use of interdisciplinary source materials. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Traditional Art of Pacific Ocean Cultures.** A survey of traditional art in Polynesia, Melanesia, and Micronesia, including New Zealand and Australia; emphasizes major style areas and their historical and cultural significance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
315. **The Archaeology of Greece.** Same as Classical Civilization 343. See Classical Civilization 343.
316. **The Archaeology of Italy.** Same as Classical Civilization 344. See Classical Civilization 344.
317. **The Ancient Ideal in Art and Literature.** Same as Classical Civilization 332 and Comparative Literature 306. See Classical Civilization 332.
318. **Etruscan and Italic Art.** Same as Classical Civilization 318. History of early Italic and Etruscan sculpture, painting, and architecture from c. 1000 B.C. to the first century B.C. Emphasis on the international context of Etruscan art and architecture. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
321. **Early Christian and Early Medieval Art.** Christian art of the Roman Empire, the art of early Medieval Europe (including England and Ireland), and of the Eastern Mediterranean from the third to the eighth centuries. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
322. **Byzantine and East Christian Art.** The arts of Byzantine, the Crusader States, and Russia from the ninth to the fifteenth centuries. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
323. **Romanesque Art.** Art and architecture of the Romanesque period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
324. **Gothic Art.** The arts of western Europe from the end of the Romanesque period until the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Medieval Manuscripts and Early Printed Books.** Surveys manuscript illumination and early book production from 300 to 1500 A.D.; topics include techniques of manuscript illustration and printing production in such masterpieces as the *Vatican Virgil*, the *Utrecht Psalter*, the *Book of Kells*, the *Tres Riches Heures*, the *Gutenberg Bible*, and Brant's *Ship of Fools*. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
330. **Topics in Italian Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of Italy during the Renaissance selected for intensive study. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a

maximum of 6 hours or 2 units.

331. **Topics in Northern Renaissance Art.** A special field in the history of painting, sculpture, and minor arts of France, Germany, Spain, and England during the Renaissance selected for intensive study. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
332. **Italian Art of the Sixteenth Century.** Painting, sculpture, and minor arts in Italy from 1520 to 1590. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Baroque Art in Italy and France.** Studies painting, sculpture, and graphic work in Italy and France during the period 1580-1700 emphasizing such major masters as Bernini, Caravaggio, the Carracci, Cortona, La Tour, and Poussin. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
336. **The Age of Rembrandt and Rubens.** Studies seventeenth-century art in the Low Countries with extensive treatments of the careers of Rubens and Rembrandt. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
337. **Spanish Art of the Golden Age.** A study of art in Spain during the sixteenth and seventeenth centuries, with emphasis on major masters such as El Greco, Velazquez, Zurbaran, Montanes, Ribera, Cano, Murillo, and Valdes Leal. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
339. **English Art of the Eighteenth Century.** The rise and development of the pictorial arts in eighteenth century England with particular emphasis on such major artists as Hogarth, Gainsborough, Reynolds, and Wilson. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit.
340. **Romantic Art.** Studies English, French, and German art from the end of the eighteenth century through 1840; focuses on revivalist movements, historicism, landscape art, and changing conceptions of art and artist during the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Realism to Post-Impressionism.** Studies European art from 1850 to 1900, with emphasis on French painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
342. **German and Austrian Painting of the Late Nineteenth and Early Twentieth Centuries.** A survey of modern German and Austrian painters and pictorial movements from the 1890s to the period of Hitler, with special emphasis on the expressionist period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
343. **The Art Nouveau in Europe.** A survey of the principal artists and artistic currents in the applied arts during the 1890s in Europe; emphasis on individual figures, with an attempt to define the common stylistic and theoretical assumptions of the period. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
344. **The Beginnings of Modernism: European Art from Post-Impressionism to World War I.** The pioneer movements in modern painting and sculpture, emphasizing the work and ideas of individual major figures. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Twentieth-Century Art in Europe: 1915-1945.** A study of the leading personalities and movements in European painting, sculpture, and architecture, with emphasis on painting. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
346. **Recent American Painting and Sculpture.** A critical survey of developments since World War II with emphasis on questions of quality and personal content and with consideration of the most current tendencies. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
350. **Realism and Romanticism in American Art, 1776-1876.** Studies the two major directions of art in the United States from independence to the centennial, with focus on major figures and the scientific and philosophical movements which influenced them. Prerequisite: One year of art history or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **Early American Modernism.** Examines American art, particularly painting and sculpture, 1876-1940, against its cultural background and the relation of the American artist to Europe in an attempt to isolate the roots of Modernism in the United States. Prerequisite: One year of art history or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **History of Photography.** Examines a history of photography from its origin to the

- present, including both documentary and artistic approaches; considers relationships with other arts. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Historiography of Art and the History of Art Criticism.** Origins and the development of the history of art criticism. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
366. **Introduction to Art Museology.** Survey of the art museum as a professional institution, its history, and present orientation; designed to acquaint prospective graduate students with the field of museum operation and to serve as background for students entering graduate courses in special fields of art museum practice (museology). Prerequisite: Consent of instructor. 4 hours or 1 unit.
391. **Topics in Art History.** Variable content; consult the *Timetable* for current topics. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated as topics vary.
401. **Seminar in Chinese Art.** Investigation of selected phases, concepts, and problems of the art of China; intensive reading and reports. Prerequisite: History of Art 301 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
402. **Seminar in Japanese Art.** Investigation of selected phases, concepts, and problems of the art of Japan; intensive reading and reports. Prerequisite: History of Art 302 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
410. **Seminar: African Art.** An intensive investigation of selected problems in the sculpture and other arts of Negro Africa. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
415. **Seminar in Ancient Art.** Same as Classical Civilization 415. Research seminar in subject selected from the art and architecture of the ancient period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
420. **Seminar in Classical Archaeology.** Same as Classical Civilization 420. See Classical Civilization 420.
422. **Studies in Medieval Art.** Research seminar in subjects selected from the art and architecture of the medieval period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
430. **Seminar in Renaissance Art.** Special problems in the history of Renaissance art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
431. **Studies in Northern Renaissance Art.** Research seminar in subjects selected from the art of the Northern Renaissance. Prerequisite: Graduate standing and consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
435. **Seminar in Baroque Art.** Research seminar in problems selected from the art of seventeenth-century Europe. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
440. **Seminar in the Art of the Period 1750-1900.** An intensive study of selected problems in European art. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
441. **Seminar in Modern Art.** Investigation of special problems in the history of twentieth-century art. Students present reports of their research. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
446. **Seminar in Contemporary Art.** Intensive study of selected problems or artists. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
450. **Seminar in American Art.** Investigation of selected problems in the history of American art. Prerequisite: History of Art 350 and 351, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
466. **Art Curatorial Techniques.** An intensive course in the role, responsibilities, and duties of the art museum curator; demonstration and practice of curatorial techniques in researching, documenting, acquiring, transporting, handling, and conservation of works of art. Prerequisite: History of Art 366. 1 unit.
467. **Art Museum Administration and Education.** Two aspects of art museum work: (1)

administration, covers trustee relations, methods of serving the public, fund raising, budgeting, staff organization, and program planning; (2) museum education. Students receive practice in the preparation of educational exhibitions and related educational materials. Prerequisite: History of Art 366. 1 unit.

468. **Art Museum Internship.** Introduction to actual supervised practice in one specialized department in an art museum: curatorial, educational, or administrative department. Prerequisite: History of Art 466 and 467. 1 unit.
492. **Individual Readings in the History of Art.** Directed readings in special fields or aspects of history of art not provided in depth by the current course offerings. Prerequisite: Consent of instructor. Sections A and B may be taken simultaneously. Registration allowed for each section is $\frac{1}{2}$ to 1 unit.
499. **Thesis Research.** Guidance in research and writing theses for advanced degrees. Prerequisite: Graduate standing in art history. 0 to 4 units.

Industrial Design

133. **Design Workshop.** Fundamentals of three-dimensional design. Primarily for students majoring in the industrial design curriculum. Prerequisite: General Professional Courses in Art and Design 118, 120, and 121. 2 hours.
134. **Introduction to Industrial Design.** Fundamentals of two and three dimensional design as applied to industrial design. Prerequisite: Industrial Design 133 and General Professional courses in Art and Design 122. 3 hours.
175. **Design Methodology.** Introduction to problem solving methods, project organization, and project programming for designers; lectures and discussions include techniques for stimulating creative problem solving and task analysis; research paper required. Prerequisite: Sophomore standing in industrial design, or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
270. **Drawing and Rendering.** Perspective drawing using color pastels, markers, and other media with emphasis on quick delineation. Prerequisite: Concurrent registration in Industrial Design 275, 276, 277, or 278; or consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
271. **Materials and Processes, I.** Use and manipulation of basic materials in modern industry. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
272. **Materials and Processes, II.** Continuation of Industrial Design 271. Prerequisite: Industrial Design 271. 3 hours.
275. **Industrial Design, I.** Designing of objects for manufacture by the machine industries. Field trip required. Prerequisite: Junior standing in industrial design curriculum or consent of department. 3 hours.
276. **Industrial Design, II.** Continuation of Industrial Design 275. Field trip required. Prerequisite: Industrial Design 275. 3 hours.
277. **Advanced Industrial Design, I.** Prerequisite: Industrial Design 276. 4 hours.
278. **Advanced Industrial Design, II.** Prerequisite: Industrial Design 277. 4 hours.
280. **Professional Practices.** Focuses on the preparation of a design portfolio and resume; examines operations of professional design offices; and includes presentations and discussions by visiting designers. 2 hours.
290. **Senior Honors in Industrial Design.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in industrial design, a cumulative grade-point average of 4.0; and consent of instructor, adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
291. **Individual Industrial Design Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
371. **Computer Applications in Design, I.** Concepts and methods used in computer-aided

design using interactive paint programs, computer-aided design and drafting programs, and three-dimensional solids modeling programs; emphasizes the use of the computer as a tool in the designer's developmental process. Prerequisite: Junior or graduate standing in industrial design curriculum or consent of instructor. 2 hours or $\frac{1}{2}$ unit.

372. **Computer Applications in Design, II.** Continuation of Industrial Design 371 with emphasis on applying computer applications programs to solving product, graphic, and communications problems in design; uses of networking and high quality output devices (plotters, printers, and video media). Prerequisite: Industrial Design 371 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
477. **Industrial Design Laboratory.** Individually directed research in the drafting room or workshop with concentration on industrial design. Prerequisite: Enrollment in the M.F.A. program in industrial design or consent of departmental graduate committee. $\frac{1}{2}$ to 3 units. May be repeated.
491. **Special Problems in Industrial Design.** Directed individual creative activity or design. Prerequisite: Graduate standing in industrial design. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 8 units.

Painting

125. **Life Drawing.** Prerequisite: General Professional Courses in Art and Design 118. 2 hours.
126. **Life Drawing.** Prerequisite: Painting 125. 2 hours.
141. **Beginning Painting I.** An introductory course in oil and acrylic painting. Painting is primarily observational. Literal representational content is varied. The processes and fundamentals of the craft of painting are explored, emphasizing the developments of creative pictorial aesthetics. Prerequisite: Freshman standing in art and design. 3 hours.
142. **Figure Painting I.** The process and fundamentals of painting are explored as applied to representational and interpretive painting of the human figure. Prerequisite: Painting 125, 141, or consent of instructor. 3 hours.
143. **Painting Composition, I.** Problems of nonliteral content for painters, with special consideration of materials and techniques. Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
144. **Painting Composition, II.** Continuation of Painting 143 with special emphasis on formal organization in painting. Prerequisite: Painting 143. 2 hours.
201. **Watercolor, I.** Prerequisite: General Professional Courses in Art and Design 118 and 120. 2 hours.
202. **Watercolor, II.** Continuation of Painting 201. Prerequisite: Painting 201. 2 hours.
219. **Current Art Issues.** Seminar with readings, lectures, discussions on ideas and issues affecting contemporary art. Attendance is required at visiting artists' and scholars' lectures and field trips. Prerequisite: Junior standing in fine and applied arts or consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
225. **Intermediate Drawing and Painting, I.** Explores the interrelationship of drawing and painting. Prerequisite: Painting 126 and 142 and junior standing in art. 3 hours.
226. **Intermediate Drawing and Painting, II.** Continues the exploration of the interrelationship of drawing and painting. Prerequisite: Painting 225 and junior standing in art. 3 hours.
229. **Anatomical Drawing.** Advanced drawing emphasizing human anatomy including the skeletal and muscular structure of the human figure. Prerequisite: General Professional Courses in Art and Design 118 and Painting 126. 3 hours.
231. **Intermediate Composition.** Prerequisite: Painting 126, 142, and 144. 3 hours.
232. **Intermediate Composition.** Prerequisite: Painting 231. 3 hours.
233. **Advanced Composition.** Prerequisite: Painting 226, 232, and 244. 3 hours.
234. **Advanced Composition.** Prerequisite: Painting 233. 3 hours.
244. **Narrative Painting.** Exploration of creating stories from a variety of sources including the personal, historical, political, psychological. A variety of styles and media will be discussed. Prerequisite: Painting 126 and 144, or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
245. **Advanced Painting and Drawing.** Advanced creative study from nature and the model in various painting and drawing media. Prerequisite: Painting 226, 232, and 244. 3 hours.

- 246. Advanced Studio Art.** Advanced creative study and research in various painting and drawing media, individual exhibition, documentation of work, statement of aesthetic objectives. Visiting critic/artist and staff critique student art. Prerequisite: Painting 245. 3 hours.
- 290. Senior Honors in Painting.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in painting, a cumulative grade-point average of 4.0; and consent of instructor, adviser, and associate director of the School. 2 to 5 hours. May be repeated to a maximum of 5 hours.
- 291. Individual Painting Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 335. Computer Imaging.** A fine arts approach to computer imaging for students in painting, printmaking, sculpture and related fields; no previous computer experience is necessary. Prerequisite: Sophomore standing or consent of instructor. 2 hours or $1\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
- 380. Drawing.** Advanced drawing in several media. Prerequisite: For undergraduates, consent of instructor; for graduates, consent of departmental graduate committee. 2 hours, or $1\frac{1}{2}$ to 1 unit.
- 381. Painting.** Advanced painting in oil and other media. Not open to candidates for the M.F.A. in painting. Prerequisite: For undergraduates, Painting 142 or equivalent; for graduates, consent of departmental graduate committee. 2 to 4 hours, or $1\frac{1}{2}$ to 1 unit. May be repeated to a total of 2 units.
- 382. Painting Materials and Techniques.** Study of the materials and techniques used in the various media: oil, watercolor, tempera, gouache, encaustic, etc. Prerequisite: Painting 142 or graduate standing in art. 2 hours or $1\frac{1}{2}$ unit.
- 491. Special Problems in Painting and Drawing.** Directed individual creative activity or research. Prerequisite: Graduate standing in painting. $1\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 495. Painting Laboratory.** Professional and experimental painting with emphasis on the development of maturity of style and personal expression. Prerequisite: Enrollment in the M.F.A. program in painting. $1\frac{1}{2}$ to 3 units.

Photography

- 115. Basic Photography.** Investigates basic elements comprising a photograph; explores the photogram, tone, and texture as expressive media; and works with the camera, exposure meter, and film and print developing in black and white. See *Timetable* for average cost; student must furnish camera. Prerequisite: Freshman standing in art and design; open to others during on-campus registration. 3 hours.
- 215. Photography, II.** Uses hand held cameras (35mm and $2\frac{1}{4}$ ") and black and white processes to express ideas and emotions with emphasis on the development of a personal aesthetic. See *Timetable* for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 216. View Camera and Studio.** Includes work with camera movements, black and white exposure, and development relationships as tools of creative expression; covers basic lighting techniques and studio procedures. Most equipment furnished. Prerequisite: Photography 215 or consent of instructor. 3 hours.
- 220. Color Photography.** Explores the potential of color prints and transparencies as media for creative expression. See *Timetable* for average cost; student must furnish camera. Prerequisite: Photography 115. 3 hours.
- 291. Individual Photography Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 315. Photography, III.** Explores creative expression through the medium of photography. Students select format and process (i.e., black and white, color, mixed media) based on prior experience; group critiques held frequently; initial opportunity to experiment in

- personally selected directions which will be refined and amplified in Photography 316. Prerequisite: Photography 215; History of Art 357; or consent of instructor. 3 hours or $3/4$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ unit.
316. **Advanced Photography.** Concentrated use of photographic processes for creative expression with emphasis on professionalism and the production of a photographic portfolio. Prerequisite: Photography 216 and 315; and minimum one other photography elective course. 3 hours or 1 unit.
330. **Alternative Processes.** Explores cyanotype, Van-Dyke Brown, Bichromate Printing and other historical processes. Additional work will utilize offset lithography and electrostatic equipment. Prerequisite: Two art photography course including Photography 215 or consent of instructor. Background in drawing, design, and art history courses will be expected. 3 hours or 1 unit.
331. **Digital Photography.** Problem solving using digital photographic technology. Projects will include the production of slides and/or video with additional graphic arts techniques, electrostatics and computer typesetting. Prerequisite: Photography 115 and enrollment in a BFA or graduate curriculum in art and design; or consent of instructor. 3 hours or 1 unit.
332. **Experimental Visualization Technologies.** Exploration and problem solving in visual communication using the Renaissance Experimental Lab at the Beckman Institute. Students will use computers, and sometimes collaborate with peers in the sciences and humanities, to create projects and scientific visualizations. Prerequisite: Photography 331 or consent of instructor. 3 hours or 1 unit.
350. **Photography Seminar.** Advanced study of photographic issues and literature. Discusses aesthetics, criticism, and current imagery, as well as photography's relationship to other media. Prerequisite: Photography 115, or History of Art 357; or consent of instructor. 3 hours or 1 unit.
360. **Video for Artists, I.** Explores the potential of video as a medium for creative expression and communications within the context of visual art. See current *Timetable* for average student materials cost; camera, recording, and editing equipment are furnished. Prerequisite: Junior standing in art; Photography 115 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
361. **Video for Artists, II.** Explores advanced concepts and techniques of video as a medium of creative expression and communication within the context of visual art. See current *Timetable* for average student material cost; camera, recording, and editing equipment are furnished. Prerequisite: Photography 360. 3 hours, or $3/4$ or 1 unit.
398. **Photography Workshop.** An advanced course on a special topic: see *Timetable* section note for description. Prerequisite: Junior, senior or graduate standing in art and design; or consent of instructor based upon announced criterion that varies with topic. 3 hours or 1 unit.
486. **Photography Studio.** Individually directed research; personal expression through the photographic medium. Prerequisite: Enrollment in M.F.A. program and major in photography, or consent of the departmental graduate committee. $1\frac{1}{2}$ to 2 units. May be repeated.
491. **Special Problems in Photography.** Directed individual creative activity or research. Prerequisite: Graduate standing in photography. $1\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.

Printmaking

271. **Beginning Etching.** An introductory course in intaglio printmaking, including the complete image development from sketch to printing stages. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
272. **Intermediate Etching.** An intermediate course in intaglio printmaking, including the complete development from sketch to printing stages. Prerequisite: Printmaking 271. 3 hours.
281. **Beginning Lithography.** A studio course in lithography comprised of black and white

printing primarily from stones. Work includes the complete development of a lithographic print from idea to the final print. Prerequisite: Sophomore standing in art and design or consent of instructor. 3 hours.

- 282. Intermediate Lithography.** A studio course in lithography comprised of black and white and multiple color printing from both stones and metal plates. Work includes the complete development of a lithographic print from idea to the final print. Prerequisite: Printmaking 281. 3 hours.
- 291. Individual Printmaking Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design; and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
- 371. Advanced Etching.** An advanced course in intaglio printmaking, including the complete image development from sketch to printing stages. Prerequisite: Printmaking 271 and 272. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 381. Lithography.** Laboratory course in lithography. Course of study includes a complete development of the process, exploiting its potential as a fine art medium. Prerequisite: For undergraduates, Printmaking 282; for graduates, consent of departmental graduate committee. 2 hours, or $\frac{1}{2}$ to 1 unit.
- 491. Special Problems in Printmaking.** Directed individual creative activity or research. $\frac{1}{2}$ to 2 units. May be repeated to a maximum of 5 units.
- 497. Print Workshop.** Intaglio, relief, and planographic print media; includes etching, engraving, aquatint, wood, paper, and plastic relief printing, and lithography. Prerequisite: Graduate standing in art. $\frac{1}{2}$ to 3 units.

Sculpture

- 151. Sculpture.** Anatomical and ornamental forms; plaster molds and models; and wood and stone sculpture. Prerequisite: Freshman standing in art. 2 hours.
- 152. Sculpture.** Continuation of Sculpture 151. Prerequisite: Sculpture 151. 2 hours.
- 228. Introduction to Handmade and Cast Paper.** Introduces the techniques of handmaking paper of various materials and of casting paper as sculpture, including molding techniques, investigations into various uses, and applications of the two techniques. 3 hours.
- 253. Intermediate Sculpture, I.** A free, experimental, and creative use of permanent and impermanent sculpture materials; clays, wood, pastelines, and plasters. Prerequisite: Sculpture 152. 2 hours.
- 254. Intermediate Sculpture, II.** Special projects in stone carving and malleable sheet metal; lead, copper, brass, and aluminum. Prerequisite: Sculpture 253. 2 hours.
- 255. Sculpture Materials and Techniques, I.** Special projects for cast bronze; model preparations, investments, melting, pouring, chasing, and developing of patinas. Prerequisite: Sculpture 152; junior standing in curriculum in sculpture. 3 hours.
- 256. Sculpture Materials and Techniques, II.** Special projects in terra cotta; use of various clays; preparation and construction methods; special problems in casting methods and materials; kiln operation; fuels; and glazing. Prerequisite: Sculpture 255. 3 hours.
- 257. Advanced Sculpture, I.** Introduction to plastics and welded metals; projects utilizing the special qualities of these materials. Prerequisite: Sculpture 254. 2 hours.
- 258. Advanced Sculpture, II.** Projects in permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 257. 2 hours.
- 259. Advanced Sculpture Materials and Techniques, I.** Projects in various permanent materials; special attention given to the relation of sculpture to the allied fields of architecture and landscape architecture. Prerequisite: Sculpture 256. 3 hours.
- 260. Advanced Sculpture Materials and Techniques, II.** Continuation of Sculpture 259. Prerequisite: Sculpture 259. 3 hours.
- 290. Senior Honors in Sculpture.** Independent creative activity, guided study, or research for honors. Prerequisite: Senior standing in sculpture, a cumulative grade-point average of 4.0; and consent of instructor, adviser, and associate director of the School. 2 to 5 hours.

May be repeated to a maximum of 5 hours.

291. **Individual Sculpture Problems.** Directed independent creative activity or research. Prerequisite: Junior standing in art and design and consent of instructor, adviser, and associate director of the School. 1 to 4 hours. May be repeated to a maximum of 6 hours.
328. **Handmade and Cast Paper.** Examines advanced techniques of handmaking paper of various materials and of casting paper as sculpture. Includes sheet forming, studies of molding techniques, plant fibers, and dyes appropriate for papermaking. Prerequisite: Sculpture 228 or graduate standing in art and design curricula. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
341. **Advanced Sculpture Techniques.** Advanced work in various sculptural media. Prerequisite: Consent of instructor. 2 hours or 1/2 to 1 unit.
426. **Advanced Papermaking.** Artistic applications of hand paper making with emphasis upon individual aesthetic expressions. Prerequisite: Sculpture 228 or graduate standing in art and design. 1/2 to 1 unit. May be repeated to a maximum of 3 units.
441. **Special Problems in Sculpture.** Directed individual creative activity or research. Prerequisite: Graduate standing in sculpture. 1/2 to 2 units. May be repeated to a maximum of 5 units.
446. **Sculpture Laboratory.** Experience at a professional level in sculptural techniques including metals casting, welding, stone carving, wood carving, clay modeling, and ceramic sculpture, with emphasis on the development of creative achievement. Prerequisite: Enrollment in the M.F.A. program in sculpture or consent of departmental graduate committee. 1 to 3 hours.

ART EDUCATION

(See Art and Design)

ASIAN STUDIES

(See East Asian Languages and Cultures)

ASTRONOMY

Chair of Department: Ronald F. Webbink

Department Office: 105 Astronomy Building, 1002 West Green Street, Urbana

100. **Perspectives in Astronomy.** A one-semester introduction to astronomy. The nature of science, sun, planets, and moons, origin of the solar system, nature and evolution of stars, exploding stars, stellar remnants (including dwarfs, neutron stars, and black holes), molecules in space, galaxies and quasars, past and future of the universe, and life in the universe. Lectures and observation. 3 hours. (Credit is not given to students with credit in Astronomy 100, 102, 104, or 300, not open to students with credit in Physics 102, 307, or equivalent.)
101. **Descriptive Astronomy.** The first semester of a two-semester introduction to astronomy. (Introductory survey of the universe; structure and motions of the earth and moon; planetary motions; physical nature of the planets, comets and meteors, and origin and evolution of the solar system. Lectures, discussion, and observation. 4 hours. (Credit is not given to students with credit in Astronomy 100, 104, or 300; not open to students who have credit in Physics 102, 307, or equivalent.)
102. **Descriptive Astronomy.** The stars, distances, motions, and dimensions, atoms and radiation, structure, origin, and evolution of stars, structure of the Milky Way, and

galaxies and the structure of the universe. Lectures, discussion, and observation. Prerequisite: Astronomy 101, or consent of instructor. 4 hours. Credit is not given to students with credit in Astronomy 100, 210, or 300.

- 111. Life in the Universe.** Reviews the nature and evolution of the physical Universe emphasizing the constraints thus imposed on possible abodes of life; the nature, origin, and evolution of life on Earth and implication for the possibility of extraterrestrial life; the search for life on other planets of the solar system; and the possibility of and search for life beyond the solar system. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
- 113. The Sky.** Examines the visual aspects and phenomena of the sky; astronomical lore and history. Prerequisite: Astronomy 100 or 102, or consent of instructor. 3 hours.
- 140. Astronomy and Civilization.** Examines the importance of astronomy in early western cultures; studies the impact of developing astronomical and physical discoveries and theories on western civilization, as well as the reverse impact of society on astronomy and physics. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 210. General Astronomy.** A survey of astronomy for students having some background in physics. The approach is primarily descriptive, but mathematical techniques are used where needed. The chief topics are orbits and gravitation; the bodies of the solar system; the nature and evolution of the stars; galaxies; and the structure of the universe. Prerequisite: Physics 102, 107, or equivalent; or consent of instructor. 3 hours. Credit is not given to students who have credit in Astronomy 100, 101, 102, or 300.
- 290. Individual Study.** Individual study at an advanced undergraduate level. Prerequisite: Consent of adviser and of staff member who supervises the work. 1 to 4 hours.
- 300. Astronomy for Teachers.** A general course in astronomy designed for teachers which includes classical astronomy, modern developments, and aspects of the space program; discussion of available curriculum materials for elementary and secondary teaching and some practice given in telescopic observation. 4 hours or 1 unit. Credit is not given to students with credit in Astronomy 100, 102, or 210, or to astronomy majors. Graduate credit is given only to students in elementary and secondary teacher training programs.
- 304. Astrophysics, I.** Introduction to astrophysical problems, with emphasis on underlying physical principles; includes the nature of stars, equations of state, stellar energy generation, stellar structure and evolution, astrophysical neutrinos, binary stars, white dwarfs, neutron stars and pulsars, and novae and supernovae. Prerequisite: Physics 108, or consent of instructor. 3 hours or 1 unit.
- 305. Astrophysics, II.** Introduction to astrophysical problems; includes fundamentals of solar system astrophysics, elements of physical cosmology, and such additional topics as galactic nuclei, quasars, cosmic ray nuclei, the interstellar medium, and cosmic electrodynamics. Prerequisite: Astronomy 304, or consent of instructor. 3 hours or 1 unit.
- 314. Observational Astronomy.** Introduction to astronomical equipment: optical photography, photometry, and spectroscopy; radio astronomy; astronomical coordinate systems and transformations; determination of latitude, longitude, and time; and introduction to error theory and data analysis. Practical experience with the 12-inch refractor. Lectures and laboratory. Prerequisite: Astronomy 102 or 210; Mathematics 245; or consent of instructor. 4 hours or 1 unit.
- 321. Galactic Astronomy.** Galactic structure: the observational data; stars in the solar neighborhood; the solar motion; stellar statistics and distribution; stellar populations; interstellar matter and spiral structure; and the whole galaxy. Prerequisite: Astronomy 102 or 210; Astronomy 305 or consent of instructor. 3 hours or 1 unit.
- 322. Extragalactic Astronomy.** Overview of current physical understanding of the large-scale structure, contents, and evolution of the universe; includes such topics as the properties of galaxies, quasars, clusters and superclusters of galaxies, the microwave background radiation, origin and evolution of galaxies, and observational cosmology. Prerequisite: Astronomy 305 or consent of instructor. 3 hours or 1 unit.
- 325. Galactic Dynamics.** Dynamics of galaxies; stellar encounters; formation and solution of the Boltzmann equation; mass models of the Galaxy; stellar orbits; equilibria of collisionless systems; spiral structures; dynamics of collisional systems; star clusters; dark matter. Prerequisite: Astronomy 321 or consent of instructor. 3 hours or 1 unit.

333. **Solar System Astrophysics.** Planetary orbits and perturbations; physical perturbations; physical parameters of the planets; planetary interiors, atmospheres, magnetospheres, and surface layers; the satellites, asteroids and comets; meteors, meteorites, and tektites; interplanetary grains and gas, and problems of origin and evolution. Prerequisite: Consent of instructor. 3 hours or 1 unit.
396. **Seminar in Astronomy.** Lectures on topics of current interest in astronomy and astrophysics, for advanced undergraduates and graduates. See *Timetable* for current topics. Prerequisite: Consent of instructor. 2 to 4 hours, or 1 to 1 unit. May be repeated.
401. **Stellar Atmospheres.** Physical characteristics of stellar atmospheres as derived from spectroscopic observations; radiation transfer; theory and observations of the continuous spectrum; limb darkening; formation of absorption lines; line profiles; curves of growth; relative chemical abundances; and emission features. Prerequisite: Consent of instructor. Desirable background includes some familiarity with atomic physics, advanced calculus, and general astronomy. 1 unit.
402. **Theoretical Astrophysics.** Same as Physics 402. See Physics 402.
403. **Observational Astronomy.** Techniques and basic results of observational astronomy; gamma ray, x-ray, ultraviolet, visible, infrared, and radio astronomy; data handling; coordinate systems; time, astrometry/detectors, telescopes; imaging; photometry; spectroscopy; polarimetry. Prerequisite: Consent of instructor. 1 unit.
404. **Stellar Structure and Evolution.** Same as Physics 404. Relationship between observable features of stars and the physical processes that occur in their interiors; topics include matter and radiation in stars, equations of state, modes of energy flow, nuclear energy production, and element synthesis; structure of stars during all phases prior to the supernova or planetary nebula stage; stellar pulsations with reference to Cepheids and RR Lyrae variables, and properties of white dwarfs, neutron stars, and contact binaries. Prerequisite: Physics 361 and 382, Physics 402, or consent of instructor. 1 unit.
405. **Diffuse Matter Astrophysics.** Same as Physics 405. Interstellar gas: balance of microscopic processes, large-scale structure, interaction with stars, dynamics, heating, ionization, and cooling; continuous and discrete radiation processes, excitation mechanisms, propagation of radiation, molecule formation, dust grains, star formation, magnetic fields, and cosmic rays. Prerequisite: Consent of instructor. 1 unit.
406. **High Energy Astrophysics.** Same as Physics 406. Survey of nuclear processes in astrophysical environments; topics include nuclear energy generation, thermonuclear reactions, weak interactions, and neutrino astrophysics, nucleosynthesis, superheavy nuclei, cosmochronology, and mechanisms of nova and supernova explosions. Prerequisite: Physics 402 or consent of instructor. 1 unit.
407. **Radiation Hydrodynamics.** Dynamics of radiating fluids, i.e., fluids in which radiation dominates energy and/or momentum transport in the flow; emphasis on underlying physical principles with examples from astrophysics; numerical methods. Prerequisite: Astronomy 401 or consent of instructor. Familiarity with basic concepts of radiation transport, fluid mechanics, and tensors desirable. 1 unit.
424. **General Relativity and Cosmology.** Same as Mathematics 460 and Physics 424. See Physics 424.
490. **Individual Study.** Individual study or nonthesis research. Prerequisite: Consent of adviser and of staff member who supervises the work. 1 to 2 units. May be repeated to a maximum of 4 units.
496. **Seminar in Special Topics.** Prerequisite: Consent of instructor. 0 to 4 units. May be repeated.
499. **Thesis Research.** 0 to 4 units.

ATMOSPHERIC SCIENCES

Head of Department: M. Mak

Department Office: 101 Atmospheric Sciences Building, 105 South Gregory Street, Urbana

100. **Introduction to Meteorology.** Introduces the student to the basic concepts and principles of atmospheric science in a descriptive format; emphasizes the physics responsible for changes in the weather; uses current weather information to illustrate textbook material. 3 hours. Students may not receive credit for both Atmospheric Sciences 100 and 222.
120. **Severe and Unusual Weather.** Analyzes the world's most extreme weather-related events in terms of their scientific basis and their economic, human, and historical consequences; examples include blizzards, major cold waves, hurricanes and tornadoes, flash floods, droughts, and major air pollution events. Utilizes the department's weather data and computational facilities when appropriate. 3 hours.
140. **Climate and Global Change.** Introduces climate change and its interactions with the global environment; surveys the physical, chemical, biological and social factors contributing to global change; includes topics such as greenhouse warming, acid rain, ozone depletion, regional drought and nuclear winter; distinguishes anthropogenic influences and natural variability of the earth system; addresses societal impacts, mitigation strategies, policy options and other human responses to global change. 3 hours.
199. **Undergraduate Open Seminar.** Special topics each semester. 1 to 5 hours. May be repeated.
222. **Weather Processes.** Introduction to the mean state of the atmosphere, the fundamental physics of weather processes, and the mechanisms producing daily weather changes, both qualitative and quantitative in nature. Prerequisite: Mathematics 242. 3 hours. Students may not receive credit for both Atmospheric Sciences 222 and 100.
301. **Principles of Atmospheric Physics.** Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere, and the formation of clouds and precipitation. Prerequisite: Mathematics 242 or 245; consent of instructor. 4 hours or 1 unit.
302. **Principles of Atmospheric Dynamics.** Same as Physics 302. An introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of the neutral atmosphere. Prerequisite: Mathematics 280; consent of instructor. 4 hours or 1 unit.
310. **Satellite Meteorology.** Reviews the theory and practice of observing the atmosphere using satellite-borne instrumentation; applications include weather analysis and forecasting using visible and infrared images, and the measurement of basic atmospheric variables such as temperature, moisture, wind, and precipitation. Prerequisite: Atmospheric Sciences 222 or 301; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **Radar Meteorology.** Basic principles of radar and references to other ground based remote sensing systems, with emphasis on radar. Discusses principles of conventional and Doppler radar, data processing, and use of Doppler radar in meteorology. Emphasizes radar observations of meteorological phenomenon, such as severe thunderstorms and wind shear. Students analyze data from national radar facilities. Prerequisite: Atmospheric Sciences 222 or consent of instructor. 4 hours or 1 unit.
390. **Individual Study.** Individual study or reading at an advanced undergraduate level in a subject not covered in normal course offerings. Prerequisite: Consent of adviser and of staff member supervising work. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units. May not be used to satisfy requirements for an MS or PhD degree in Atmospheric Sciences.
397. **Topics in Atmospheric Sciences.** Special topics in atmospheric sciences at an advanced undergraduate level. Prerequisite: Advanced undergraduate standing and consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
401. **Synoptic Meteorology.** Examines the observed behavior of the atmosphere through the application of physical and hydrodynamical principles to analyses of real meteorological data; develops concepts for studying atmospheric circulations, particularly extratropical

cyclones and anticyclones. Laboratory work includes the development of diagnostic techniques suitable for a better understanding of the current weather. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.

402. **Mesoscale Meteorology.** Basic concepts and ideas on atmospheric processes that occur on scales of motions from a few kilometers to a few hundred kilometers, a scale loosely classified by meteorologists as "mesoscale". After an introductory discussion of mesoscale classifications and attendant forecast problems, the course will introduce various mesoscale phenomena, internally generated circulations, externally forced circulations, and mesoscale instabilities. Covers all three fundamental aspects of mesoscale meteorology: observations, theory and modeling, with particular emphasis on the dynamics of precipitating mesoscale systems. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
405. **Numerical Methods in Fluid Dynamics.** Same as Computer Science 405. Intended to give the student practical numerical techniques for solving those linear and nonlinear differential equations which appear frequently as initial and boundary value problems in hydrodynamics and dynamic meteorology. Prerequisite: Mathematics 280 or consent of instructor. 1 unit.
406. **Dynamical Weather Prediction.** Describes the principles and methods of simulating and predicting large-scale atmospheric motions on the basis of hydrodynamics and thermodynamics. Prerequisite: Atmospheric Sciences 302. 1 unit.
408. **Atmospheric General Circulation.** Reviews the observed general circulation of the earth's atmosphere; discusses the balance requirements of mass, momentum, and energy conservation; illustrates, by means of different mathematical modelings and laboratory physical modeling, the important processes which determine the earth's and other planets' general circulation. Prerequisite: Atmospheric Sciences 301 or equivalent, and Atmospheric Sciences 302. 1 unit.
410. **Physical and Dynamical Oceanography.** Basic principles underlying physical and dynamical oceanography, with an emphasis on processes affecting air-sea interaction and climate modeling; topics include the physics of sea water, water mass characteristics, static stability, diffusion, equations of motion, geostrophic currents, wind-driven circulation, thermohaline circulation, numerical models, waves, tides. Prerequisite: Mathematics 242 and Atmospheric Sciences 301, or consent of instructor. 1 unit.
421. **Precipitation Physics.** Develops an understanding of precipitation processes through cloud observations, microphysics, dynamics, and comprehensive theoretical models; includes growth by condensation, coalescence, and riming; and studies ice crystals, hail, and weather modification. Prerequisite: Atmospheric Sciences 301. 1 unit.
431. **Atmospheric Turbulence and Convection.** Statistical fluid mechanics of atmospheric turbulence of both small and large scales; similarity law at statistically stationary states; the effect of heating associated with water vapor condensation and radiative heat transfer by clouds. Dynamics of both isolated and aggregated convection, cumulus convection and thunderstorms driven by the release of condensational heating. Prerequisite: Atmospheric Sciences 301 and 302. 1 unit.
441. **Dynamics of Climate and Climate Change.** Global aspects of climate and climate change; empirical studies of the observed climate system; the heat budget, general circulation of the atmosphere, role of oceans and cryosphere, interannual variability, and causes of climate change; climate modeling; and long range forecasting and possible future trends. Prerequisite: Atmospheric Sciences 301 and 302, or consent of instructor. 1 unit.
442. **Global Atmospheric Modeling.** This course provides the student with training in the development, testing and application of physically based climate models. Physically based mathematical models of the Earth's climate are used to study the causes of the ice ages which have occurred within a period of 100,000 years during the last two million years, the predictability of climate on the timescale of 1 to 3 months with particular attention to the worldwide El Nino phenomena, and project the potential climatic consequences of the increasing concentrations of carbon dioxide and other greenhouse gases. Prerequisite: Atmospheric Sciences 301 and 302 or consent of instructor. 1 unit.
451. **Atmospheric Radiation.** Physical concepts and various methods of analysis of radiation scattering by atmospheric molecules, particulates, and clouds; infrared radiative transfer in a stratified inhomogeneous atmosphere; radiation and ozone photochemistry in the stratosphere; and remote temperature and composition sensing techniques using satellite radiation data. Prerequisite: Atmospheric Sciences 301 or Astronomy 380. 1 unit.

- 461. Advanced Atmospheric Dynamics.** Introduces the language and methods of modern atmospheric dynamics, covering the areas of atmospheric waves, dynamical instabilities, and wave-mean flow interactions. Emphasis is on gaining a physical understanding of atmospheric motions from planetary down to gravity wave scales, and on solving dynamical problems that arise in research. Prerequisite: Atmospheric Sciences 302 or consent of instructor. 1 unit.
- 490. Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $1/2$ to 2 units.
- 491. Seminar in Atmospheric Sciences.** Seminar on topics of current interest; see *Timetable* for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 497. Special Topics in Atmospheric Sciences.** Lecture course in topics of current interest; subjects such as tropical meteorology, aerosol physics and geophysical fluid dynamics will be covered in semester offerings on a regular basis. Prerequisite: Consent of instructor. 0 to 1 unit.
- 499. Thesis Research.** Section A, for master's degree candidates; Section B, for doctoral degree candidates. Prerequisite: Consent of instructor. 0 to 4 units.

AVIATION

Director of Institute: H. L. Taylor

Institute Office: Administration Building (Old Terminal Building), University of Illinois-Willard Airport, Savoy 61874

- 101. Private Pilot, I.** The first of a two course sequence to prepare for FAA Private Pilot certification. Includes classroom instruction on aerodynamics, airplane systems, airport and airplane operations, federal regulations and airplane safety. Also includes 25 hours of flight training and 6 hours in a flight simulator in the flight laboratory. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Private Pilot certification requires the completion of Aviation 120. Prerequisite: Consent of director. 3 hours.
- 102. Orientation Refresher.** This course provides the student with additional aeronautical experience to develop the required proficiency to complete successfully the objectives of a flight course, pilot certificate, or aircraft rating. The flight hours may be divided between dual instruction or solo flight as required to meet the student's needs. The amount of dual vs. solo time and aircraft to be used will be determined by the chief pilot. Students enrolled in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Consent of director. 0 hours. May be repeated.
- 120. Private Pilot, II.** The second of a two course sequence to prepare for FAA Private Pilot certification. Includes classroom instruction on airplane operation, navigation, night flying and meteorology. Includes 36 hours of flight training and 6 hours in a flight simulator in the flight laboratory. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Students successfully completing final examinations will be issued a Private Pilot certificate. Prerequisite: Aviation 101 and consent of director. 3 hours. Credit is not given for both Aviation 120 and 121.
- 121. Private Pilot, Requalification.** A forty-five classroom hour transitional course for students entering the Institute with a Private Pilot certificate who desire to continue in the Commercial-instrument sequence (Aviation 140 through 210/211). Includes instruction on airplane operations, navigation, and meteorology. Includes 17 hours of flight training and 3 hours in a flight simulator in the flight laboratory. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Private Pilot certificate (with a minimum of 60 hours of flight), and consent of director. 2 hours. Credit is not given for both Aviation 120 and 121.
- 130. Private-Instrument, I.** The first of a two course sequence to prepare the private pilot for the instrument rating; reviews cross-country flight with an emphasis on instrument

approaches and enroute instrument procedures; includes forty-five hours classroom instruction on instrument flying, navigation, aircraft instruments, and regulation. Includes 27.5 hours of flight training and 10 hours in a flight simulator in the flight laboratory. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Issuance of the instrument rating requires completion of Aviation 140. Prerequisite: Aviation 120 or 121, and consent of director. 3 hours.

140. **Private-Instrument, II.** The second of a two course sequence to prepare the private pilot for the instrument rating. Includes forty-five hours classroom instruction on advanced maneuvers, aerodynamics, navigation, and aircraft systems. Includes 28 hours of flight training and 8 hours in a flight simulator in the flight laboratory. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 130 and consent of director. 3 hours.
142. **Reciprocating Powerplant Theory.** Comprehensive examination of the operating principles of an extensive selection of reciprocating aircraft powerplants; topics include power development and efficiency calculations, design factors, manufacturing techniques, operational procedures, and analysis of select engine systems. Students enrolling in this course will also participate in up to 5 hours of experiments. 3 hours.
143. **Aircraft Materials and Processes, I.** Surveys the materials and techniques used in maintaining and repairing aircraft; topics include principles and methodology in precision measurement, identification and application of fastening devices, fastener security, fluid transfer system materials, and nondestructive methods of flaw analysis. Students enrolling in this course will also participate in up to 5 hours of experiments. 3 hours.
144. **Turbine Powerplant Theory.** Comprehensive examination of the operating principles of an extensive selection of gas-turbine aircraft powerplants; topics include power development and efficiency calculations, design factors, manufacturing techniques, operational procedures, and analysis of select engine systems. Students enrolling in this course will also participate in up to 5 hours of experiments. 3 hours.
145. **Aircraft Electrical Systems.** Surveys of conventional physical principles applicable to current aerospace vehicles; includes alternating and direct current theory, power sources, transmission and distribution, logic circuitry, electron flow management, and circuit analysis. Students enrolling in this course will also participate in up to 5 hours of experiments. 3 hours.
147. **Introduction to Federal Aviation Regulations.** Studies regulations, directives, and specifications governing the manufacture, operation, and maintenance of aircraft. Also includes certification criteria for equipment and personnel engaged in aircraft operation and maintenance and effects of litigious actions on persons and business. 3 hours.
152. **Powerplant Systems, I.** Theory and operating principles of power generating systems and components; ignition, starting and power distribution systems used in conjunction with aircraft gas-turbine and reciprocating powerplants. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 142 and 145. 4 hours.
153. **Aircraft Materials and Processes, II.** Studies materials utilized in the fabrication of structural components found in aerospace vehicles. Emphasizes the derivation, manufacturing techniques, physical and mechanical properties and working characteristics of various ferrous and nonferrous materials. Also includes identification of corrosive attack and methods of control. Students enrolling in this course will also participate in up to 5 hours of experiments. 2 hours.
154. **Powerplant Systems, II.** Theory and application of operation, design, and maintenance procedures for current aviation propulsion systems; includes propeller governing and control systems for reciprocating and turbo-prop powerplants. Students enrolling in this course will also participate in up to 5 hours of experiments. 3 hours.
155. **Aerodynamics and Load Planning.** Calculation of structural member loading, factors in load planning, weight and balance theory and application, powerplant performance criteria and calculation and aerospace aerodynamics. Students enrolling in this course will also participate in up to 5 hours of experiments. 3 hours.

- 156. Powerplant Systems, III.** Studies aviation fuel distribution and management systems; includes carburetion, fuel injection, and supercharging; turbine and reciprocating powerplant metering systems; distillation techniques and rating systems. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 142 and 145. 3 hours.
- 157. Powerplant Conditioning and Testing.** Examines powerplant fault assessment, maintenance procedures and equipment; includes condition monitoring techniques for turbine and reciprocating powerplants and economic aspects of powerplant maintenance. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 143, 144, 152, 153, 154, and 156; and concurrent registration in Aviation 159 or consent of instructor. 7 hours.
- 159. Powerplant Maintenance and Inspection System.** Studies specialized inspection techniques, equipment, and procedures used in the maintenance of aircraft powerplants; includes federal aviation regulations, advisory circulars, airworthiness directives, manufacturers' publications, and record keeping systems as they apply to powerplants. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 142, 143, 144, 145, 147, 152, 154, and 156; and concurrent registration in Aviation 157 or consent of instructor. 2 hours.
- 163. Aircraft Materials and Processes, III.** Studies nonstructural materials suitable for the fabrication of aircraft components; includes assembly techniques, physical properties, and fabricating characteristics of composites, synthetics and fabrics, emphasis on surface treatments and finishing techniques. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 143. 3 hours.
- 165. Aircraft Fabricating Processes, I.** Examines methodology of mechanical, nonfusion attachment; utilization of structural and nonstructural metal covering; use of bonded and synthetic materials in aircraft component fabrication; dissimilar metal attachment. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 143, 153, and 155. 4 hours.
- 167. Aircraft Fabricating Processes, II.** Examines nonmechanical fusion and adhesion procedures and techniques including gas, arc and inert gas applications related to a variety of fabrication contexts. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 143 and 153. 3 hours.
- 169. Aircraft Systems, I.** Studies basic principles and design concepts of the environmental and life-support systems used in modern aircraft; emphasizes component relationship, system analysis and fault diagnosis. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 145. 4 hours.
- 170. Aircraft Systems, II.** Studies electrical distribution circuits and associated lighting, power management, communication, navigation, and instrumentation systems common to current production aircraft. Emphasizes circuit analysis, performance testing, and fault diagnosis. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 145, 152, and 155. 5 hours.
- 172. Aircraft Systems, III.** Studies principles and design concepts of fluid power and pneumatic control and actuating systems used in contemporary aircraft; emphasizes component relationship, system analysis and fault diagnosis. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 145. 3 hours.
- 174. Aircraft Assembly and Inspection.** Applied aerodynamic theory augmented through fabrication and assembly of aircraft structural and nonstructural components; system design and installation; specification conformity inspections. Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 163, 165, 167, 169, 170, and 172. 5 hours.
- 179. Airframe Maintenance and Inspection Systems.** Studies specialized inspection techniques, equipment, and procedures used in the maintenance of aircraft/rotorcraft airframes; includes federal aviation regulations, advisory circulars, airworthiness directives, manufacturers' publications, and record-keeping systems as they apply to airframes.

Students enrolling in this course will also participate in up to 5 hours of experiments. Prerequisite: Aviation 163, 165, 167, 169, 170, 172, and 174; or concurrent registration in Aviation 172 and 174. 2 hours.

- 184. Aircraft Systems for Pilots.** Basic aircraft systems, their components, and theory of operation. Familiarization of Federal Aviation Administration maintenance rules and regulations applicable to pilots. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Pre-Commercial Pilot.** A special flight course in preparation for the FAA Commercial Pilot certificate offered for those flight students needing additional preparation prior to Aviation 210. Includes 15 hours of flight (12 dual and 3 solo) including a 1.5 hours flight exam for qualified students plus 8 hours in a flight simulator. Emphasizes instrument flying procedures and provides an introduction to commercial maneuvers. For students enrolled in this course, its successful completion is required prior to enrolling in Aviation 210 (or Aviation 211). Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 140 and consent of director. 1 hour.
- 210. Commercial Pilot.** The final course in a series of advanced flight/courses in preparation for the FAA Commercial Pilot certificate with instrument rating. Includes forty-five hours classroom instruction on IFR and VFR cross-country, and VFR commercial maneuvers. Includes 28 hours of flight instruction and training (single-engine airplane) and 3 hours in a flight simulator in the flight laboratory. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 140 and consent of director. 5 hours. Students may not receive credit for both Aviation 210 and 211.
- 211. Commercial Pilot-Multiengine.** The final course in a series of advanced lecture/flight courses in preparation for the FAA Commercial Pilot certificate with both the instrument rating and multi-engine ratings. Includes forty-five hours classroom instruction on IFR and VFR cross-country, and VFR commercial maneuvers. Includes 35 hours of flight instruction and training (23 hours multi-engine airplane and 12 hours single-engine airplane) and 2 hours in a flight simulator in the flight laboratory. Includes three flight exams for qualified individuals. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 140, recommendation from Aviation 140 instructor, and consent of director. 5 hours. Students may not receive credit for both Aviation 211 and 210.
- 220. Flight Instructor-Airplane.** Prepares the commercial pilot for an FAA Flight Instructor (Airplane) certificate. Includes forty-five hours classroom instruction on fundamentals of teaching, student motivation, blocks to learning, stress, cognitive approaches to learning, flight instructor duties/responsibilities, lesson planning and development, aerodynamics, and pertinent federal aviation regulations. Includes 22 hours of flight training and instruction and three hours in flight simulator teaching techniques in the flight laboratory. Also includes a one hour flight check for course completion. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Commercial Pilot certificate with instructor rating and consent of director. 3 hours.
- 222. Instrument Flight Instructor.** Provides the instruction and supervised training for the addition of the Instrument-Airplane rating to the Flight Instructor certificate. Reviews instrument operations with an emphasis on the instructional aspects of these operations. Includes five hours of flight simulator instruction, ten hours of flight instruction and supervised training, four hours of discussion and a one hour flight test. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Commercial Pilot certificate with instrument rating; flight instructor-airplane certificate or concurrent enrollment in Aviation 220; and consent of director. 1 hour.
- 224. All Attitude Orientation.** Primary focus of course is to teach the recovery of an airplane from emergency inflight attitudes. Teaches the safe handling of an aircraft in all attitudes of flight through the use of various aerobatic maneuvers including loops, snap rolls, slow rolls, Immelmans, Cuban eights, spins, and similar maneuvers, plus takeoff and landing procedures in a tailwheel airplane. Ten flight hours. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 101 and 120; or the Private Pilot certificate and consent of director. 1 hour.

- 250. Practice Teaching-Airplane.** Practice teaching using classroom, audiovisual materials, flight simulators, and airplanes; prepares the certified flight instructor to teach in all modes of aviation education. A minimum of 2 hours of classroom lecture, 3 hours of simulator instruction, and from 1 to 19 hours of airplane instruction is given by the student; an additional 20 hours of classroom lecture-discussion clarifies and explains the proper methods of aviation instruction. Prerequisite: Aviation 220 and flight instructor certificate; junior standing; recommendation from Aviation 220 flight instructor; and consent of director. 3 hours.
- 263. History of Aviation.** Historical development of aviation from man's first flight to the present, in broad national and international economic, socio-economic, and cultural perspectives; includes the study of initial flight experimentation, early technological advancements with applications to current developments in aviation as it relates to American culture. 3 hours.
- 280. Multiengine Land-Special Rating.** Prepares the commercial pilot for an FAA multiengine land airplane rating; 18 hours of discussion and 9 hours of flight in a multiengine airplane (7½ dual instruction, ½ solo, plus 1.0 check ride for qualified individuals). Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Commercial Pilot certificate, and consent of director. 1 hour.
- 284. Jet Aircraft Systems and Operations, I.** An operator-oriented study of modern jet systems and procedures, including related federal aviation regulations, aerodynamics, and weight and balance; preparation for the airline flight engineer. Forty-five hours classroom instruction. Prerequisite: Commercial Pilot certificate; or Private Pilot certificate and credit or concurrent registration in Aviation 169, 170, and 172; or consent of instructor. 3 hours.
- 291. Special Ratings and/or Specialized Flight.** Consists of aeronautical experience that can be used for special FAA certificates and/or ratings such as Airline Transport Pilot or rotorcraft-helicopter. Course may also be used for specialized flight such as advanced multiengine operations. 16 hours of discussion and a variable number of hours of flight instruction (dual and/or solo) to meet the individual needs of the student. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Pilot certificate and consent of director. 1 hour. May be repeated to a maximum of 8 hours with a 3 hour maximum in any given semester.
- 292. Professional Multiengine Indoctrination.** Extends the development of an advanced professional pilot student; offers an internship providing a manufacturer-equivalent school in a Cessna 310R aircraft, a crew coordination (CRM) school for passenger carrying operations, and proficiency based right-seat, second in command qualification. Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 211 or equivalent, and consent of instructor. 3 hours.
- 293. Corporate-Jet Pilot Orientation.** An introduction to multi-engine jet airplane operations; 45 hours of lecture-discussion and 20 hours (10 as pilot and 10 as co-pilot) of simulated flight in a T-40 jet aircraft simulator or equivalent; includes turbine engine theory and operation for pilots, normal and emergency procedures, performance calculation, and crew coordination (Cockpit Resource Management). Students enrolling in this course will also participate in up to 5 hours of research flight experiments. Prerequisite: Aviation 211 and consent of director. 3 hours.
- 294. Airport Management.** Management problems in planning, design, operation, maintenance, and administration of airports; legislation and federal regulations affecting air commerce and airports; and current problems in certification, security, safety, land acquisition, zoning, and state and federal participation in airport development. Prerequisite: Aviation 101 and Business Administration 210 or 247, or consent of instructor. 3 hours.
- 295. Aviation Management.** Studies management functions, responsibilities, techniques, and problems specific to aviation enterprises. Includes case study analysis of typical problems/ situations found in aviation organizations. Prerequisite: Aviation 120 or Business Administration 210 or 247, or consent of instructor. 3 hours.
- 355. Aviation Accident Investigation and Analysis.** Fundamental concepts of aviation safety augmentation with emphasis on accident prevention through accident investigation,

casualty reduction through crashworthy design, and safety enhancement resulting from litigation; accident investigation techniques and crash survival design factors. Prerequisite: Aviation 101 or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.

BIOCHEMISTRY

Head of Department: Robert L. Switzer

Department Office: 415 Roger Adams Laboratory, 1209 West California Street, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
292. **Senior Thesis.** Limited in general to seniors in biochemistry and chemistry. Biochemistry 292 is recommended for all those who plan to do research and graduate study, and it or Chemistry 292 is a prerequisite for graduation with distinction in biochemistry. Each student who desires to do thesis research must receive written permission from a member of the biochemistry faculty. Accordingly, prospective students are encouraged to contact the biochemistry staff in the semester prior to registration in this course. Students must present a thesis to receive credit in this course. Registration of 10 hours over two semesters is expected. Prerequisite: Biochemistry 352, 353, and 355. 2 to 6 hours. (Counts for advanced hours in LAS.)
320. **Molecular Biophysics.** Same as Biophysics 320. See Biophysics 320.
338. **Plant Molecular Biology.** Same as Plant Biology 338. See Plant Biology 338.
350. **Introductory Biochemistry.** The chemistry and metabolism of carbohydrates, lipids, proteins, nucleic acids, vitamins, and coenzymes and their relation to the regulation and processes of organisms, cells, and subcellular components. Not intended for students in biochemistry curriculum. Prerequisite: Chemistry 131 or 136, or equivalent. 3 hours or $1\frac{1}{2}$ unit. Students may not receive credit for both Biochemistry 350 and the Biochemistry 352-353 sequence.
352. **General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Students should not enroll in Biochemistry 352 without intent to take Biochemistry 353. Prerequisite: Chemistry 110 or 123, and Chemistry 331 or 336; or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
353. **General Biochemistry.** Principles, chemistry, and methods of analysis of the composition and processes of living systems. Required for students in biochemistry curriculum. Prerequisite: Biochemistry 352 or consent of instructor. 4 hours or 1 unit. Students may not receive credit for both the Biochemistry 352-353 sequence and Biochemistry 350.
355. **Biochemistry Laboratory.** Introduction to experimentation with biochemical systems, processes, and compounds; identification and quantitative measurement of constituents and transformations in biological systems. Prerequisite: Chemistry 131 or 136, or equivalent; credit or concurrent registration in Biochemistry 350, 352, or 353, or equivalent. Quantitative analytical chemistry and credit or concurrent registration in a course that includes nucleic acid biochemistry (i.e., Biochemistry 350 or 353) are recommended. 4 hours or 1 unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biophysics and Chemistry 440. See Chemistry 440.
450. **Biomolecular Physics.** Same as Biophysics 450 and Physics 450. See Physics 450.
452. **Experimental Techniques in Biochemistry.** Experiments concerning the detection, isolation, and characterization of macromolecules, including enzymes, antibodies, and nucleic acids; methods of studying the size, shape, and hydrodynamic properties of macromolecules and other compounds. Prerequisite: Biochemistry 355. $\frac{3}{4}$ to 1 unit. May be repeated to a maximum of $1\frac{1}{2}$ units credit.
455. **Biochemistry Seminar.** Discussions of current research and literature. Required of all graduate students whose major is biochemistry. Prerequisite: Biochemistry 352, 353, and 355; or equivalent. $\frac{1}{2}$ unit.
490. **Individual Study.** Designed for students majoring or minoring in biochemistry who wish to undertake individual studies of a non-Ph.D. thesis nature under the direction of

a faculty member of the department. Prerequisite: Consent of head of department. $\frac{3}{4}$ to 4 units (summer session, $\frac{1}{4}$ to 2 units).

- 494. Advanced Topics in Biochemistry.** A series of half-semester intensive courses on the recent research findings in important areas of biochemistry and molecular biology. Covers such areas as: biophysical methods; enzyme mechanisms; membrane biochemistry; regulation of gene expression; nucleic acid biochemistry; metabolic regulation; cellular communication; and medical biochemistry. Lectures, discussions, student papers, and presentations. Prerequisite: Biochemistry 352 and 353 and (at the option of the instructor) Chemistry 346; or consent of instructor. $\frac{1}{2}$ unit. May be repeated. Students may register for this course more than once in the same term to a maximum of 1 unit.
- 499. Thesis Research.** 0 to 4 units.

BIOENGINEERING

Chair, Executive Committee: R. Magin

Program Office: 164 Mechanical Engineering Building, 1206 West Green Street, Urbana

- 120. Introduction to Bioengineering.** Lecture and discussion of recent trends in bioengineering; topics typically include the biological interaction with ultrasound and microwave radiation, modeling, instrumentation, biomaterials, biomechanics, biological heat and mass transfer, and medical imaging techniques. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 270. Individual Study.** Individual projects. Prerequisite: Consent of instructor. 0 to 4 hours.
- 306. Veterinary Orthopedic Biomechanics.** Same as Veterinary Biosciences 306. See Veterinary Biosciences 306.
- 308. Implant Materials for Medical Applications.** Review of the biological and engineering aspects of implant materials; characterization of major classes of promising implant materials; and problems of tissue-implant interaction and surgical problems involved in implant work. Laboratories and independent projects illustrate the use of implant materials. Prerequisite: Chemistry 102; Physics 102 or 108, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 314. Biomedical Instrumentation.** Same as Electrical and Computer Engineering 314. See Electrical and Computer Engineering 314.
- 315. Biomedical Instrumentation Laboratory.** Same as Electrical and Computer Engineering 315. See Electrical and Computer Engineering 315.
- 370. Special Topics in Bioengineering.** Prerequisite: Consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 375. Modeling of Bio-Systems.** Same as Electrical and Computer Engineering 375. See Electrical and Computer Engineering 375.
- 424. Ultrasonic Biophysics.** Same as Biophysics 424. See Biophysics 424.
- 498. Individual Study.** Individual projects. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.

BIOLOGY

Director of School of Life Sciences: Jordan Konisky

School Office: 393 Morrill Hall, 505 South Goodwin Avenue, Urbana

- 100. Biological Sciences.** An introduction to biology for the nonmajor. In-depth focus on two contemporary problems - maintaining a livable environment and issues of human health. Lecture and discussion. 3 hours. Credit is not given for both Biology 100 and 101.
- 101. Biological Sciences.** An introduction to biology for the nonmajor, including laboratory. In-depth focus on two contemporary problems - maintaining a livable environment and

- issues of human health. Emphasis in laboratory is on science as a process. Lecture, discussion and laboratory. 4 hours. Credit is not given for both Biology 100 and 101.
- 104. Animal Biology.** Introductory zoological concepts with emphasis on the diversity and comparative anatomy of animals and the fundamentals of physiology, genetics, evolution, and behavior. Enrollment priority is given to students in curricula which require this course. 4 hours.
- 105. Insects and People.** Same as Entomology 105. See Entomology 105.
- 106. Heredity and Society.** Provides nonscience students with an understanding of genetics so they can appreciate how recent discoveries and environmental changes may affect their future and the future of society. 3 hours. Credit is not given for both Biology 106 and Biology 120, 122, or 210.
- 107. Evolution. History and analysis of Darwinism and Neo-Darwinism.** Examines the origin of life and its diversification; the evolutionary basis of thought, reason, and human behavior. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Biology 107 and Ecology, Ethology, and Evolution 301.
- 108. Biology of Human Aging.** Comprehensive and critical analysis of what happens as humans age; includes information gained from model systems ranging from cells to such diverse organisms as bamboo and chimpanzees; considers the role of evolution in shaping special features of our life cycle. 3 hours.
- 120. Genetics, Evolution, and Biodiversity.** The first course in a 3-semester introduction to biology for majors in life sciences curricula and others requiring a good foundation in biology, such as preprofessional students. This lecture-laboratory course covers transmission genetics, evolution and plant and animal phylogeny and systematics. Prerequisite: Credit or concurrent registration in Chemistry 101, or 107 and 109. 5 hours. Credit is not given for both Biology 120 and Biology 106 or 210.
- 121. Ecology and Organismic Biology.** The second course in a 3-semester introduction to biology for majors in life sciences curricula and others requiring a good foundation in biology, such as preprofessional students. This lecture-laboratory course covers ecology and animal and plant physiology. Prerequisite: Biology 120 or consent of Director of Biology Programs and credit or concurrent registration in Chemistry 102 or credit for Chemistry 107 and 109. 5 hours. Credit is not given for both Biology 121 and 251.
- 122. Molecular and Cellular Biology.** The third course in a 3-semester introduction to biology for majors in life sciences curricula and others requiring a good foundation in biology, such as preprofessional students. This lecture-laboratory course covers molecular genetics and molecular and cellular biology. Prerequisite: Biology 121 or consent of Director of Biology Programs and credit or concurrent registration in Chemistry 131. 5 hours. Credit is not given for both Biology 122 and Biology 106, 151, or 210.
- 123. Adventures in Life Sciences.** General introduction to the School of Life Sciences emphasizing selected areas of research in SOLS and career opportunities in life sciences. 0 hours.
- 144. Introduction to the Biological Literature.** Using professional literature as examples of introductory-level biological concepts, class discussions analyze biological research papers as they appear in a weekly scientific journal. Prerequisite: One year of biology or consent of instructor. 1 hour.
- 151. The Cell.** Study of the biology of cells from the molecular to the microscopic level of organization. Prerequisite: Credit or concurrent registration in organic chemistry; consent of the honors biology committee. 5 hours. Credit is not given for both Biology 151 and Cell and Structural Biology 213 or 215, or Biology 122.
- 199. Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
- 210. Genetics.** Principles of heredity and the nature of genetic material. Prerequisite: One year of biology or consent of instructor. 4 hours. Credit is not given for both Biology 210 and Biology 106, 120, or 122. (Counts for advanced hours in LAS.)
- 251. The Organism.** Study of the way different classes of organisms respond to challenges of their environment; emphasis on the general features of organismic behavior. Prerequisite: Biology 151; good standing in the honors biology program; and consent of the honors biology committee. 5 hours. Credit is not given for both Biology 251 and Biology 121.

- 303. Introduction to Neurobiology.** An introduction to the physiology of nerve cells, mechanisms of neural integration, and the organization of sensory and motor systems; also introduces neurochemistry, neuroendocrinology, neural development, neural plasticity, and the physiological basis of behavior. Prerequisite: Biology 122 or 251, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 304. Biological Clocks.** Study of the nature, mechanisms, functions, development, and evolution of the biological rhythms associated with geophysical cycles; emphasizes circadian rhythms and their role as biological clocks for the timing of photoperiodism, celestial orientation, and human physiology and behavior. Prerequisite: Biology 122 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 305. Fundamentals of Microscopy.** Lectures on applications of transmission and scanning electron microscopy; review of light microscopy, phase contrast, interference, and Nomarski optics. Prerequisite: Physics 102 or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 309. Ecological Genetics.** Study of the genetics of natural populations, stressing empirical observations and experiments. Emphasis on recent theories of genotype/environmental interactions and their relationship to evolutionary processes. Prerequisite: Biology 122 or 210. 3 hours or $\frac{3}{4}$ unit.
- 310. Immunogenetics and Immunophysiology.** Same as Animal Sciences 310 and Veterinary Pathobiology 310. See Animal Sciences 310.
- 313. Experimental Genetics.** Laboratory course to expose students to several types of organisms, experimental approaches, and methods of analysis utilized in genetic research. Prerequisite: Biology 122, 151 or 210; consent of instructor. 4 hours or 1 unit.
- 316. Population Genetics.** Same as Animal Sciences 316. See Animal Sciences 316.
- 317. Quantitative Genetics.** Same as Animal Sciences 317. See Animal Sciences 317.
- 324. Chemical Ecology.** The chemical bases of ecological interactions among organisms; topics include the chemical structures and functions of messenger compounds important in inter- and intraspecific interactions among plants, insects, higher animals, fungi, microbes, and their environments. Prerequisite: Courses in organic chemistry and ecology, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 338. History of Biology.** Same as History 338. See History 338.
- 339. Tropical Ecology.** Ecological principles as they apply to plants, animals, and humans in tropical habitats; topics include climate, soils and ecosystem processes; seasonality and habitat diversity; community structure, species diversity, and plant-animal interactions; regrowth following natural and human disturbances; and human use and abuse of tropical forests. Prerequisite: Ecology, Ethology, and Evolution 212 or Plant Biology 381; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 350. Integrated Electron Microscopy.** Same as Veterinary Biosciences 350. An introduction to historical aspects, principles, and applications of transmission and scanning electron microscopy for students in biology, premedicine, veterinary medicine, agriculture, food and textile science, and related fields. Course stresses modern technical approaches in electron microscopy to scientific problem solving. Prerequisite: Upper division standing and 6 hours of life sciences. 3 hours or $\frac{3}{4}$ unit.
- 351. Population Biology.** Study of problems associated with behavior of plant and animal populations based on genetic, evolutionary, and ecological principles. Prerequisite: Biology 251; statistics; good standing in the honors biology program; consent of the honors biology committee. 4 hours or 1 unit.
- 352. Scanning Electron Microscopy Laboratory.** Same as Veterinary Biosciences 352. Laboratory training and experimental techniques in biological specimen preparation, operation of scanning electron microscopes and ancillary equipment, and x-ray microanalysis. Includes proficiency training on research scanning electron microscope. Prerequisite: Upper division standing and 6 hours of life sciences; credit or concurrent registration in Biology 350 or Veterinary Biosciences 350 or consent of instructor. 2 or 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Additional credit requires consent of instructor.
- 353. Transmission Electron Microscopy Laboratory.** Same as Veterinary Biosciences 353. Alignment, operation and performance evaluation of transmission electron microscopes; electron micrography of a variety of biological specimens, varied approaches to biologi-

- cal specimen preparation and ultramicrotomy. Prerequisite: Upper division standing and 6 hours of life sciences; credit or concurrent registration in Biology 350 or Veterinary Biosciences 350 or consent of instructor. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit. Additional credit requires consent of instructor.
368. **Biological Modeling.** Same as Agronomy 368 and Geography 368. See Geography 368.
371. **Quantitative Biology, I.** Theory and practical application in biology of probability and statistics; lectures and assigned problems. Prerequisite: Mathematics 120 or equivalent or consent of instructor. 4 hours or 1 unit.
372. **Quantitative Biology, II.** Additional topics in biostatistics, emphasizing nonparametric comparative, correlational, and sequential analyses; multi-dimensional contingency analyses, circular statistics, binomial sequential sampling. Lecture and discussion. Prerequisite: Biology 371 or consent of instructor. 4 hours or 1 unit.
380. **Social Issues in Biology.** Ethical and sociopolitical implications of the biological sciences: an issue-oriented lecture-discussion format centering on problems such as biotechnology, reproductive freedom, health care and allocation of scarce resources, death and dying, behavior manipulation, biological experimentation, population control, and environmental ethics. Prerequisite: Upper-division standing and 6 hours of life science. 3 hours or $\frac{3}{4}$ unit.
390. **Special Courses.** Experimental and temporary courses. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{4}$ to 1 unit. May be repeated as topic varies.
417. **Advanced Quantitative Genetics.** Same as Animal Sciences 417. See Animal Sciences 417.
418. **Concepts and Topics in Immunology.** Same as Veterinary Pathobiology 418. See Veterinary Pathobiology 418.
420. **Advanced Topics in Neural and Behavioral Biology.** Survey of current research in modern neural and behavioral biology. Each weekly seminar is presented by a faculty member or distinguished visiting neuroscientist. Abstracts and suggested readings are presented prior to each seminar. Prerequisite: Graduate standing or consent of instructor. $\frac{1}{4}$ unit.
444. **Morphometry.** Examines the theoretical basis and practical applications of stereological principles to sectioned materials (useful for both light and electron microscopic studies); compares manual and computer-assisted data collection and analysis; three-dimensional reconstructions from serial sections. Prerequisite: Statistics 100 or equivalent; consent of instructor. $\frac{1}{2}$ or $\frac{3}{4}$ unit.
454. **Advanced Methods in Electron Microscopy.** Same as Ceramic Engineering and Materials Science and Engineering 454. Supplementary training in advanced techniques such as electron microprobe analysis, freeze-etch/freeze-fracture techniques, quantitative energy dispersive x-ray analysis, or instruction on specific microscopes. Prerequisite: Biology 350, 352, or consent of instructor. $\frac{3}{4}$ unit. May be repeated.
457. **Ultrastructural Pathology.** Same as Veterinary Pathobiology 457. See Veterinary Pathobiology 457.
490. **Special Topics in Biology.** Individual topics in research conducted under the supervision of faculty members in the School of Life Sciences. Designed for students enrolled in the biology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their doctorate degree. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

BIPHYSICS

(See Physiology and Biophysics)

BRIDGE PROGRAM

Office Address: College of Liberal Arts and Sciences, 270 Lincoln Hall, 702 South Wright Street, Urbana

100. **Summer Bridge - Reading.** Intensive course designed to improve critical comprehension skills for effective reading of college texts and primary sources; not intended for credit toward a baccalaureate degree. Offered only as part of the Summer Bridge Program. 0 hours.
101. **Summer Bridge - Composition.** Intensive course designed to improve writing skills; not intended for credit toward a baccalaureate degree. Offered only as part of the Summer Bridge Program. 0 hours.
102. **Summer Bridge - Math.** Intensive course designed to improve arithmetical and elementary algebraic skills; topics vary according to the needs of the students, but generally include elementary algebra (absolute value, first degree equations and inequalities, algebraic expressions, rules of exponents, factoring graphing, quadratic equations); not intended for credit toward a baccalaureate degree. Offered only as part of the Summer Bridge Program. 0 hours.

BUSINESS

Interim Dean of College: Howard Thomas

College Office: 260 Commerce Building (West), 1206 South Sixth Street, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
299. **International Business Study in Absentia.** Upon prior written approval of the adviser, the major department, and the College of Commerce and Business Administration office, a student may earn up to 18 credit hours per semester undertaking a study and/or research project in international business away from the Urbana-Champaign campus. The student's major department verifies the satisfactory progress of the work by means of interim and final written reports, written or oral examinations, or other means established by the department. While absent from the Urbana-Champaign campus, the student must continue to pay all fees required by the University of Illinois to retain continuity of enrollment and to allow the time spent away from this campus to count toward residency. Prerequisite: The student must be a commerce major in good standing who has completed at least 45 semester hours toward a bachelor's degree with at least one semester in residence at the University of Illinois. 0 to 18 hours. This course may be repeated for a maximum of 36 credit hours, all of which must be earned within twelve consecutive months.

BUSINESS ADMINISTRATION

Head of Department: Frederick W. Winter

Department Office: 350 Commerce Building (West), 1206 South Sixth Street, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **The Legal Environment of Business.** Examination of the nature of law and the formation and application of legal principles; the role of law in society; the legal environment in which business operates, particularly government taxation; the regulation of commerce, competition, and labor-management relations; and the concept of property: its creation, transfer, and importance to our business society. Prerequisite: Junior standing. 3 hours.
202. **Principles of Marketing.** Emphasizes the concepts of planning, organization, control, and decision making as they are applied in the management of the marketing function. Prerequisite: Economics 172 or equivalent. 3 hours.

205. **Business Location Decision-Making: Theory and Practice.** Same as Geography 205. See Geography 205.
210. **Management and Organizational Behavior.** A general analysis of management and organizational behavior from a systems point of view, including classical organizational theory and management, organizational behavior, and management science; environmental forces; planning, organizing, and control processes; motivation, incentives, leadership, communication, and interpersonal relations; and discussion of production and decision-making and mathematical models. Prerequisite: Junior standing. 3 hours. Credit is not given for both Business Administration 210 and 247.
212. **Principles of Retailing.** Gives a general analysis of the structure of retailing emphasizing the retailing environment and operating efficiencies; includes patronage behavior, merchandise control, pricing, promotion, location, and vendor relations; and gives special attention to emerging trends in retailing. Prerequisite: Business Administration 202. 3 hours.
247. **Introduction to Management.** Summary of management in a modern industrial enterprise; emphasis on motivation, small group behavior, and the problems of designing and operating a formal organization structure. For noncommerce students only. Prerequisite: Sophomore standing. 3 hours. Credit is not given for both Business Administration 247 and 210.
261. **Summary of Business Law.** Basic principles of the private law of business including the law of contracts, agency, and business organizations; a brief introduction to the law of sales, commercial paper, security devices, and property. Prerequisite: Junior standing. 3 hours. Credit is not given for both Business Administration 261 and 303.
274. **Operations Research.** Introduction to methods of operations research from an executive or managerial viewpoint, emphasizing formulation of business problems in quantitative terms; industrial applications of linear programming, dynamic programming, game theory, probability theory, queueing theory, and inventory theory. Prerequisite: Economics 173, or consent of instructor. 3 hours.
294. **Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0, honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours.
295. **Senior Research.** A research and readings course for students majoring in business administration. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours.
300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Political Science, and Social Science 300. See Political Science 300.
303. **Principles of Business Law.** Contracts, sales, products liability, commercial paper, debtor-creditor relations, property, agency and employment, partnership, corporation. Prerequisite: Business Administration 200 or consent of instructor. 4 hours of 1 unit.
314. **Production.** Introduction to production management, consideration of major problems of the production area, and the use of quantitative methods for solving them. Prerequisite: Business Administration 274 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
315. **Management in Manufacturing.** The application of production concepts and quantitative techniques to actual industrial problems; the mathematical structure of the particular production problems; the general structure of the production system and its interaction with marketing and budgeting; and areas including inventory control, production processes, programming, production control, forecasting of production levels, simulation of the production system, and physical planning of industrial plants. Prerequisite: Business Administration 314. 3 hours or $\frac{1}{2}$ unit.
320. **Marketing Research.** Focuses on the techniques and methods of marketing research; emphasizes primarily survey research and experimental design; and offers students the opportunity to apply techniques to real-world situations. Prerequisite: Business Administration 202 and Economics 172. 3 hours or $\frac{1}{2}$ unit.
321. **Individual Behavior in Organizations.** Understanding the behavior of employees in

- work organizations; particular attention to the motivation of individuals to join and perform in organizations and to employee satisfaction with elements of the work environment; and emphasis on various management strategies to modify employee motivation and satisfaction. Prerequisite: Business Administration 210, graduate standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 322. Group Processes in the Organization.** Analyzes several aspects of group techniques within the organization, including norm establishment, communication and comparison processes, collective bargaining, group decision making, problem solving, and coalition formation and conflict. Prerequisite: Business Administration 210 and Psychology 201. 3 hours or $\frac{3}{4}$ unit.
- 323. Organizational Design and Environment.** Understanding of complex organizations; particular attention to ways of dividing work, achieving coordination, and issues connected with change and adaptation. Prerequisite: Business Administration 210. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 337. Promotion Management.** Studies the effects of promotion upon sales and society from managerial and behavioral points of view; examines management of the advertising, sales promotion, and sales force functions within the context of an overall marketing program; includes consumer response to advertising, promotional planning and budgeting, advertising and sales research, media selection, legal environment of promotion, and sales force management and control; takes an analytical focus throughout; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 338. Strategic Marketing in Food and Agribusiness.** Same as Agricultural Economics 338. See Agricultural Economics 338.
- 339. Practicum in Food and Agribusiness Management.** Same as Agricultural Economics 339. See Agricultural Economics 339.
- 343. Purchasing and Materials Management.** Examines the analysis, planning, and forms of organization that are associated with the buying functions in business. Major focus on the principal issues involved in the procurement of raw materials, components, equipment, operating supplies, and services. Also treats the unique aspects of institutional and government purchasing. Case problems constitute a major vehicle of instruction. Prerequisite: Business Administration 200 and 202. 3 hours or $\frac{3}{4}$ unit.
- 344. Buyer Behavior.** Studies the factors affecting customer behavior in household and organizational markets and their relevance for marketing management planning and analysis; provides an overview of explanations of consumption differences anchored in socioeconomic, demographic, cultural, and psychological processes; and surveys buyer decision-making processes and their implications for marketing strategy. Prerequisite: Business Administration 320. 3 hours or $\frac{1}{2}$ unit.
- 345. Small Business Consulting.** Through guided experience, students identify and offer advice to local small business firms; exposes students, serving as consultants, to the wide variety of problems facing the smaller firm as well as enables them to apply current business methods to real problems. Students work in teams. Prerequisite: Junior standing in the College of Commerce and Business Administration or admission to the Master of Business Administration program; or consent of instructor. 4 hours or 1 unit.
- 346. Entrepreneurship: Small Business Formation.** Studies entrepreneurship for those with a serious interest in owning their own business within five years of graduation; students prepare a comprehensive business plan for starting or acquiring such a business; also studies the problems of an existing small business. Prerequisite: Consent of instructor. 4 hours or 1 unit.
- 347. Legal Strategies for the Entrepreneurial Firm.** Addresses the legal and managerial strategies important to the emerging firm, with particular focus on defensive legal strategies in the context of entrepreneurship. From the entrepreneur's perspective, examines the law of partnerships, sole proprietorships, corporations, joint ventures, agency, and defensive strategies to thwart takeovers. 4 hours or 1 unit.
- 351. Personnel Administration.** Studies concepts and methods used by the staff personnel unit in building and maintaining an effective work force in an industrial organization; development of ability to design the personnel subsystem within the firm and to deal

effectively with problems encountered in such areas as recruitment, selection, training, and wage and salary administration; and considerable emphasis on case analysis, role playing, and research. Prerequisite: Business Administration 323; Economics 173 and 240. 3 hours, or $\frac{1}{2}$ to 1 unit. Credit is not given for Business Administration 351 and Psychology 245.

- 352. Pricing Policies.** The role of pricing in contemporary marketing and major pricing decisions facing the firm; theoretical, economic, and practical methods and models for setting prices; pricing new products, initiating price changes, and responding to competitive pricing; the relationship of pricing objectives and strategies to the goals of the firm; and sealed bidding for contracts. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 360. Marketing to Business and Government.** Introduces the general area of industrial marketing; examines the nature of industrial markets especially as they compare to consumer markets and emphasizes such factors as the demand for industrial goods, marketing intelligence systems for industrial firms, marketing strategy in industrial markets, and analyses and control of industrial marketing programs; integrates important concepts from sales management and business logistics throughout the course; uses case studies. Prerequisite: Business Administration 202. 3 hours or $\frac{1}{2}$ unit.
- 370. International Marketing.** Examines social, political, cultural, and economic environmental differences among countries in terms of their impact on the strategy of extension versus adjustment of marketing practice by multinational corporations; examines each marketing function in detail with respect to the specific areas the international marketer must examine. A special section concentrates on international market research. Prerequisite: Business Administration 344 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 380. Advanced Marketing Management.** An integrative study of methods and models for marketing decision-making; emphasizes the application of analytical tools and behavioral and quantitative models to marketing decision-making. Uses lectures, case studies and simulation exercises. Prerequisite: Business Administration 274 and 344. 3 hours or $\frac{1}{2}$ unit.
- 382. Introduction to International Business.** Analyzes the major business management functions of international business operations of multinational firms; topics include international business environment, organizational policies and strategies of multinational companies, industrial relations and control policies. Prerequisite: Business Administration 202 or 210, or equivalent; Economics 101 or 102. 3 hours or $\frac{1}{2}$ unit.
- 384. International Management.** Analyzes the impact of socio-cultural variables on organization structure processes, decision-making, leadership role, employee motivation and productivity in the international business area. Prerequisite: Business Administration 202 or 210, or equivalent; senior standing. 3 hours or 1 unit.
- 389. Business Policy.** Analysis of policy formulation and implementation from a company-wide standpoint; emphasis on integration of knowledge and approaches across functional areas; both endogeneous and exogeneous factors which affect company policies; and the role of the firm in society. Prerequisite: Senior standing in the College of Commerce and Business Administration. 3 hours or $\frac{1}{2}$ unit.
- 391. Introduction to Management Information Systems.** Same as Accountancy 332. See Accountancy 332.
- 392. Information Organization for Management Information Systems.** Same as Accountancy 333. Data collection, classification, verification, and transmission; file organization, including sequential and random processing techniques, record locating, overflow procedures, and file security; analysis of alternative methods of data organization; commercial file management systems; design of data processing systems; and instruction in COBOL and use of case studies. Prerequisite: Accountancy 332 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 393. Management Information System Development.** Same as Accountancy 334. Essential steps in developing a management information system, including preliminary planning, design, feasibility analysis, implementation schedule, and postimplementation review of the system; includes a semester-long project which familiarizes students with methodology and techniques. Prerequisite: Accountancy 332 or Business Administration 392, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.

394. **Management Information and Control Systems.** Same as Accountancy 335. See Accountancy 335.
408. **Foundations of Behavioral Science for Administration.** Develops and integrates fundamental behavioral concepts and theory having administrative applications; initially focuses on the individual decision maker and ultimately includes interpersonal, organizational, and social structures and influences; and develops strategies and methods of research on behavioral applications in business. 1 unit.
409. **Organizational Behavior.** Same as Labor and Industrial Relations 409. Examines and analyzes the organization as a social system and the impact of its various components on work attitudes and behavior; topics include the development of organizational structures, organizational effectiveness, decision making and policy formulation, leadership, and change. Prerequisite: Business Administration 408. 1 unit.
410. **Organizational Sciences, I.** Same as Political Science 460, Psychology 453, and Sociology 456. Introduction to the principal theories and important empirical research in various disciplines that study organizations; in addition to examination of the subject matter content of various disciplines, students critically examine the capacities and limitations of the various fields to make contributions to the study of organizations. Prerequisite: Enrollment as a major in organizational sciences in a cooperating program or consent of instructor. 1 unit.
411. **Problems of Personnel Management.** Same as Labor and Industrial Relations 448. Examines the organization and administration of the personnel function in management; the relations of personnel administration to operating departments and the scope of business and industrial personnel services; analytical appraisal of policies and practices in selected areas of personnel administration, such as selection and training, carried out through case studies and direct industrial contracts; and specific consideration given to problems up to and including placing the person on a job. Prerequisite: Consent of instructor. 1 unit.
412. **Organization and Its Environment.** Analysis of business organizations adapting to shifts in internal and external elements; major emphasis on (1) the business firm as a part of a complex socioeconomic system; (2) the effects of government, labor unions, and political, religious, and business organizations on the executive's decision problems; (3) environmental factors conducive to organizational change; and (4) organizational growth. Prerequisite: Business Administration 409. 1 unit.
413. **Behavioral and Organizational Decision Making.** Examines the major types of organization theory; use of organization theory to guide research and to make business decisions; and examination of major research methods used to study business organizations. Prerequisite: Business Administration 412. 1 unit.
414. **Human Resources Management and Strategy.** Same as Labor and Industrial Relations 465. See Labor and Industrial Relations 465.
415. **Foundations of Buyer Behavior.** Studies alternative models of buyer behavior; focuses attention on psychological, sociological, and economic factors including motivation, learning, attitudes, personality, reference groups, social stratification, demographics, life-styles, and cross-cultural differences and their impact on purchasing, consumption, and choice decisions. Prerequisite: Business Administration 420. 1 unit.
416. **Metatheory in Consumer Behavior.** An advanced doctoral level seminar which critically examines the relevance of behavioral and social constructs for generating consumer behavior theories with the use of philosophy of science and metatheory criteria; specifically discusses the need for, and procedures with which to modify behavioral/social constructs and processes such as motivation, concept formation, information processing, choice axioms, attitude consistency, and group norms. Prerequisite: Business Administration 415. 1 unit.
420. **Marketing Management.** Introduces concepts useful in understanding marketing systems and buyer behavior in addition to developing skills in making marketing decisions; the orientation is primarily managerial and uses examples from both business and nonbusiness contexts. 1 unit.
421. **Marketing Strategy: Theoretical Foundations.** A formal analysis of strategy drawing on concepts from the theory of games, decision theory, value theory, and information theory;

topics cover elements of game models, classes of decision problems, games against nature, modern utility theory, information theory, group decision making, statistical decision theory, and linear and nonlinear optimization. 1 unit.

- 422. Marketing Strategy: Decision Models.** The role of models in the design, implementation, and adjustment of seller strategy; application of simulation, programming, and other methods to the specification and solution of product, price, promotion, and other marketing problems; and topics including the nature of models and model building, forecasting models, optimization models, and other decision models. Prerequisite: Business Administration 421. 1 unit.
- 424. Market Segmentation.** Deals with unique subsets of potential customers in the market who differ with regard to applications of the marketing tactic to be employed; applies cost benefit criteria to possible aggregations of these subsets. Discusses the topic from a historical perspective, a research perspective, and finally a strategic perspective; involves actual segmentation research by students. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
- 425. Product Management.** The decisions on the firm's total market offer, including such topics as use of market analysis in making decisions on assortment, product development, pricing, packaging, branding, and sales forecasting; coordination of these decisions and actions with market communications, physical movement, production, finance, and the overall goals and policies of the firm; and emphasizes the use of analytic and research methods in making assortment and product decisions. Prerequisite: Business Administration 420 and 472; or consent of instructor. 1 unit.
- 426. Marketing Theory and Systems.** A detailed study of macro- and micro-marketing systems and the various approaches to marketing theory; attention given to general systems theory, the nature of marketing systems, system adaptation to the environment, concepts of theory, and major approaches to macro- and micro-theory in marketing. 1 unit.
- 427. Sales Force Management.** Examines primary elements and problems in the area of sales force management; studies such topics as the dyadic interaction between the buyer and seller, the sales presentation, important salesperson characteristics, the selection, training, assignment, motivation, and compensation of salespeople, supervision and evaluation of the sales force, and coordination of the sales force with other elements in a firm's marketing program. Uses case studies. Prerequisite: Business Administration 420. 1 unit.
- 428. Promotional Strategy.** Management orientation to promotional strategy for the medium and large size organization: includes analyses of the primary elements of the promotional function from both qualitative and quantitative perspectives emphasizing such factors as (1) selection among alternative promotional tools, (2) the promotional budgeting and allocation process, and (3) determination of appropriate messages and media schedules for given product/market situations. Explores widely used models in depth for strategic usefulness; emphasizes case analysis and contemporary situations. Prerequisite: Business Administration 420. 1 unit.
- 429. Marketing Research.** Examines the collection and analysis of information applied to marketing decisions; stresses quantitative methods including samplings, scalings, experimental design, forecasting, and multivariate procedures through the use of class projects on actual market research problems. Prerequisite: Business Administration 472, and credit or concurrent registration in Business Administration 420. 1 unit.
- 430. Research Methods in Business Administration.** Theory and practice of research methodology for the study of administrative, industrial, and consumer behavior and organizations; alternative methods of data collection and their strengths and weaknesses; observational, questionnaire, field, and laboratory experimentation and statistical analysis of pregathered time-series and cross-sectional data; and examples of good and bad research in business disciplines. A completed individual research project of potentially publishable nature is formally presented in class. Prerequisite: Basic inferential statistics course; credit or concurrent registration in Business Administration 408. 1 unit.
- 431. Survey Methods in Marketing Research.** Same as Sociology 474. Analysis of survey methods in marketing with emphasis on sample design, data collection, and data

- processing; an advanced course in the methods required to design, implement, and evaluate a research project. Prerequisite: Economics 171 or equivalent. 1 unit.
432. **Applied Multivariate Analysis in Business.** An advanced doctoral level seminar on the applications of multivariate statistical techniques to marketing and business problems; critically examines the relevance of optimization rules and inferential properties of various multivariate techniques including regression, AID, MANOVA, discriminant, canonical, factor, clustering and multidimensional scaling for marketing and business problems; particularly emphasizes pitfalls of data and computational problems. Prerequisite: Psychology 494. 1 unit.
433. **Experimental Design.** Training in the design, execution, and interpretation of field and laboratory experimental research; emphasis on the evaluation of alternative designs, execution of problems, and interpretation of data; and a review of illustrative research studies made, an actual study designed, and data collected and interpreted. Prerequisite: Business Administration 472 or consent of instructor. 1 unit.
435. **The Sampling of Human Populations and Social Organizations.** Same as Sociology 485 and Psychology 485. Procedures for selecting samples from and estimating population parameters for human populations and social organizations; types of sample designs treated include simple random samples, stratified, and cluster samples together with random number and systematic selection techniques; and emphasis given to the study of various kinds of advanced sample designs for both area and institutional settings together with the problems involved in the application of analytical statistics to complicated sampling procedures. Each student is required to participate in a field project which involves the actual selection of a cluster sample from the local area. Prerequisite: Sociology 387 or consent of instructor. 1 unit.
443. **Legal Aspects of Management Decisions.** The legal environment in which business decisions are made, including the legal system and the role of courts, government taxation and regulation of business, administrative law, antitrust law, labor law, and trends in the law affecting business policy. 1 unit.
444. **Policy and Planning.** Policy construction and planning of policy implementation at the executive level; case studies of company-wide situations from the management point of view; and integration and application of material from previous courses. Credit is not given for both Business Administration 444 and 389. Prerequisite: Business Administration 408, 420, and 467, Finance 451, or equivalent. 1 unit.
467. **Production Management.** An introductory course in decision-making problems in production; includes the theoretical foundations for production management as well as the applications of decision-making techniques to production problems in the firm; and considers production processes, plant layout, maintenance, scheduling, quality control, and production control in particular. Prerequisite: Business Administration 472 and 473. 1 unit.
468. **Production Planning and Control.** In-depth treatment of decision-making topics in production at the factory manager level and above; topics include the development of generalized decision rules and systems analysis in production; and particular emphasis on the design of production control, quality control, and inventory control systems, and how each of these systems is integrated into the firm as a whole. Prerequisite: First year of the M.B.A. program. 1 unit.
469. **Quantitative Techniques in Production.** An advanced course in the application of quantitative techniques to decision-making problems dealing with production in the firm; topics include structural estimation of production systems, application of operations research techniques to production problems, and computer simulation of decision systems. Prerequisite: Business Administration 468 or equivalent. 1 unit.
470. **Mathematical Analysis for Management Decisions.** An elementary course in calculus with applications to business and economics; topics include differentiations, integration, Lagrange multipliers, multivariate functions, and matrices. 1 unit.
472. **Modern and Classical Statistics for Management Decisions.** The application of classical and modern statistics for business decision making. The level of the course assumes some prior knowledge of basic statistics as well as facility with elementary calculus. Prerequisite: Business Administration 470. 1 unit.

- 473. The Quantitative Analysis of Decisions.** Introduction to operations research techniques; topics include the construction and solution of linear models under certainty, and the construction of probabilistic models, specifically queueing theory, Markov chains, and sequential decisions. Prerequisite: Business Administration 470. 1 unit.
- 474. Applications of Operations Research Techniques.** The application of the operations research techniques developed in Business Administration 473 to practical business problems. Most of the semester is devoted to a series of field research studies. A review of previous work in the field is made prior to the field studies, and the role of the computer in solving operations research problems and its application to the field research is also a major consideration. Prerequisite: Business Administration 473. 1 unit.
- 475. Systems Modeling and Simulation.** Same as Computer Science 445. Theory and techniques of simulation and gaming; simulation languages such as GPSS, DYNAMO, and SIMSCRIPT. Applications: investigation, control, and design of various systems (inventory, production scheduling, computer, marketing, and others). Prerequisite: Computer Science 105 or Statistics 310 or Business Administration 274, or equivalent, or consent of instructor. 1 unit.
- 476. Business Forecasting and Econometrics.** Introduction to maximum likelihood estimating techniques; topics including the use and limitations of least squares, two-stage least squares, limited-information and full-information estimates; and consideration of problems with observational errors, multicollinearity, and autocorrelation in time-series and cross-section structural estimation. A major portion of the course is devoted to the application of the econometric techniques in business forecasting and analysis. Prerequisite: Business Administration 472. 1 unit.
- 477. Economics of Decision Making.** The operational analysis of the problems of individual decisions under uncertainty that arise in the practice of management. Prerequisite: Business Administration 472. 1 unit.
- 478. Stochastic Models in Management Science.** Application of Markov processes to describe, analyze, and design systems of interest in management science, including queues, inventory, production, brand loyalty, stock market, and other applications. Prerequisite: Mathematics 361 or Statistics 310, or equivalent. 1 unit.
- 479. Mathematical Programming for Management Science.** Mathematical programming models (linear, integer, quadratic, nonlinear, dynamic, and combinatorial) used to describe, analyze, and design systems such as production, transportation, scheduling, and planning. Prerequisite: Mathematics 315 or equivalent. 1 unit.
- 482. International Business Operations, I.** An integration of economics and the functional areas of business focused on the problems of managing international business operations; studies economic, legal, functional, and administrative problems through cases and literature emphasizing financial and marketing problems. Students select one area from the following for special study and reporting: Europe, Latin America, Africa, Middle and Near East, or South Asia and Far East. Prerequisite: Completion of first year of the M.B.A. program. 1 unit.
- 483. International Business Operations, II.** Continuation of Business Administration 482. Prerequisite: Business Administration 482. 1 unit.
- 486. Japanese Business and Management Systems.** Analyzes the business and management systems of Japan and compares them with the American business and management systems; topics include quality circles and quality of work life; the human side of Japanese productivity; business-government relations in Japan; organizational strategies and policies of Japanese business organizations; economic, political, legal, and ecological factors affecting Japanese management systems. Prerequisite: Graduate standing; Business Administration 409 or equivalent. 1 unit.
- 490. Seminar in Business Administration.** Special topics in the general area of business. Topics are selected by the instructor at the beginning of each semester. 0 to 1 unit.
- 491. Seminar in Special Topics.** Lectures in topics of current interest not covered by regular course offerings. Subjects are announced in the *Timetable*. Prerequisite: Consent of instructor or head of department. $\frac{1}{4}$ to 1 unit.
- 493. Research in Special Fields.** $\frac{1}{4}$ to 2 units.

- 494. Independent Study and Research.** Directed reading and research. $\frac{1}{2}$ or 1 unit.
- 499. Dissertation Research.** Required of all students writing doctoral dissertations in business administration; guidance in writing theses and seminar discussions of interim progress reports. 0 to 4 units.

BUSINESS AND TECHNICAL WRITING

(See English)

CELL AND STRUCTURAL BIOLOGY

Head of Department: Alan Horwitz

Department Office: 506 Morrill Hall, 505 South Goodwin Avenue, Urbana

- 211. Developmental Biology.** Introduction to embryonic development with emphasis on understanding the basic processes of cell determination and differentiation, and morphogenesis, at the tissue, cell, and molecular levels. Prerequisite: Biology 122 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
- 213. Cells and Tissues.** Lecture introduction to the fundamental organization and structure of animal cells and tissues and plant cells, including ultrastructure. Prerequisite: Biology 121. 3 hours. Credit is not given for both Cell and Structural Biology 213 and Biology 151. Credit is also not given for Cell and Structural Biology 213 and 300, unless 300 is taken after 213. (Counts for advanced hours in LAS.)
- 215. Cells and Tissues Laboratory.** Laboratory course in the functional organization and structure of cells and tissues. Prerequisite: Credit or concurrent registration in Cell and Structural Biology 213 or 300; or equivalent lecture course with consent of instructor. 1 hour. Credit is not given for both Cell and Structural Biology 215 and Biology 151. (Counts for advanced hours in LAS.)
- 234. Functional Human Anatomy.** Studies the essentials of functional human anatomy with special reference to skeletal, muscular, splanchnic, circulatory, and nervous systems. Prerequisite: Biology 122 or Physiology 103; or consent of instructor. 5 hours. (Counts for advanced hours in LAS.)
- 290. Individual Topics.** Laboratory work and/or reading in fields selected in consultation with an appropriate faculty member. Prerequisite: 15 hours in Life Sciences courses including one course in Cell and Structural Biology, and consent of instructor. 1 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
- 300. Cell Biology, I.** Principles of eukaryotic cell biology; consideration of molecular and fine structural components of the cell with an emphasis on experimental analysis of the relationship of structure to function of gene, membrane, cytoskeleton, and extracellular matrix. Prerequisite: Biology 122, and credit or concurrent registration in Biochemistry 350 or 352, or consent of instructor. 4 or 5 hours, or 1 or $1\frac{1}{4}$ unit. Students who have received credit for Cell and Structural Biology 300 may not also receive credit for 213.
- 301. Cell Biology, II.** Continuation of Cell Biology I. Emphasis is on the cell cycle, transport, contractility, motility, and molecular and cellular topics in development, neurobiology, and immunology. Prerequisite: Cell and Structural Biology 300 or 213, and Biochemistry 350 or 352, or consent of instructor. 4 or 5 hours, or 1 or $1\frac{1}{4}$ units.
- 307. Structure and Function of the Nervous System.** Same as Physiology 315. Examines the structural organization and function of the major systems of the nervous system.

- Prerequisite: Physiology 302, Biology 303, graduate standing, or consent of instructor. 4 hours or 1 unit.
308. **Immunology.** Introduction to fundamentals of immunology with emphasis on biological application; basic background for understanding immunological responses and techniques applicable to biological research. Prerequisite: Four semesters of college biology; a course in organic chemistry, or consent of instructor. 4 hours or $3/4$ unit.
315. **Human Genetics.** Studies the techniques employed for genetic analysis of human traits; discussion of genetic mechanisms operative in human development, metabolism, and behavior; and genetics and human disease. Prerequisite: Biology 122 or 210; biochemistry and statistics recommended. 3 hours or $3/4$ unit.
319. **Vertebrate Histology.** Microscopic anatomy of vertebrates with special reference to man; emphasis on developing an understanding of the structural organization of cells, tissues, and organs, together with functional relationships; provides morphological approaches for comprehending and investigating biological problems at cellular and subcellular levels. Prerequisite: Biology 122 or 151, or equivalent; and consent of instructor. 4 hours or 1 unit.
322. **Anatomy of the Human Extremities.** Comprehensive study of the human extremities with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $1/2$ unit.
323. **Anatomy of the Human Thorax and Back.** Comprehensive study of the human thorax and back with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 1 hour or $1/4$ unit.
324. **Anatomy of the Human Abdomen and Pelvis.** Comprehensive study of the human abdomen and pelvis with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $1/2$ unit.
325. **Anatomy of the Human Neck and Head.** Comprehensive study of the human neck and head with emphasis on the principles of systematic anatomy, relations between form and function, and regional dissection. Prerequisite: Consent of instructor. 2 hours or $1/2$ unit.
335. **Image Processing for Biologists.** Applications of imaging technology to contemporary problems in cell biology. Includes in-depth discussion of examples based on recent literature. Several demonstrations at research image workstations will be scheduled. Prerequisite: Math 130, 131, or 245, or equivalent, and Physics 102 or 108, or equivalent. A previous course in cell biology (e.g., Cell and Structural Biology 213 or 300, Biology 151, or Physiology 301, or equivalent) is recommended. 3 hours or $3/4$ unit.
380. **Developmental Neurobiology.** Principles of vertebrate and invertebrate developmental neurobiology with emphasis on the molecular and cellular mechanisms controlling neuronal determination, axon pathfinding, synapse formation, and plasticity. Prerequisite: Cell and Structural Biology 213 or 300 or consent of instructor. 3 hours or $3/4$ unit.
412. **Cell and Structural Biology Seminar.** Invited speakers, faculty, and student presentations and discussions on current research topics. Prerequisite: Graduate standing and Cell and Structural Biology 300; or consent of instructor. $1/4$ unit. May be repeated to a maximum of 2 units.
490. **Individual Topics.** Individual topics in research and/or reading for graduate students, to be conducted under the supervision of faculty members in cell and structural biology; designed to allow students to become more familiar with specialized fields of study prior to committing themselves to a specific area for their graduate degree. Prerequisite: Graduate standing and consent of instructor. $1/4$ to 4 units.

CERAMIC ENGINEERING

(See Materials Science and Engineering)

CHEMICAL ENGINEERING

Head of Department: R. C. Alkire

Department Office: 114 Roger Adams Laboratory, 1209 West California Street, Urbana

- 161. The Chemical Engineering Profession.** Lectures and problems on the history and scope of chemical engineering endeavors; decisions and criteria for process development and plant design. Prerequisite: Chemistry 101 or 107. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Cooperative Education: Planning.** Same as Chemistry 201. See Chemistry 201.
- 202. Cooperative Education: Industrial Practice.** Same as Chemistry 202. See Chemistry 202.
- 261. Introduction to Chemical Engineering.** Lectures and problems on material and energy balances. Prerequisite: Chemistry 102 or 108. 3 hours.
- 292. Senior Thesis.** Limited in general to seniors in the curriculum in chemical engineering. Any others must have the consent of the head of the department. Each student taking the course must register in a minimum of 5 hours either in one semester or divided over two semesters. A maximum registration of 10 hours in two semesters is permitted. However, Chemical Engineering 390 (2 hours) may be substituted for 2 of the 5 hours required in Chemical Engineering 292. In order to receive credit, a thesis must be presented by each student registered in Chemical Engineering 292. 1 to 6 hours.
- 370. Chemical Engineering Thermodynamics.** Fundamental concepts and laws of thermodynamics with emphasis on application to chemical engineering problems; introduction to phase equilibria. Prerequisite: Chemical Engineering 261. 3 hours or $1/2$ unit.
- 371. Fluid Mechanics and Heat Transfer.** Introduction to fluid statics and dynamics; dimensional analysis; design of flow systems; and introduction to heat transfer conduction, convection, and radiation. Prerequisite: Chemical Engineering 261 or consent of instructor. 4 hours or 1 unit.
- 373. Mass Transfer Operations.** Introduction to mass transfer processes and design methods for separation equipment. Prerequisite: Chemical Engineering 371 or consent of instructor. 4 hours or 1 unit.
- 374. Chemical Engineering Laboratory.** Experiments and computation in fluid mechanics, heat transfer, reaction kinetics, and separation processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; senior standing in chemical engineering. 3 hours or $1/2$ unit.
- 377. Synthesis and Design of Chemical Systems.** Techniques used in the synthesis and analysis of designs for chemical processing systems; emphasizes the strategy of process engineering, including economic analysis, process simulation, and optimization. This is a capstone course designed to bring together principles from previous courses for the design of complete processes. Prerequisite: Chemical Engineering 373; credit or concurrent registration in Chemical Engineering 381; Mathematics 285; Computer Science 101. 3 hours or $3/4$ unit.
- 380. Heat, Mass, and Momentum Transport.** A unifying treatment of physical rate processes with particular emphasis on the formulation and solution of typical boundary value problems associated with heat, mass, and momentum transport. Prerequisite: Chemical Engineering 371; Mathematics 285. 3 hours or $3/4$ unit.
- 381. Chemical Rate Processes and Reactor Design.** Chemical kinetics, chemical reactor design, and the interrelationship of transport and chemical reaction in open and closed systems. Prerequisite: Credit or registration in Chemical Engineering 373. 2 hours or $1/2$ unit.
- 382. The Prediction of Physical Properties.** Prediction of equilibrium and transport properties in gases, liquids, and solids. Prerequisite: One year of physical chemistry. 2 hours or $1/2$ unit.
- 387. Applied Chemical Kinetics and Catalysis.** Problems in chemical kinetics; techniques for the prediction and measurement of rates of reactions; and homogeneous and heterogeneous catalysis chain reactions. Prerequisite: Chemistry 342 or Chemical Engineering 370. 2 or 3 hours, or $1/2$ or $3/4$ unit.

388. **Electrochemical Engineering.** Fundamentals of analysis, design, and optimization of electrochemical systems. Prerequisite: Senior standing in physical science or engineering. 2 or 3 hours, or $1/2$ or $3/4$ unit.
389. **Chemical Process Control and Dynamics.** Techniques used in the analysis of process dynamics and in the design of process control systems; includes Laplace transforms, stability analysis, and frequency response methods. Laboratory emphasizes on-line data acquisition and control. Prerequisite: Chemical Engineering 371 and senior standing in Chemical Engineering; Mathematics 285; Computer Science 101. 3 hours or $3/4$ unit.
390. **Individual Chemical Engineering Projects.** Laboratory; development of an individual project. Prerequisite: Senior standing in chemical engineering. 2 hours or $1/2$ unit.
392. **Polymer Science and Engineering.** Fundamentals of polymer science and engineering; polymerization mechanisms, kinetics, and processes; physical chemistry and characterization of polymers; polymer rheology, mechanical properties, and processing. Prerequisite: Chemical Engineering 370; credit or concurrent registration in Chemical Engineering 371; Chemistry 344. 3 hours or $3/4$ unit. Credit is not given for both Chemical Engineering 392 or Chemistry 346.
396. **Special Topics in Chemical Engineering.** Study of topics in chemical engineering; content varies from semester to semester. Typical topics include optimization, chemical kinetics, phase equilibrium, biochemical engineering, kinetic theory, and transport properties. Prerequisite: Senior standing in chemical engineering, or consent of instructor. 1 to 3 hours, or $1/4$ to $3/4$ unit. May be repeated.
465. **Chemical Engineering Seminar.** Required of all graduate students whose major is chemical engineering. Prerequisite: Chemical Engineering 373. $1/4$ unit.
466. **Applied Mathematics in Chemical Engineering.** The development of mathematical models and a survey of modern mathematical methods currently used in the solution of chemical engineering problems; topics include the application of vectors and matrices, partial differential equations, numerical analysis, and methods of optimization in chemical engineering. Prerequisite: Consent of instructor. $3/4$ or 1 unit.
468. **Properties of Fluids.** The kinetic theory of gases and the prediction of transport coefficients; statistical mechanics applied to dense gases and liquids; and theories of solutions. Prerequisite: A background in modern physical chemistry and physics; consent of instructor. $3/4$ or 1 unit.
469. **Special Topics in Chemical Engineering.** Various advanced topics; generally taken during the second year of graduate study. Typical topics include turbulence, hydrodynamic instability, process dynamics, interfacial phenomena, reactor design, properties of matter at high pressure, and phase transitions. Prerequisite: Consent of instructor. $1/4$ to 1 unit. May be repeated.
487. **Fluid Dynamics.** Basic concepts in fluid dynamics with special emphasis on topics of interest to chemical engineers; derivation of the Navier-Stokes equations; solutions for creeping flow, for perfect fluids, and for boundary layers; non-Newtonian fluids; and turbulence. Prerequisite: Consent of instructor. 1 unit.
488. **Advanced Topics in Heat and Mass Transfer.** Principles of transfer operations developed in terms of physical rate processes; boundary layer heat and mass transfer, eddy diffusion, phase changes, and separation processes. Prerequisite: Consent of instructor. $3/4$ or 1 unit.
496. **Individual Study.** Study under the supervision of a staff member in areas not covered in course offerings. Prerequisite: Consent of the staff member under whom the study is to be made. 0 to 1 unit.
497. **Special Problems.** Individual work on problem-oriented projects not included in theses. This could be research, engineering design, or professional work in chemical engineering which has educational values. The work must be done under the supervision of a staff member with the approval of the department head. $1/2$ to 4 units.
498. **Research Seminar.** Discussion of recent developments of importance to different areas of chemical engineering research. The course is divided into a number of sections, and subject matter differs from section to section and from time to time. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.

- 499. Thesis Research.** Candidates for the master's degree who elect research are required to write a thesis. A thesis is always required for the Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in another department must receive permission from the head of the Department of Chemical Engineering to register in this course. 0 to 4 units.

CHEMICAL SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings:

Biochemistry, Chemical Engineering, and Chemistry.)

Director of School: Jiri Jonas

School Office: 106 Noyes Laboratory, 505 South Mathews Avenue, Urbana

CHEMISTRY

Head of Department: G. B. Schuster

Department Office: 106 Noyes Laboratory, 505 South Mathews Avenue, Urbana

- 100. Introductory Chemistry.** Introduction to the basic concepts and language of chemistry; lectures, recitations, and laboratory. Prerequisite: 2-2 units in high school mathematics, or credit or concurrent registration in Mathematics 112. 3 hours. Only students without high school chemistry or with chemistry placement scores inadequate for enrollment in Chemistry 101 receive graduation credit.

NOTE: Chemistry 101 - 102 constitutes the standard college chemistry sequence. Chemistry 107, 108, 109, and 110 is the intensive, more rigorous sequence for chemistry majors and well-prepared students of science. The regular and intensive sequences are not designed to be mixed. A student who registers for parts of both sequences without special permission from the director of general chemistry risks loss of credit. Chemistry 101 and 103 constitutes a terminal sequence for agriculture students which does not satisfy prerequisites for advanced chemistry courses.

- 101. General Chemistry.** Lecture and laboratory. For students who have some prior knowledge of chemistry. Principles governing atomic structure, bonding, states of matter, stoichiometry, and chemical equilibrium; descriptive chemistry of the elements and coordination compounds. Prerequisite: Credit in or exemption from Mathematics 112; one year of high school chemistry or equivalent. Placement into 101 by the Chemistry Placement Test recommended. 4 hours. Students may not receive credit for both Chemistry 101 and Chemistry 107 and 109. 3 semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
- 102. General Chemistry (Biological or Physical Version).** Lectures, recitations, and laboratory. Section B (Biological Version): Chemistry of organic and biochemical systems, chemical energetics and equilibrium, chemical kinetics, and reaction mechanisms. Section P (Physical Version): Chemistry of materials, including organic and biological substances, chemical energetics and equilibrium, chemical kinetics, and solids and crystals. Prerequisite: Chemistry 101, or Chemistry 107 and 109, or advanced placement credit for one semester of college-level chemistry. 4 hours. Students may not receive credit for both Chemistry 102 and Chemistry 108 and 110. 3 semester hours credit for the lecture portion of the course will be granted upon satisfactory performance on a proficiency examination or in other unusual cases at the discretion of the chemistry department.
- 103. General Chemistry: Organic Chemical Studies.** Lectures, recitations, and laboratory-discussion. Descriptive facts and theory of organic chemistry and applications to living

processes. For students in the College of Agriculture. A terminal course in chemistry; it does not meet the Chemistry 102 prerequisite for more advanced courses in chemistry. Prerequisite: Chemistry 101. 4 hours. Credit is not given for both Chemistry 103 and Chemistry 102 and 108.

107. **Accelerated Chemistry, I.** Lectures and recitations. The beginning chemistry course for students in the chemical sciences and others with strong high school chemistry and mathematics preparation. Chemical calculations, structure, bonding and equilibrium. Credit toward graduation is received for Chemistry 107 only if Chemistry 109 is also completed. Prerequisite: Admission by U. of I. placement test or consent of adviser; credit or concurrent registration in Mathematics 120, 121 or 135; concurrent registration in Chemistry 109. 3 hours.
108. **Accelerated Chemistry, II.** Continuation of Chemistry 107. Lectures and recitations. Emphasizes chemical thermodynamics, equilibrium, chemical kinetics, and coordination chemistry. Prerequisite: Chemistry 107 and/or 109 and concurrent registration in Chemistry 110, or consent of instructor. 3 hours.
109. **Accelerated Chemistry Laboratory, I.** Laboratory and discussion. Includes quantitative analysis. Prerequisite: Concurrent registration in Chemistry 107, or receipt of credit by examination for Chemistry 107, or consent of department. 2 hours. Credit is not given for both Chemistry 109 and either 122 or 123.
110. **Accelerated Chemistry Laboratory, II.** Laboratory and discussion. Includes experiments in qualitative analysis, inorganic synthesis, and kinetics as well as an individual project. Prerequisite: Concurrent registration in Chemistry 108 or consent of department. 2 hours.
115. **The Chemistry of Everyday Phenomena.** Introduces students majoring in nontechnical fields to the chemical model of the material universe describing the structure and dynamics of changing matter with special emphasis on the materials and processes of everyday living. Prerequisite: Two years of high school algebra. 3 hours.
122. **Elementary Quantitative Analysis.** Theory and practice of equilibria pertinent to chemical analyses; practical applications of classical and instrumental methods of analysis. Intended primarily for students outside the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 122 and either 109 or 123.
123. **Quantitative Analysis.** Theory and application of chemical equilibria and instrumentation in analysis. Intended primarily for students majoring in departments within the School of Chemical Sciences. Prerequisite: Chemistry 102 or equivalent. 3 hours. Credit is not given for both Chemistry 123 and either 109 or 122.
131. **Elementary Organic Chemistry.** Presents elementary structural and synthetic chemistry with emphasis on applications of this material to closely related areas. For students in agricultural, nutritional, and biological sciences, as well as premedical, pre dental, and preveterinary programs. One-semester survey course; may be followed by Chemistry 331. Prerequisite: Chemistry 102 or 108. 3 hours. Credit is not given for both Chemistry 131 and Chemistry 136.
134. **Elementary Organic Chemistry Laboratory.** Basic laboratory technique in organic chemistry is presented with emphasis on experiments of interest to closely related areas. For students in agricultural science, dairy technology, food technology, nutrition, dietetics, premedical, pre dental, and preveterinary courses. Prerequisite: Credit or concurrent registration in Chemistry 131. 2 hours. Credit is not given for both Chemistry 134 and 181.
136. **Fundamental Organic Chemistry I.** Lectures. The first semester of a two-semester integrated sequence (to be taken with Chemistry 336 the following semester). Presents fundamental structural, synthetic, and mechanistic organic chemistry. For students majoring in chemistry or chemical engineering, or in curricula requiring a rigorous background in organic chemistry. Prerequisite: Chemistry 108, 122, or 123; concurrent registration in Chemistry 181; Mathematics 130, 131, or 135. 3 hours. Credit is not given for both Chemistry 136 and 131.
181. **Structure and Synthesis.** A laboratory course emphasizing molecular structure and synthetic chemistry. Prerequisite: Chemistry 108, 122, or 123; Mathematics 130, 131, or 135; credit or concurrent registration in Chemistry 136. 2 hours. Credit is not given for both Chemistry 181 and 134.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Cooperative Education: Planning.** Same as Chemical Engineering 201. On-campus planning and discussion of cooperative work-study education programs in industry and government. Each chemistry or chemical engineering student participating in the cooperative education program must register for Chemistry/Chemical Engineering 201 or 202 each term (201 if on-campus, 202 if off-campus). Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
202. **Cooperative Education: Industrial Practice.** Same as Chemical Engineering 202. Off-campus cooperative practice of chemistry or chemical engineering in industrial or governmental facilities. Each chemistry or chemical engineering student participating in cooperative education must register for Chemistry 202 for each off-campus term. Prerequisite: Acceptance into the School of Chemical Sciences Cooperative Education Program. 0 hours.
245. **Thermodynamics of Materials.** Same as Materials Science and Engineering 301. See Materials Science and Engineering 301.
292. **Senior Thesis.** Research, with thesis, under the direction of a senior staff member in chemistry. Normally the student takes two semesters of Chemistry 292 in the senior year. Chemistry 292 is recommended for all those who plan to do research and graduate study, and it or Biochemistry 292 is a prerequisite for graduation with distinction in chemistry. In the semester preceding their initial enrollment, those interested in taking the course should consult with their advisers and with the graduate adviser for the area of interest in which they plan to work. A maximum of 10 hours may be counted toward graduation and a thesis must be presented for credit to be received. 2 to 6 hours. (Counts for advanced hours in LAS.)
315. **Inorganic Chemistry.** Electronic structure of atoms and molecules and their relation to the properties of the elements and compounds; types of bonding; and a survey of symmetry, group theory, ligand field theory, organo-metallic chemistry, acids and bases, nonaqueous solvents, homogeneous catalysts, and bioinorganic chemistry. Prerequisite: Credit or concurrent registration in Chemistry 342. 3 hours or $3/4$ unit.
316. **Inorganic Chemistry Laboratory.** Preparation of typical inorganic compounds illustrating special and advanced techniques, including characterization by modern physical methods. Prerequisite: Chemistry 383, or credit or concurrent registration in Chemistry 315, or equivalent. 3 hours or $3/4$ unit.
322. **Separation Methods.** Examines theory, practice, and instrumentation in gas and liquid chromatography, extraction techniques, mass spectrometry as coupled to chromatography, electrophoresis, and separations based on phase equilibria. Prerequisite: Credit or concurrent registration in Chemistry 340 or 342. 4 hours or 1 unit.
323. **Applied Electronics for Scientists.** A lecture and laboratory course designed expressly for chemists and other scientists or engineers who have little or no background in electronics, but who need a working knowledge of electronic devices, circuits, and instruments; begins with electronic principles and leads systematically into digital, analog, and servo systems used in scientific instrumentation. Prerequisite: Senior or graduate standing in any of the physical sciences or engineering, or consent of instructor. 4 hours or 1 unit.
329. **Instrumental Methods of Analysis.** Studies instrumental methods for characterization of chemical systems: potentiometry, voltammetry, atomic spectroscopy, molecular absorption and fluorescence, mass spectrometry, activation analysis, electron and x-ray spectroscopies, gas and liquid chromatography, and current topics such as laser spectroscopy. Prerequisite: Chemistry 340; or credit or concurrent registration in Chemistry 342; or consent of instructor. 4 hours or 1 unit.
331. **Organic Chemistry.** Second course; lectures covering topics in organic chemistry with special applications to the life sciences. Prerequisite: Chemistry 131 and 134. 3 hours or $3/4$ unit. This course should not be taken by students who have completed Chemistry 136. Students may not receive credit for both Chemistry 331 and Chemistry 336.
336. **Fundamental Organic Chemistry II.** Lectures. This course is the second semester of a two-semester integrated sequence and should be taken the semester following enrollment in Chemistry 136. Prerequisite: Chemistry 136 and 181; students who have completed

Chemistry 131 and 134 may be enrolled with consent of instructor. 3 hours or $3/4$ unit. Students may not receive credit for both Chemistry 336 and Chemistry 331.

337. **Organic Chemistry.** Laboratory experiments in organic chemistry with emphasis on synthesis. Prerequisite: Credit or concurrent registration in Chemistry 331 or 336. 3 hours or $3/4$ unit.
338. **Separation, Purification, and Identification of Organic Compounds.** Separation, purification, and identification of organic compounds using modern research methods; the identification of organic compounds by the use of spectroscopic methods and chemical conversion; the separation of mixtures and the purification of the components by crystallizations, sublimation, distillation, extraction, and chromatography; and the qualitative and quantitative identification of the components of a mixture. Prerequisite: Chemistry 331 or 336 and 337. 4 hours or 1 unit.
339. **Advanced Organic Chemistry.** Third course, lectures. Topics in structure, synthesis and reactions of organic chemistry. Prerequisite: Chemistry 331 or 336. 3 hours or $3/4$ unit.
340. **Principles of Physical Chemistry.** A one-semester course in physical chemistry emphasizing topics most important to students in the biological and agricultural sciences. Not open to students in the specialized curricula in chemistry and chemical engineering. Laboratory experience in this area provided by Chemistry 383 to be taken preferably after Chemistry 340. Prerequisite: Chemistry 122 or 123 and Chemistry 131, or equivalent; Physics 102; Mathematics 242 or equivalent (calculus including partial derivatives). 4 hours or 1 unit.
342. **Physical Chemistry, I.** Lectures and problems focusing on microscopic properties. Chemistry 342 and 344 constitute a year-long study of chemical principles covering topics such as quantum chemistry, atomic and molecular structure and spectra, statistical thermodynamics, properties and thermodynamics of materials in gases, solids, and liquids, and chemical kinetics and equilibria. Prerequisite: Chemistry 108, 122, or 123; Mathematics 225 or 315, and a minimal knowledge of differential equations, or equivalent; Physics 106, 107, and 108 or equivalent. 4 hours or 1 unit. Credit is not given for both Chemistry 342 and Physics 361.
344. **Physical Chemistry, II.** Continuation of Chemistry 342, focusing on bulk properties. Prerequisite: Chemistry 342. 4 hours or 1 unit. Credit is not given for both Chemistry 344 and Physics 361.
346. **Physical Chemistry of Macromolecules.** The physical properties of systems containing large molecules, with special emphasis on proteins, nucleic acids, and high polymers; the use of physical methods for the characterization of such substances. Prerequisite: Chemistry 340 or 344. 3 hours or $3/4$ unit. Credit is not given for both Chemistry 346 and Chemical Engineering 392.
348. **Advanced Physical Chemistry.** The sequence, Chemistry 348 and 349, is designed to give seniors and graduate students a unified treatment of physical chemistry on an advanced level; topics include the electronic structure and spectra of atoms, principles of wave mechanics, experimental and theoretical aspects of the chemical bond in diatomic and polyatomic molecules, statistical thermodynamics, and chemical kinetics. Prerequisite: Chemistry 344 or equivalent. 4 hours or 1 unit.
349. **Advanced Physical Chemistry.** Continuation of Chemistry 348. Prerequisite: Chemistry 348. 4 hours or 1 unit.
383. **Dynamics, Structure, and Physical Methods.** Laboratory presenting the relationship of dynamics and structure with emphasis on the use of physical methods to follow the course of reactions. Prerequisite: Chemistry 181 or 134; credit or concurrent registration in Chemistry 342, or credit in Chemistry 340. 2 hours or $1/2$ unit.
385. **Chemical Fundamentals.** Laboratory with experiments on the fundamental physical nature of chemical phenomena. Prerequisite: Chemistry 342 and 383; credit or concurrent registration in Chemistry 344. 4 hours or 1 unit.
390. **History of Chemistry.** Selected topics in the intellectual and social history of chemistry from antiquity to the present, viewed within the context of broader scientific and cultural developments. Prerequisite: Technical background commensurate with that of juniors in chemistry or allied sciences; or, with consent of instructor, junior standing in history and philosophy of science or other disciplines. 2 hours or $1/2$ unit.

- 391. Special Topics in Chemical Science and Technology.** Open to advanced undergraduates and graduate students. Deals with subjects not ordinarily covered by regularly scheduled courses. Prerequisite: Credit or concurrent registration in any 300-level course in chemistry. 2 or 3 hours, or $1/2$ or $3/4$ unit. May be repeated as topics vary.
- 392. Solid State Structural Analysis.** Lectures and laboratory on various aspects of x-ray diffraction studies of solids; topics include the properties of crystals, symmetry, diffraction techniques, data collection methods, and the determination and refinement of crystal structures. Prerequisite: Chemistry 342 or consent of instructor. 4 hours or 1 unit.
- 397. Radiochemistry.** Same as Nuclear Engineering 397. Properties of radioactive nuclei, nature of radioactivity, nuclear structure, nuclear reactions, interactions of radiations with matter, chemical aspects of radioactivity work, and applications of nucleonics to chemistry. Prerequisite: One semester of physical chemistry or one semester of atomic physics, or consent of instructor. 3 hours or $3/4$ unit.
- 404. Advanced Inorganic Chemistry Laboratory.** Specialized laboratory techniques; more difficult inorganic syntheses. Prerequisite: Credit or concurrent registration in one of the lecture courses in inorganic chemistry in the 400 series. $1/4$ to $3/4$ unit.
- 405. Inorganic Chemistry Seminar.** Required of all graduate students whose major is inorganic chemistry. $1/4$ unit.
- 406. Physical Inorganic Chemistry.** Includes group theory and use of physical methods to provide information about the geometry, electronic structures, and reactivity of inorganic compounds in solution; emphasizes NMR and ESR. Prerequisite: Chemistry 344. 1 unit.
- 407. Special Topics in Inorganic Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as organometallic chemistry, advanced ligand field theory and molecular orbital theory of inorganic compounds, kinetics and mechanisms of inorganic reactions, etc. Prerequisite: Chemistry 406 or consent of instructor. $1/2$ to 1 unit. May be repeated for credit.
- 421. Spectrochemical Methods of Analysis.** Principles and applications of spectroscopic measurements and instrumentation; atomic emission, absorption, and fluorescence; ultraviolet, visible, and infrared absorption spectroscopy; molecular fluorescence and phosphorescence; Raman spectroscopy; and other spectrometric methods. Prerequisite: General physics and chemistry equivalent to a major in physical sciences for a bachelor's degree. $1/2$ or 1 unit. ($1/2$ unit for lecture only; 1 unit for lecture and laboratory.)
- 422. Electrochemistry and Electroanalysis.** Fundamentals of electrochemical systems with an emphasis on structure and dynamics at electrode/electrolyte interfaces and applications of electrochemistry in chemical analysis. Prerequisite: Chemistry 342 and Chemistry 344. Chemistry 340 may be substituted for the Chemistry 342, Chemistry 344 sequence. $3/4$ or 1 unit. ($3/4$ unit for lecture only; 1 unit for lecture and laboratory.)
- 424. Special Topics in Analytical Chemistry.** Recent advances in measurement science and the application of analytical chemistry to other sciences; designed to acquaint students with techniques and applications not covered in other courses. Prerequisite: Consent of instructor. $1/2$ unit. May be repeated.
- 425. Analytical Chemistry Seminar.** Required of all graduate students whose major is analytical chemistry. $1/4$ unit.
- 430. Advanced Organic Chemistry: Structure and Spectroscopy.** Advanced survey of organic chemistry with emphasis on structure and spectroscopy. Prerequisite: Chemistry 331 or 336. 1 unit.
- 431. Advanced Organic Chemistry: Reaction Mechanisms.** Advanced survey of organic chemistry with emphasis on reaction mechanisms and concepts of physical organic chemistry. Prerequisite: Chemistry 331 or 336 and one year of physical chemistry. 1 unit.
- 432. Advanced Organic Chemistry: Synthesis.** Advanced survey of organic chemistry with emphasis on synthesis. Prerequisite: Chemistry 331 or 336. 1 unit.
- 433. Organic Chemistry.** Special topics in organic chemistry. An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as natural product synthesis and biosynthesis, organic photochemistry, chemistry of special families of organic compounds, etc. Prerequisite: Chemistry 431 and 432, one of which may be taken concurrently. $1/2$ or $3/4$ unit. Two lectures per week are required for $3/4$ unit credit. May be repeated for credit.

435. **Organic Chemistry Seminar.** Current literature in organic chemistry. Prerequisite: Consent of instructor. $1/2$ unit.
436. **Experimental Organic Chemistry.** A lecture course on research techniques in organic chemistry. Prerequisite: Consent of instructor. $1/4$ unit.
440. **Research Topics in Biophysical Chemistry.** Same as Biochemistry and Biophysics 440. Topics of importance in research in biophysical chemistry are discussed with emphasis on physical background and current applications; topics may be chosen from among the following: NMR and ESR spectra of biological macromolecules; x-ray diffraction studies of macromolecules; kinetics and statistical mechanics of helix coil transitions; physical approaches to the refolding and assembly of multi-subunit proteins; fluorescence spectroscopic studies on macromolecules; and light scattering from macromolecules in solution. Prerequisite: Chemistry 344 or equivalent, or Chemistry 346. 1 unit.
441. **Thermodynamics and Statistical Thermodynamics.** Fundamentals of classical thermodynamics with emphasis on equilibrium and stability criteria; an introduction to equilibrium statistical mechanics with discussion of several ensembles and applications to ideal systems of interest to chemists; and introduction to nonequilibrium thermodynamics. Prerequisite: Chemistry 342 and 344, or equivalent. 1 unit.
442. **Statistical Mechanics.** Fundamentals of equilibrium statistical mechanics with selected applications to interacting classical fluids: dense gases, solutions, liquids, plasmas, and ionic solutions; introduction to nonequilibrium statistical mechanics and linear response theory. Prerequisite: Chemistry 348 and 441, or equivalent, or consent of instructor. 1 unit.
443. **Quantum Dynamics.** The quantum mechanical description of time-dependent processes, including discussions of the time-dependent Schrodinger equation, approximations, interaction of matter with radiation, wave packets, elastic and inelastic scattering, and relaxation phenomena. Prerequisite: Concurrent registration in Chemistry 348 or consent of instructor. 1 unit.
445. **Physical Chemistry Seminar.** Required of all graduate students whose major is physical chemistry. Prerequisite: Consent of instructor. $1/4$ or $1/2$ unit.
446. **Molecular Electronic Structure.** The theoretical basis of the electronic structure of atoms and molecules; molecular orbital concepts and self-consistent field theory; angular momentum and the full rotation group; electron correlation effects; and applications to electronic spectroscopy of organic molecules, detailed descriptions of chemical reactions, and molecular properties. Prerequisite: Chemistry 348. 1 unit.
448. **Chemical Kinetics.** Theoretical and experimental topics in chemical kinetics and chemical dynamics; topics include relation between rates and mechanisms of chemical reactions, collision theory of reaction rates, activated complex theory, theory of unimolecular processes, classical dynamics of reactive scattering, elastic scattering, quantum theory of inelastic scattering or equivalent curve crossing processes, and experimental methods. Prerequisite: Chemistry 344. 1 unit.
449. **Special Topics in Physical Chemistry.** An advanced course dealing with a subject not ordinarily covered by regularly scheduled courses, such as molecular spectroscopy, statistical mechanics, radiation and hot-atom chemistry, molecular quantum mechanics, radio-frequency spectroscopy, advanced experimental methods, kinetics of irreversible processes and cooperative phenomena, etc. Prerequisite: Consent of instructor. $1/2$ or 1 unit. May be repeated.
490. **Special Topics in Chemistry.** Designed for students majoring or minoring in chemistry who wish to undertake individual studies of a nonresearch nature under the direction of a faculty member of the department. Prerequisite: Consent of instructor and written approval of department head. Staff for the course is the same as for Chemistry 499. $1/4$ to 1 unit.
496. **Isotopically Labeled Compounds in Chemistry and Biology.** A variable credit course consisting of 2 parts: 1) The first third is a practical study of the most commonly used radioisotopes, including procedures for their safe handling and 2) The last $2/3$ of the course studies the synthesis and analysis of isotopically labeled compounds using both radioisotopes and stable isotopes. Prerequisite: Chemistry 337 or consent of instructor. $1/4$ or $3/4$ unit. ($1/4$ unit granted for first third only; $3/4$ unit for entire course.)

- 499. Thesis Research.** A candidate for the master's degree who elects research is required to present a thesis. A thesis is always required of students working toward the degree of Doctor of Philosophy. Not all candidates for thesis work necessarily are accepted. Any student whose major is in a department other than chemistry or chemical engineering must receive permission from the head of the Department of Chemistry to register in this course. 0 to 4 units.

CINEMATOGRAPHY

(See Art and Design)

CIVIL ENGINEERING

Head of Department: Neil M. Hawkins

Department Office: 1114 Civil Engineering Building, 205 North Mathews Avenue, Urbana

- 195. Introduction to Civil Engineering.** A civil engineering orientation course including historical developments, educational requirements, relation to science, professional practice, and specialties within the profession. Prerequisite: Sophomore standing in civil engineering. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Engineering Surveying.** Introduction to surveying and photogrammetry. Prerequisite: Civil Engineering 293; credit or concurrent registration in Computer Science 101. 4 hours.
- 205. Route Surveying and Design.** Principles for the design and layout of routes; coverage includes horizontal and vertical alignment, route location, earthwork, computation, ground and photogrammetric survey methods, and special survey methods for highways, railroads, pipelines, tunnels and urban construction. Prerequisite: Civil Engineering 201 or consent of instructor. 3 hours.
- 210. Behavior of Materials.** Same as Theoretical and Applied Mechanics 224. See Theoretical and Applied Mechanics 224.
- 216. Construction Engineering.** Introduction to the construction processes: contracting and bonding, planning and scheduling, estimating and project control, productivity models, and construction econometrics. Prerequisite: Civil Engineering 292; credit or concurrent registration in Computer Science 101 and Civil Engineering 293. 3 hours.
- 220. Materials for Transportation Facilities.** Materials for the construction of transportation roadways including soils, aggregates, soil-aggregates, bituminous materials, asphaltic mixtures, and stabilized soils; emphasizes properties, behavior, mixture analysis, and quality control. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours.
- 241. Air and Water Quality.** Sources and types of air and water pollution; measurement of air and water quality; effects of pollutants on the environment; transport and ultimate fate of pollutants; environmental quality standards; and methods of pollution control and abatement. Prerequisite: Chemistry 102. 3 hours.
- 255. Introduction to Hydrosystems Engineering.** Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water; presents a quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: Civil Engineering 293 or a course in probability or statistics; credit or concurrent registration in Theoretical and Applied Mechanics 235 and Civil Engineering 292, or equivalent. 3 hours.
- 261. Introduction to Structural Engineering.** Basic topics in the analysis, behavior and design of trusses and framed structures under static loads; analysis topics include member forces

- in trusses, shear and moment diagrams, deflections, simple applications of the force method and slope-deflection; and an introduction to computer applications by means of a general purpose structural analysis program. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours.
262. **Intermediate Structural Analysis.** Energy principles as applied to structural analysis; a comprehensive study of the flexibility and stiffness methods of analysis of structures; influence functions; curves of maxima; and use and interpretation of computer structural analysis programs. Prerequisite: Civil Engineering 261. 3 hours.
263. **Behavior and Design of Metal Structures, I.** Introduction to the design of metal structures; behavior of members and their connections; and theoretical, experimental, and practical bases for proportioning members and their connections. Prerequisite: Civil Engineering 261. 3 hours.
264. **Reinforced Concrete Design, I.** Study of the strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces; extensive discussion of the influence of the material properties on behavior. Prerequisite: Civil Engineering 261. 3 hours.
280. **Introduction to Soil Mechanics and Foundation Engineering.** Classification of soils, compaction in the laboratory and in the field, soil exploration, boring and sampling, permeability of soils, one-dimensional settlement analyses, strength of soil, introduction to foundations. Prerequisites: Theoretical and Applied Mechanics 221. 3 hours.
284. **Geotechnical Engineering.** Introduction to applied problems in Geotechnical Engineering; analysis and design of foundations, bearing capacity and settlement of foundations; stability of excavations and slopes; ground movements due to construction; analysis and design of excavations, retaining walls, slopes and underground structures in soil and rock. Prerequisite: Civil Engineering 280. 3 hours.
292. **Planning, Design, and Management of Civil Engineering Systems.** Introduction to the formulation and solution of civil engineering problems. Major topics are: engineering economy, mathematical modeling, and optimization. Techniques, including classical optimization, linear and nonlinear programming, network theory, critical path methods, simulation, decision theory, and dynamic programming are applied with the aid of personal computers to a variety of civil engineering problems. Prerequisite: Mathematics 132, and credit or concurrent registration in Mathematics 225. 3 hours.
293. **Engineering Modeling Under Uncertainty.** Identification and modeling of nondeterministic problems in civil engineering, and the treatment thereof relative to engineering design and decision making. Development of stochastic concepts and simulation models, and their relevance to real design and decision problems in various areas of civil engineering. Prerequisite: Mathematics 132; credit or concurrent registration in Mathematics 242 recommended. 3 hours.
295. **Professional Practice.** A series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. Lectures are given approximately once a week. Prerequisite: Junior standing. 0 hours.
314. **Properties and Behavior of Concrete.** Examines the influence of constituent materials (cements, aggregates and admixtures) on the properties of fresh and hardened concrete; mix design handling and placement of concrete; and behavior of concrete under various types of loading and environment; test methods. Laboratory practice is an integral part of the course. Prerequisite: Civil Engineering 210. 3 hours or $3/4$ unit.
315. **Construction Productivity.** Introduction of the application of scientific principles to the measurement and forecasting of productivity in construction engineering. Conceptual and mathematical formulation of the labor, equipment, and material factors affecting productivity. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
316. **Construction Planning and Control.** Project definition; scheduling and control models; material, labor and equipment allocation; optimal schedules; project organization; documentation and reporting systems; and management and control. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $3/4$ or 1 unit.

- 318. Construction Cost Analyses and Estimates.** Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups and profits; and the fundamentals of cost recording for construction cost accounts and cost controls. Prerequisite: Civil Engineering 216 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 320. Pavement Analysis and Design, I.** Analysis, behavior, performance, and structural design of pavements for highways and airfields; topics include climate factors, rehabilitation, life cycle design economics, and traffic loadings. Prerequisite: Civil Engineering 220 or equivalent. 3 hours, or $3/4$ or 1 unit.
- 321. Bituminous Materials and Mix Design.** Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; and recycling of mixtures. Prerequisite: Civil Engineering 220 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 322. Development of Highway Facilities.** Analysis of factors in developing a highway transportation facility; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming improvements; drainage design; structural design of surface; concepts of highway management and finance; and highway maintenance planning. Prerequisite: Civil Engineering 220 or consent of instructor. 4 hours or 1 unit.
- 325. Highway Traffic Analysis and Design.** Study of fundamentals of traffic engineering; analysis of traffic stream characteristics; capacity of urban and rural highways; design and analysis of traffic signals and intersections; traffic control; traffic impact studies; and traffic accidents. Prerequisite: Civil Engineering 322 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 330. Urban Transportation Planning.** Same as Urban Planning 330. See Urban Planning 330.
- 334. Airport Facilities Design.** Basic principles of airport facilities design to include aircraft operational characteristics, noise, site selection, land use compatibility, operational area, ground access and egress, terminals, ground service areas, airport capacity, and special types of airports. Prerequisite: Senior standing in Civil Engineering, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 336. Hazardous Waste Management.** Analysis of the sources, characteristics, and environmental and health effects of hazardous wastes. Legislative and regulatory controls. Biological, chemical, and thermal destruction of hazardous materials. Land disposal of solid residues. Contaminated site clean-up. Prerequisite: Civil Engineering 342, and Civil Engineering 344 or equivalent. 3 hours or $3/4$ unit.
- 337. Managing Wastewaters in Aquatic Ecosystems.** Examines the characteristics of rivers and lakes which affect the management of domestic and industrial wastewaters; includes assessment of chemical hazards, and introduction to surveillance and biomonitoring, and a review of regulations governing effluents. Prerequisite: Civil Engineering 241 or consent of instructor. 2 hours or $1/2$ unit.
- 338. Biomonitoring: Design, Analysis, and Interpretation.** Discusses the theory and application of biomonitoring as a component of environmental management; reviews a range of techniques to analyze effluents and assess condition and trend in the environment, using biological and ecological systems; and emphasizes biomonitoring program design, selection and analysis of data, and interpretation of biomonitoring results. Prerequisite: Civil Engineering 337 or consent of instructor. 3 hours or $3/4$ unit.
- 339. Environmental Systems Analysis, I.** Examination of principles of environmental engineering design: applications to mathematical methods, including single and multi-objective programming, to environmental systems; economic analysis, including benefit-cost; and management strategies. Prerequisite: Civil Engineering 292; and Civil Engineering 342 or 349. 3 hours or $3/4$ unit.
- 340. Physical Principles of Environmental Engineering Processes.** Analysis of the physical principles which form the basis of many water and air quality-control operations;

sedimentation, filtration, inertial separations, flocculation, mixing and principles of reactor design. Prerequisite: Civil Engineering 342 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 341. Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Environmental Studies 341, Geography 341, and Urban and Regional Planning 375. Simulation of environmental, political, and economic problems facing a midwestern community. Students assume the responsibilities of planners, environmental quality managers, lawyers, business managers, land developers, and other roles and interact to resolve these problems. Introduces practical procedures and decisions that public servants, lawyers, engineers, business persons, and citizens in general confront with regard to the environment. Prerequisite: Senior or graduate standing, or consent of instructor and credit in an introductory course in pollution control. 2 hours or $\frac{1}{2}$ unit.
- 342. Water Quality Control Processes.** Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.
- 343. Chemical Principles of Environmental Engineering Processes.** Application of principles of chemical equilibrium and chemical kinetics to air and water quality. Chemistry topics are thermodynamics, kinetics, acid/base chemistry, complexation, precipitation, dissolution, and oxidation/reduction. Specific applications include batch reactors, alkalinity, acidity, buffers, the carbonate system, solubility, water stability, corrosion, and disinfectants. Prerequisite: Civil Engineering 342 or consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. Students taking the course for 4 hours or 1 unit enroll for the entire semester; students taking the course for 2 hours or $\frac{1}{2}$ unit take only the first half of the semester.
- 344. Solid Waste Management.** Analysis of the sources, quantities, and characteristics of solid waste; effect of refuse on the environment; establishment and operation of collection and transportation systems; material recovery systems; energy recovery systems; ultimate disposal systems. A term project is required of all graduate students. Prerequisite: Civil Engineering 241 or consent of instructor. 3 hours or 1 unit.
- 345. Atmospheric Dispersion Modeling.** Application of the fundamentals of meteorology to air pollution problems including the transport and diffusion of particulate matter, aerosols and gases; precipitation processes and rain-out; behavior of stack effluents; effects of pollutants in the atmosphere. Prerequisite: Theoretical and Applied Mechanics 235 and Mechanical Engineering 205, or equivalent, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 346. Biological Principles of Environmental Engineering Processes.** Application of principles of biochemistry and microbiology to air and water quality, wastes, and their engineering management; biological mediated changes in water and in domestic and industrial wastewater. Prerequisite: Civil Engineering 343 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 347. Stream Ecology.** Same as Ecology, Ethology, and Evolution 359. A description of physical, chemical, and biological characteristics in streams and rivers including an integrated study of the environmental factors affecting the composition and distribution of biota; emphasizes the application of ecological principles in aquatic ecosystem protection and management. Prerequisite: Civil Engineering 337 or Ecology, Ethology, and Evolution 212, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 348. Atmospheric Chemistry.** Same as Environmental Studies 348. Examines the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; atmospheric chemistry of carbon, nitrogen, and sulfur; atmospheric aerosol and heterogeneous reactions; material transport; stratospheric ozone and its depletion; airborne radioactivity and atmospheric ion chemistry. Prerequisite: Mechanical Engineering 207, Chemistry 340, or Atmospheric Sciences 301, or equivalent; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 349. Air Resources Engineering.** Introduction to air pollution; includes the basis for air quality criteria, classification of sources, and the design of systems to control air pollution from stationary sources. Prerequisite: Civil Engineering 241; credit or concurrent registration in Theoretical and Applied Mechanics 235. 3 hours or $\frac{3}{4}$ unit.

- 350. Surface Water Hydrology.** A study of descriptive and quantitative hydrology dealing with the distribution, circulation, and storage of water on the earth's surface; discusses principles of hydrologic processes and presents methods of analysis and their applications to engineering and environmental problems. Prerequisite: Civil Engineering 255 or equivalent with consent of instructor. 3 hours, or $3/4$ unit.
- 351. Hydromechanics.** Incompressible fluid mechanics with particular emphasis on topics in analysis and applications in civil engineering areas; primary topics include principles of continuity, momentum and energy, kinematics of flow and stream functions, potential flow, laminar motion, turbulence, and boundary-layer theory. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $3/4$ unit.
- 353. Analysis and Design of Hydraulic Systems.** Hydraulic analysis and design of engineering systems: closed conduits and pipe networks; hydraulic structures, including spillways, stilling basins, and embankment seepage; selection and installation of hydraulic machinery. Prerequisite: Theoretical and Applied Mechanics 235 or consent of instructor. 3 hours or $3/4$ unit.
- 356. Hydraulics of Surface Drainage.** Hydraulic analysis and design of urban, highway, airport, and small rural watershed drainage problems; discussion of overload and drainage channel flows; hydraulics of storm-drain systems and culverts; determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts. Prerequisite: Civil Engineering 255 or consent of instructor. 3 hours or $3/4$ unit.
- 357. Groundwater.** Physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass transport, well hydraulics and pumping test analysis, role of groundwater in the hydrologic cycle, groundwater quality and contamination. Prerequisite: Civil Engineering 255 and Theoretical and Applied Mechanics 235, or consent of instructor. 3 hours or $3/4$ unit.
- 361. Matrix Analysis of Framed Structures.** A unified formulation of displacement and force methods of analysis including the topological view of the structure as an assemblage of members; matrix techniques of formulation; considerations for automatic computation; and evaluation of truss, grid, and frame models for the response of real structures. Prerequisite: Civil Engineering 262. 3 hours, or $3/4$ or 1 unit. Credit is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.
- 363. Behavior and Design of Metal Structures, II.** Metal members under combined loads; connections, welded and bolted; moment-resistant connections; plate girders, conventional behavior, and tension field action. Prerequisite: Civil Engineering 263. 3 hours, or $3/4$ or 1 unit.
- 364. Reinforced Concrete Design, II.** Study of the strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $3/4$ or 1 unit.
- 365. Design of Structural Systems.** The whole structural design process including definition of functional requirements, selection of structural scheme, formulation of design criteria, preliminary and computer-aided proportioning, and analysis of response, cost, and value. Prerequisite: Civil Engineering 262, and credit in either Civil Engineering 263 or 264 with concurrent registration in the other. 3 hours or 1 unit.
- 367. Masonry Structures.** An introduction to analysis, design and construction of masonry structures. Mechanical properties of clay and concrete masonry units, mortar, and grout. Compressive, tensile, flexural, and shear behavior of masonry structural components. Strength and behavior of unreinforced bearing walls. Detailed design of reinforced masonry beams, columns, structural walls with and without openings, and complete lateral-force resisting building systems. Prerequisite: Civil Engineering 264 or first course in reinforced concrete design. 3 hours, or $3/4$ to 1 unit.
- 368. Prestressed Concrete.** Study of strength, behavior, and design of prestressed reinforced concrete members and structures, with primary emphasis on pretensioned, precast construction; emphasis on the necessary coordination between design and construction

techniques in prestressing. Prerequisite: Civil Engineering 262 and 264. 3 hours, or $3/4$ or 1 unit.

369. **Behavior and Design of Wood Structures.** Mechanical properties of wood, stress grades and working stresses; effects of strength-reducing characteristics, moisture content, and duration of loading and causes of wood deterioration; glued-laminated timber and plywood; behavior and design of connections, beams, and beam-columns; design of buildings and bridges; other structural applications: trusses, rigid frames, arches, and pole-type buildings; and prismatic plates and hyperbolic paraboloids. Prerequisite: Civil Engineering 261 and one of: Civil Engineering 262, 263, or 264. 3 hours, or $3/4$ or 1 unit.
371. **Fire Protection for Structures.** An introduction to the design and analysis of fire protection for structures of buildings; includes study of the effects of fire on structural materials and elements and of basic defenses against spread of fires; assessment of fire damage and methods of repair. Prerequisite: Civil Engineering 262, 263, and 264, or equivalent, or consent of instructor. 4 hours or 1 unit.
374. **Introduction to Structural Dynamics.** Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; and introduction to systems with distributed mass and flexibility. Prerequisite: Theoretical and Applied Mechanics 212; Mathematics 285; Civil Engineering 261, or equivalent. 3 hours, or $3/4$ or 1 unit. Credit is not given for both Civil Engineering 374 and Theoretical and Applied Mechanics 311.
375. **Welding and Joining Processes.** Same as Materials Science and Engineering 344 and Metallurgical Engineering 344. See Materials Science and Engineering 344.
378. **Introduction to the Design of Ocean Structures.** Introduction to design and construction of civil engineering structures in the ocean and to associated engineering operations; principal topics include water wave mechanics, engineering oceanography, wave and current forces, and design considerations for fixed and floating structures. Prerequisite: Theoretical and Applied Mechanics 235; Civil Engineering 261; Civil Engineering 293. 3 hours, or $3/4$ or 1 unit.
379. **Applied Structural Mechanics.** Study of beams under lateral load; beams with combined lateral load and thrust; beams on elastic foundations; applications of Fourier series and virtual work principles to beam-type structures; stress and strain in three dimensions; applications to flexure of beams and plates; elements of the engineering theory of plates; and torsion of thin-walled open sections. Prerequisite: Mathematics 285 and Civil Engineering 262. 3 hours, or $3/4$ or 1 unit.
383. **Soil Mechanics and Soil Behavior.** Composition and structure of soil; water flow and hydraulic properties; stress in soil; compressibility behavior and properties of soils; consolidation and settlement analysis; shear strength of soils; compaction and unsaturated soils; experimental measurements. Prerequisite: Civil Engineering 280 or equivalent, or consent of instructor. 4 hours or 1 unit.
384. **Applied Soil Mechanics.** Application of soil mechanics to earth pressures and retaining walls, stability of slopes, foundations for structures, excavations; construction considerations; instrumentation. Prerequisite: Civil Engineering 383 or equivalent. 4 hours or 1 unit.
391. **Computer Methods in Civil Engineering.** Review of programming concepts; formulation and programming of numerical, data processing, and logical problems with applications from various branches of civil engineering; organization of programs and data; and development and use of problem-oriented programming languages in civil engineering. Prerequisite: Computer Science 101 or equivalent; senior or graduate standing in civil engineering; or consent of instructor. 3 hours or 1 unit.
393. **Engineering Decision and Risk Analysis.** Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multi-objective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk-based design criteria, risk benefit trade-offs, and optimal decisions. Prerequisite: Civil Engineering 293 or equivalent, or consent of instructor. 3 hours, or $3/4$ to 1 unit.

- 394. Reliability of Civil Engineering Systems.** Modern probabilistic bases for the safety evaluation and design of civil engineering systems, including reliability analysis and development of probability-based design criteria. Quantitative risk evaluation, systematic assessment and analysis of uncertainties, safety and design factor determinations, system reliability. Application to structural, geotechnical, hydro, transportation and other systems. Prerequisite: Civil Engineering 293, or equivalent, or consent of instructor. 4 hours or 1 unit.
- 397. Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. Prerequisite: Senior or graduate standing. 1 to 4 hours, or 0 to 4 units.
- 398. Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering offered by the faculty to augment the formal courses available. Prerequisite: Individually identified for each offering under this course number; see *Timetable*. 1 to 4 hours, or $1/4$ to 1 unit.
- 414. Advanced Concrete Technology.** Discusses the physical and engineering properties of concrete at an advanced level, with emphasis on the materials aspects of repair and rehabilitation of concrete structures. Prerequisite: Civil Engineering 314. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Industrial Engineering 416. See Industrial Engineering 416.
- 417. Systems Analysis, II: Digital Simulation.** Same as Industrial Engineering 417. See Industrial Engineering 417.
- 420. Pavement Analysis and Design, II.** Development of models for and analysis of pavement systems; use of transfer functions relating pavement response to pavement performance; evaluation and application of current pavement design practices and procedures; analysis of the effects of maintenance activities on pavement performance; and economic evaluation of highway and airport pavements. Prerequisite: Civil Engineering 320. 1 unit.
- 421. Pavement Evaluation, Maintenance, and Rehabilitation.** Concepts and procedures for condition survey rating; evaluation by nondestructive testing (roughness, skid resistance, structural capacity); and destructive testing, maintenance strategies, and rehabilitation of pavement systems for highways and airfields. Prerequisite: Civil Engineering 320. 1 unit.
- 423. Highway Materials Stabilization.** Stabilization of aggregates and soils with cement, lime, bituminous materials, and other stabilizing agents; emphasis on basic stabilization reactions, properties of stabilized materials, and composition design. Prerequisite: Civil Engineering 220 or consent of instructor. 1 unit.
- 424. Transportation Soils Engineering.** Occurrence and properties of surficial soils, soil classification systems, soil variability; subgrade evaluation procedures, repeated loading behavior of soils; soil compaction and field control; soil moisture, soil temperature, and frost action; soil trafficability and subgrade stability for transportation facility engineering. Prerequisite: Civil Engineering 383 or equivalent. 1 unit.
- 439. Environmental Systems Analysis, II.** Examination of advanced topics in environmental systems analysis with emphasis on the mathematical modeling of water quality systems and multi-objective programming methods of analysis. Large scale optimization models and inter-relationships between water quality and water quantity analyses, e.g., reservoir operation. Prerequisite: Civil Engineering 339. 1 unit.
- 440. Processes for Water Quality Control, I.** Theory and basic design of processes used in water and wastewater treatment, including adsorption, ion exchange, chemical oxidation and reduction, disinfection, sedimentation, filtration, coagulation, flocculation, and chemical precipitation. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
- 441. Modeling of Water Quality in Natural Systems.** Studies mathematical modeling of the movement and fate of pollutants and other substances in streams, lakes, and other natural water bodies; the emphasis is on the development of practical models of aquatic systems. Prerequisite: Civil Engineering 340 or 351. 1 unit.
- 442. Processes for Water Quality Control, II.** Theory and its application for design and operation of processes used in water and wastewater treatment; emphasis is on biological

treatment processes and related processes for gas transfer, sludge dewatering, sludge disposal, and solids separations. Prerequisites: Civil Engineering 340 and 343, and credit or concurrent registration in Civil Engineering 346, or consent of instructor. 1 unit.

443. **Unit Operations in Environmental Engineering.** Experimental and pilot plant studies of unit operations and unit processes in environmental engineering, emphasizing water treatment and wastewater treatment; evaluation of parameters for the design of biological waste treatment units; determination of chemical requirements for water treatment processes; and studies of anaerobic digestion. Prerequisite: Civil Engineering 440 or credit or concurrent registration in Civil Engineering 442, or consent of instructor. 1 unit.
448. **Control of Air Pollution from Stationary Sources.** Same as Mechanical Engineering 411. Study of the basic theory of pollution control devices and their application to air pollution control problems. Prerequisite: Credit or concurrent registration in Civil Engineering 340 and 343, or consent of instructor. 1 unit.
449. **Techniques and Instrumentation in Air Sampling.** Same as Environmental Studies 449. Studies principles of sampling for particles and gases in the field of air pollution; examines instrumental techniques relevant to the design of sampling systems used in process control, ambient air monitoring and laboratory experiments; methods of sample analysis and their limitations. Prerequisite: Mathematics 285 and Civil Engineering 349; or consent of instructor. 1 unit.
450. **Advanced Hydrologic Modeling.** Application of deterministic and probabilistic concepts to simulate and analyze hydrologic systems; discussion of the theory and application of linear and nonlinear, lumped, and distributed systems techniques in modeling the various phases of the hydrologic cycle. Prerequisite: Civil Engineering 350 or consent of instructor. 1 unit.
451. **Open-Channel Hydraulics.** Advanced hydraulics of free surface flow in rivers and open channels; discussion of theory, analytical and numerical solution techniques, and their applications to gradually and rapidly varied nonuniform flows, unsteady flow, and flow in open-channel networks. Prerequisite: Civil Engineering 351 or equivalent. 1 unit.
455. **Transport Processes in Water.** Physical processes involved in transport of pollutants by water; turbulent diffusion and longitudinal dispersion in rivers, pipes, lakes, and the ocean; diffusion in turbulent jets, buoyant jets, and plumes. Prerequisite: Mathematics 280 and 285, and Theoretical and Applied Mechanics 235, or consent of instructor. 1 unit.
457. **Modeling of Groundwater Flow and Solute Transport.** Examines theory and application of numerical methods, finite differences and finite element, for solving the equations of groundwater flow and solute transport; transport of chemically reacting solutes; model calibration and verification. Prerequisite: Civil Engineering 357 or consent of instructor; Mathematics 285 or equivalent. 1 unit.
459. **Sediment Transport.** Physical processes of transportation and deposition of sediment particles in liquid bodies with particular emphasis on fluvial sediment problems; sediment in desilting basins; reservoirs and delta formation; erosion; stable channel design; and river porphology. Prerequisite: Civil Engineering 451 or consent of instructor. 1 unit.
462. **Design of Tall Building Structures.** Examination of the methods of analysis and design criteria for tall buildings: dead, live, wind, and earthquake loads; reinforced concrete and steel moment-resisting frames, shear walls, braced frames; plastic design of multistory steel braced frames; P-Delta effects and instability; unreinforced and reinforced masonry buildings; very tall buildings including framed tube, tube in tube, trussed tube and hat trusses. Prerequisite: Graduate standing in structural engineering with courses equivalent to Civil Engineering 363 and 466, or consent of instructor. 1 unit.
463. **Optimization of Structures.** Structural design processes; formulation of problems in the optimization of structures; optimization of structural elements; minimum volume principles; and use of mathematical programming in optimization of structural systems. Prerequisite: Bachelor of Science degree in engineering with courses in structural analysis and design, or consent of instructor. 1 unit.
465. **Behavior of Structural Metal Frameworks.** Theories of ultimate behavior of metal structural members with emphasis on buckling and stability of members and frames; theory of torsion applied to beam torsion, lateral-torsional buckling, curved beams with

- emphasis on design criteria; postbuckling strength of plates and postbuckling versus column behavior. Prerequisite: Civil Engineering 363. 1 unit.
466. **Behavior of Reinforced Concrete Members.** In-depth study of the behavior of reinforced concrete members, including the relationships between behavior and building code requirements. Prerequisite: Civil Engineering 262 and 264. 1 unit.
467. **Behavior of Reinforced Concrete Structures.** Study of the strength and behavior of assemblages of reinforced concrete members, including a study of the applicability of traditional elastic design procedures to structures which exhibit inelastic behavior under the influence of both short and long term loadings. Prerequisite: Civil Engineering 466. 1 unit.
469. **Thin Shell Structures.** Fundamental membrane and bending theories of shells; application of theories to analysis and design of folded plates and cylindrical, rotational, and translational shells; membrane stresses and deflections; and approximate bending solutions by variational, finite-difference, and finite-element methods. Prerequisite: Civil Engineering 473 or consent of instructor. 1 unit.
473. **Theory of Plates.** Classical plate bending theory; emphasis on methods of solution including series expansions, variational procedures, and finite element techniques applicable to plate-type structures commonly encountered in practice; consideration of inplane loads, large deflections, buckling, and anisotropy. Prerequisite: Civil Engineering 262 and Mathematics 285. 1 unit.
474. **Dynamics of Framed Structures.** Advanced treatment of the dynamics of multi-degree-of-freedom framed structural systems; fundamental concepts of eigenvalue theory of real matrices and energy principles of dynamics as bases for a unified approach to dynamical problems of structural assemblages; structural idealizations, principles of dynamics, Lagrange's equations, response calculations, normal mode method and its limitations; transfer matrix approach, and computer utilization. Prerequisite: Civil Engineering 361 and 374, or equivalent. 1 unit.
475. **Steel Structures: Fatigue and Fracture.** Examines fatigue and fracture behavior of steel structures and connections; discusses relevant fatigue and fracture mechanics theory and experimental data and applies them to an assessment of behavior and current design specification practice. Prerequisite: Civil Engineering 363. 1 unit.
477. **Probabilistic Bases for Structural Loads and Design.** Application of probabilistic methods in describing and defining loads on structures with emphasis on the random fluctuation in time and space. Introduction to random vibration methods and applications to dynamic response of structures under wind and earthquake loads. Computer simulation of structural loads and responses. Probability-based safety criteria and review of current methods of selection of design loads and load combinations. Prerequisite: Civil Engineering 293 and 374, or equivalent, or consent of instructor. 1 unit.
478. **Finite Element Methods in Solid and Structural Mechanics.** Theory and application of the finite element method; stiffness matrices for triangular, quadrilateral, and isoparametric elements; two- and three-dimensional elements; algorithms necessary for the assembly and solution; direct stress and plate bending problems for static, nonlinear buckling and dynamic load conditions; displacement, hybrid, and mixed models together with their origin in variational methods. Prerequisite: Theoretical and Applied Mechanics 451, or Civil Engineering 379, or consent of instructor. 1 unit.
479. **Earthquake Engineering.** Study of the effects of earthquakes on constructed works and of the design of structures to resist earthquake motions; earthquake ground motions and mechanisms; response of structures to earthquake motion; behavior of materials, elements, assemblages and structures subjected to earthquake motion; principles of earthquake resistant design; and special topics. Prerequisite: Civil Engineering 374. 1 unit.
480. **Earth Pressures and Retaining Structures.** Classical and modern earth pressure theories and their experimental justification; pressures and bases for design of retaining walls, bracing of open cuts, anchored bulkheads, cofferdams, tunnels, and culverts. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
481. **Earth Dams and Related Problems.** Fundamentals of problems of slope stability; seepage in composite sections and anisotropic materials; methods of stability analysis;

- mechanism of failure of natural and artificial slopes; compaction; and field observations. Prerequisite: Credit or concurrent registration in Civil Engineering 384. 1 unit.
482. **Advanced Analysis of Consolidation of Clays.** Elastic solutions relevant to soil mechanics; permeability; general application of Terzaghi's theory of one-dimensional consolidation; advances in consolidation theories; mechanism of volume change; delayed and secondary compressibility and creep; theory of three-dimensional consolidation and solutions; radial flow and design of sand drains; and analysis and control of settlement. Prerequisite: Civil Engineering 383. 1 unit.
483. **Advanced Analysis of Shear Strength of Soils.** Physico-chemical properties of soils; fabric and structure of soil; mechanism of shearing resistance; residual shear strength of overconsolidated clays and clay shales; long-term shear strength of overconsolidated clays; Hvorslev shear strength parameters; and undrained shear strength of clays. Prerequisite: Civil Engineering 383. 1 unit.
484. **Foundation Engineering.** Critical study of case histories of projects in foundation engineering; current procedure for design and construction of foundations, embankments, and waterfront structures. Prerequisite: Civil Engineering 384. 1 unit.
485. **Behavior and Design of Deep Foundations.** Ultimate capacities and load-deflection of piles and drilled shafts subjected to compressive loads, tensile loads, and lateral loads; effects of duration of load, soil-structure interaction; two and three dimensional analysis of pile groups with closely spaced piles; effects of installation; inspection of deep foundations and full-scale field tests. Prerequisite: Civil Engineering 383, 384, or consent of instructor. 1 unit.
486. **Rock Mechanics, I.** Physical properties and classification of intact rock, theories of rock failure, state of stress in the earth's crust, stresses and deformations around underground openings assuming elastic, plastic, and time-dependent behavior; effect of geologic discontinuities on rock strength; and introduction to stability analyses in rock. Prerequisite: Civil Engineering 383; Geology 450 or equivalent; Theoretical and Applied Mechanics 321 or equivalent; or consent of instructor. 1 unit.
487. **Rock Mechanics, II.** Application of rock mechanics to engineering problems; shear strength of rock masses; dynamic and static stability of rock slopes; deformability of rock masses; design of pressure tunnel linings and dam foundations; controlled blasting and blasting vibrations; tunnel support; machine tunneling; design and construction of large underground openings; and field instrumentation. Prerequisite: Civil Engineering 486 or consent of instructor. 1 unit.
495. **Civil and Environmental Engineering Seminar.** Discussion of current topics in civil and environmental engineering and related fields by staff, students, and visiting lecturers. 0 to $\frac{1}{4}$ unit. May be repeated.
497. **Independent Study in Civil Engineering.** Individual investigations or studies of any phase of civil engineering selected by the student and approved by the adviser and the staff member who will supervise the investigation. Prerequisite: Consent of instructor. 0 to 4 units.
498. **Civil Engineering Special Topics.** Structured presentations of new and developing areas of knowledge in civil engineering at an advanced graduate level. Prerequisite: Individually identified for each offering under this course number; see *Timetable*. $\frac{1}{4}$ to 1 unit.
499. **Thesis Research.** 0 to 4 units.

CLASSICAL CIVILIZATION

(See Classics)

CLASSICS

(Including Classical Civilization, Coptic, Greek, and Latin)

Chair of Department: John J. Bateman

Department Office: 4072 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Classical Civilization

The following courses presuppose no knowledge of the Greek and Latin languages and are open to all students. For other courses in the area of classical civilization, see Architecture 210; History of Art 215, 216, and 323; History 181, 182, 381, 382, 383, and 384; Philosophy 203 and 310; Political Science 393; and Religious Studies 201, 202, 210, and 340.

100. **Vocabulary Building from Greek and Latin Roots.** Vocabulary building assistance for students through an analysis of Greek and Latin roots, prefixes, and suffixes found in English. 2 hours.
101. **PLATO Laboratory in English Vocabulary Building.** Intensive drill and practice in English words derived from key Latin and Greek roots. Prerequisite: Concurrent registration in Classical Civilization 100. 1 hour.
110. **Introduction to Greek Culture.** Study of social and cultural life in Greece during the classical period. 2 hours. Credit is not given for both Classical Civilization 110 and 114.
111. **Mythology of Greece and Rome.** A study of the major myths of Greece and Rome and their impact upon later art, music, and literature. 2 hours. Credit is not given for both Classical Civilization 111 and 115.
112. **The Roman Achievement.** Introduction to Roman civilization through the study of the social and cultural life of ancient Rome. 2 hours. Credit is not given for both Classical Civilization 112 and 116.
114. **Introduction to Greek Culture.** Studies the social and cultural life in Greece during the classical period. Shares two hours of lecture with Classical Civilization 110; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 110 and 114.
115. **Mythology of Greece and Rome.** Studies the major myths of Greece and Rome and their impact upon later art, music, and literature. Shares two hours of lecture with Classical Civilization 111; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 111 and 115.
116. **The Roman Achievement.** Introduces Roman civilization through the study of the social and cultural life of ancient Rome. Shares two hours of lecture with Classical Civilization 112; additional hour of lecture-discussion for a closer analysis of topics. 3 hours. Credit is not given for both Classical Civilization 112 and 116.
120. **Origins of Western Literature.** Same as Comparative Literature 120. The origins and development of selected major genres in Western literature, emphasizing the relationship between classical representatives and their modern successors. 3 hours.
131. **Introduction to Classical Archaeology: Greece.** Introduction to the archaeology of ancient Greece and the Aegean world. 3 hours.
132. **Introduction to Classical Archaeology: Rome and Italy.** Introduction to the archaeology of Italy and Rome to the fall of the Roman Empire. 3 hours.
150. **Sports in Greece and Rome.** Same as Kinesiology 141. Athletics and sports in ancient Greece and Rome from 776 B.C. to 393 A.D. 2 hours.
160. **Ancient Greek and Roman Religion.** Same as Religious Studies 160. The study of Greek and Roman Paganism and the rise of Christianity within that context. Readings are confined to ancient sources in English translation. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
217. **Greek Art.** Same as History of Art 215. See History of Art 215.

- 218. Roman Art.** Same as History of Art 216. See History of Art 216.
- 221. The Heroic Tradition.** Same as Comparative Literature 263. Study of ancient epics and their relation to the social consciousness of their period; introductory and background lectures; and readings in the epic tradition of antiquity and its successors. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 222. The Tragic Spirit.** Same as Comparative Literature 264. Readings in the tragic drama of Greece and Rome: a systematic study of the contents and development of this classical literary/dramatic genre. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 231. The Development of the Ancient City.** Same as History of Art 217. Monuments and archaeological remains illustrating the development of the Greek and Roman city (polis). Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 232. Ancient Greek Sanctuaries.** Same as History of Art 218 and Religious Studies 232. A survey of the archaeological remains of ancient Greek sanctuaries and their importance to ancient society and religion. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 240. Sex and Gender in Classical Antiquity.** Same as Comparative Literature 262 and Women's Studies 240. An understanding of the place of women in ancient societies can be gained through the examination of the ways in which the ancients conceptualized sex and gender. The myths, religion, art and literature of Egypt, Greece, Rome and the Near East contain a wide array of representations of men and women, of their emotions, as well as of their social, legal and political status and relations. 3 hours.
- 292. Senior Thesis.** Thesis and honors; for candidates for departmental distinction in classical civilization and for other seniors. Prerequisite: Senior standing and consent of chair of classics honors program. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Survey.** For candidates for departmental distinction in the classics major. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 315. Greek, Roman, and Medieval Rhetorical Theory.** Same as Speech Communication 315. See Speech Communication 315.
- 318. Etruscan and Italic Art.** Same as Art History 318. See Art History 318.
- 332. The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Comparative Literature 306. Study of the aesthetic standards and theories of the Graeco-Roman world and the ways in which these ideals are expressed in the literature, art, and architecture of antiquity. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 343. The Archaeology of Greece.** Same as History of Art 315. Monuments, material remains, and sculpture and other arts illustrating the development of Greek civilization to 323 B.C. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 344. The Archaeology of Italy.** Same as History of Art 316. Monuments, material remains, and sculpture and other arts illustrating the development of Graeco-Roman and other ancient Italian civilizations to 330 A.D. Prerequisite: A course in ancient history, art, or language, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as English as an International Language, French, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 390. Topics in Classical Literature.** Same as Comparative Literature 307. Study of selected topics in Greek and Latin literature in translation; content is variable. Prerequisite: 200 level classical civilization course, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
- 391. Topics in Classical Archaeology and Civilization: Seminar and Tutorial.** Study of selected topics; variable content. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
- 415. Seminar in Ancient Art.** Same as History of Art 415. See History of Art 415.
- 420. Seminar in Classical Archeology.** Same as History of Art 420. Problems in Classical Archeology. Various topics in all fields of Classical Archeology such as ancient topography, agricultural practices, ancient industries and crafts, and trade patterns as documented

by pottery, will be offered in separate semesters. Prerequisite: Graduate standing in Classics, Art History, Anthropology, Architecture, or History, or consent of instructor. 1 unit. May be repeated to a maximum of 3 units.

Coptic

- 301. **Introductory Coptic, I.** Same as Linguistics 314 and Religious Studies 301. Introduction to the principles of Coptic grammar and to the reading of biblical and gnostic texts. A knowledge of classical or koine Greek, though useful, is not required. 3 hours or $\frac{3}{4}$ unit.
- 302. **Introductory Coptic, II.** Same as Linguistics 315 and Religious Studies 302. Continuation of Coptic 301; reading of gnostic and postbiblical texts. Prerequisite: Coptic 301. 3 hours or $\frac{3}{4}$ unit.

Greek

- 101. **Elementary Greek, I.** Same as Religious Studies 111. Introduces ancient Greek (both classical and koine), including the reading of simple prose. 4 hours.
- 102. **Elementary Greek, II.** Same as Religious Studies 112. Continuation of Greek 101. Grammar and reading in classical and koine Greek. Prerequisite: Greek 101. 4 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. **Classical and Koine Greek Prose.** Same as Religious Studies 200. Readings in classical Greek prose, and narrative and epistolary New Testament texts. Prerequisite: Greek 102. 4 hours.
- 202. **Classical and Koine Greek Prose II.** Same as Religious Studies 204. A continuation of Greek 201. Further readings in classical Greek prose, and narrative and epistolary New Testament texts. Prerequisite: Greek 201 or equivalent. 4 hours.
- 292. **Senior Thesis.** Open to candidates for distinction in Greek. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 298. **Senior Survey.** Thesis and honors. For candidates for honors in Greek and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
- 301. **Homeric Greek.** Introduction to Epic Greek; readings of Homer. Prerequisite: Greek 202 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 310. **Introduction to Indo-European Linguistics.** Same as Latin 310 and Linguistics 309. See Linguistics 309.
- 311. **Greek Prose Composition.** Practice in the writing of Greek prose. Prerequisite: Greek 201 or equivalent. 3 hours or $\frac{1}{2}$ unit.
- 391. **Readings in Greek Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Greek. Prerequisite: Greek 301 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated.
- 393. **Independent Reading.** Prerequisite: Greek 301 and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated (to a maximum of 8 hours or 3 units).
- 411. **Advanced Composition.** Practice in writing continuous Greek prose, with special attention to stylistic problems. Prerequisite: Greek 311 or equivalent. $\frac{1}{2}$ unit.
- 419. **Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric, dramatic, or Hellenistic poetry. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
- 420. **Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or Hellenistic prose. Areas normally follow this sequence in successive years. Prerequisite: Greek 391 or equivalent. 1 unit. May be repeated as topic varies.
- 431. **Special Disciplines.** Same as Latin 431. Variable content course concentrating on an area such as comparative grammar, epigraphy, metrics, palaeography, or papyrology. Prerequisite: Greek 391 and Latin 391, or equivalent. 1 unit. May be repeated as topic varies.

480. **Greek Seminar.** Research on special problems of Greek literature; required of all majors in classical philology. Prerequisite: A Greek proseminar. 1 unit.
495. **Introduction to Classical Studies.** Same as Latin 495. An introductory survey for graduate students in classics; prepares students for work at the graduate level and surveys basic bibliography and methodology. Prerequisite: Graduate standing in classics. 1 unit.
499. **Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

Latin

101. **Elementary Latin.** Grammar and reading for students who have had no work in Latin. 4 hours.
102. **Elementary Latin.** Grammar and reading of easy prose. Prerequisite: Latin 101 or one year of high school Latin. 4 hours.
103. **Intermediate Latin.** Review of grammar; reading of easy narrative prose. Prerequisite: Latin 102 or two years of high school Latin. 4 hours.
104. **Introduction to Latin Literature.** Continuation of Latin 103, with readings chiefly in Latin poetic literature. 4 hours.
105. **Intensive Elementary Latin.** Equivalent to Latin 101 and 102. Introduction to basic grammar and syntax for students who have had no previous Latin and want to learn at a rapid rate; use of computer-assisted individual mastery lessons. 8 hours.
106. **Intensive Intermediate Latin.** Equivalent to Latin 103 and 104. Review of grammar and syntax and reading of easy prose and poetry for students who have attained 102 proficiency and wish to advance more rapidly; use of computer-assisted program materials. Prerequisite: Latin 102 or 105, or a placement score showing high school achievement equivalent to Latin 102. 8 hours.
113. **Latin Composition.** Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Credit or concurrent registration in Latin 103 or three years of high school Latin. 2 hours.
114. **Latin Composition.** Continuation of Latin 113. Grammatical drill and practice in the simpler forms of expression. Required of those receiving the recommendation of the department as teachers. Prerequisite: Latin 113. 2 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Survey of Latin Literature.** The republican period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
202. **Survey of Latin Literature.** The imperial period. Prerequisite: Latin 104 or four years of high school Latin. 3 hours. (Counts for advanced hours in LAS.)
270. **Parateaching.** Same as French, German, Russian, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Russian, and Spanish 279. See Humanities 279.
280. **Teachers' Course.** Introduction to the problems of the teaching of Latin and a study of textbooks. Required of teacher-training majors in Latin. This course will not meet during the six-week student teaching period. Prerequisite: Latin 202; senior standing. 4 hours.
292. **Senior Thesis.** Thesis and honors. For candidates for honors in Latin and for other seniors. Prerequisite: Senior standing. 2 or 4 hours. (Counts for advanced hours in LAS.)
298. **Senior Survey.** Thesis and honors. For candidates for honors in Latin and for other seniors. 2 or 4 hours. (Counts for advanced hours in LAS.)
310. **Introduction to Indo-European Linguistics.** Same as Greek 310 and Linguistics 309. See Linguistics 309.
311. **Intermediate Prose Composition.** Practice in the writing of Latin prose. Prerequisite: Credit or concurrent registration in Latin 201 or the equivalent. 3 hours or $\frac{1}{2}$ unit.
391. **Readings in Latin Literature.** Readings in authors or special topics chosen by the instructor from the entire extant literature in Latin. Prerequisite: Three years of college Latin or equivalent; consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit.

- 393. Independent Reading.** Prerequisite: Latin 202 and consent of the instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 8 hours or 3 units.
- 400. Beginning Latin for Graduate Students.** Basic grammar, syntax, and vocabulary; reading practice. Designed for graduate students who need to use Latin in their research. 4 hours. No graduate credit.
- 401. Readings in Latin for Graduate Students.** Directed readings, largely in medieval and modern Latin. Designed for graduate students who need to use Latin in their research. Prerequisite: Latin 400 or two years of high school Latin, or equivalent. 4 hours. No graduate credit.
- 411. Advanced Composition.** Practice in writing Latin prose, with special attention to stylistic questions. Prerequisite: Latin 311 or equivalent. $\frac{1}{2}$ unit.
- 419. Proseminar (Poetry).** Concentrates on a major author from one of the following areas: epic, lyric and elegiac, dramatic, or satirical poetry. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
- 420. Proseminar (Prose).** Concentrates on a major author from one of the following areas: history, philosophy, oratory, or epistolography. Areas normally follow this sequence in successive years. Prerequisite: Latin 391 or equivalent. 1 unit. May be repeated as topic varies.
- 431. Special Disciplines.** Same as Greek 431. See Greek 431.
- 480. Latin Seminar.** Research on special problems of Latin literature; required of all majors in classical philology. Prerequisite: A Latin proseminar. 1 unit.
- 495. Introduction to Classical Studies.** Same as Greek 495. See Greek 495.
- 499. Thesis Research.** Guidance in writing theses for advanced degrees. 0 to 4 units.

COMMUNICATIONS

Chair of Committee on Graduate Study: C. Christians

Office: 222b Armory Building, 505 East Armory Avenue, Champaign

- 101. The Social and Cultural Foundations of the Mass Media.** Analysis of the evolution and structure of the mass media in the United States with special emphasis on the effects of the mass media on public life. Prerequisite: Freshman or sophomore standing. 3 hours. Does not count toward major requirements in the College of Communications.
- 217. History of Communications.** Same as Journalism 217. See Journalism 217.
- 218. Communications and Public Opinion.** Same as Journalism 218. See Journalism 218.
- 220. Communications and Popular Culture.** Same as Journalism 220. Examines the critical literature on mass media entertainment; reviews significant contemporary issues and develops perspectives for understanding popular culture. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 231. Mass Communications in a Democratic Society.** Same as Journalism 231. See Journalism 231.
- 241. Law and Communications.** Same as Journalism 241. See Journalism 241.
- 251. Social Aspects of Mass Communications.** Same as Journalism 251 and Sociology 251. See Journalism 251.
- 261. American Broadcasting and Telecommunications.** Examines the history and principal issues of American broadcasting and the electronic media; the context of prior forms of mass communication and ideas about purposes and terms of control; the important social, economic, political, and cultural questions bearing on AM and FM radio, commercial television, public broadcasting, cable and new forms of electronic communication; issues in programming and service content; and basic legal and regulatory matters. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 264. Economic Structure of Communication.** Describes and analyzes the economic structures, policies, and current problems of fields such as telecommunications, publishing,

broadcasting and cable, film, recorded music, and postal service; examines how copyrights, patents, antitrust laws, and government regulation bear on the communications industry. Prerequisite: Consent of college. 3 hours.

291. **Special Problems.** Special projects, research, and independent reading in communications for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of the college. 1 to 3 hours.
308. **Cultural Analysis of Screen Media.** Same as Speech Communication 308. See Speech Communication 308.
310. **Media Ethics.** Surveys the major ethical problems in news, advertising, and entertainment media; includes case studies and moral reasoning on confidentiality, privacy, conflict of interests, deception, violence, and pornography. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours or 1 unit.
319. **Studies in Russian and East European Cinema.** Same as Slavic and Speech Communication 319. See Slavic 319.
322. **Politics and the Media.** Same as Political Science 322. Examines the interaction between the media and politics in the United States and elsewhere, with special emphasis on the constitutional protection of the media, politics of media control, impact of the media on such political processes as elections and policy making, international news agencies and communications satellites, and quest for a new international information order. Prerequisite: Political Science 150 or 6 hours of social science; or consent of instructor. 3 hours, or $1/2$ to 1 unit.
323. **Language Acquisition.** Same as Linguistics 323 and Psychology 323. See Psychology 323.
325. **Introduction to Psycholinguistics.** Same as Linguistics 325. See Linguistics 325.
335. **Interpersonal Communication Processes.** Same as Speech Communication 335. See Speech Communication 335.
352. **Attitude Theory and Change.** Same as Psychology 352 and Sociology 352. See Psychology 352.
361. **Telecommunications Programming.** History and interpretation of American radio and television programs; types, formats, and contents in relationship to trends in American social and cultural history, themes, and myths; and relevant aspects of telecommunications technology, economics, and cultural production. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours or 1 unit.
362. **Telecommunications Management.** Examines problems and issues in telecommunications management; the role of management in operation of broadcasting, cable, and telecommunications industries; forces shaping products and services in commercial and nonprofit media, i.e., technology, markets, revenues, programming, and regulation; planning, accountability, and social responsibility. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours or 1 unit.
366. **Film as Business.** Studies the filmed entertainment industry; the economic structures and policies of the production, distribution, and exhibition sectors; the nature of ownership patterns, investment, competition, and trade practices; filmed entertainment as a commodity in an international market system. Prerequisite: Consent of college or consent of instructor. 3 hours or 1 unit.
368. **Legal and Policy Issues in Telecommunications.** Same as Radio and Television 368. Studies the histories, assumptions, and consequences of major legislative, regulatory, and judicial decisions in American broadcasting and telecommunications; social, cultural and economic background of federal communications law and regulation; administrative agency (FCC) practice and constraints; various regulatory and policy issues including fiduciary licensing, fairness doctrine, cable, public broadcasting, telematics, deregulation, and statutory revision process. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours or 1 unit.
370. **Language, Culture, and Society.** Same as Anthropology 370 and Linguistics 370. See Anthropology 370.
377. **International Communications.** Same as Political Science 377. See Political Science 377.
414. **Seminar on Social Interaction.** Same as Sociology 414. See Sociology 414.

- 417. Contemporary Viewpoints in Speech Communication Theory.** Same as Speech Communication 417. See Speech Communication 417.
- 420. Seminar in Semantics.** Same as Philosophy 420. See Philosophy 420.
- 424. Developmental Psycholinguistics.** Same as Linguistics 424 and Psychology 424. See Psychology 424.
- 425. Psycholinguistics.** Same as Linguistics 425 and Psychology 425. See Psychology 425.
- 432. History of Libraries.** Same as Library and Information Science 432. See Library and Information Science 432.
- 437. The Analysis of Interpersonal Interaction.** Same as Speech Communication 437. See Speech Communication 437.
- 444. Seminar in Public Opinion.** Same as Sociology 444. See Sociology 444.
- 448. Seminar: Mass Communicators.** Examines production of mass media messages from individual, organizational and institutional perspectives; studies forces and influences shaping the creation and production of news and information, entertainment and culture. 1 unit.
- 456. Attitude Measurement and Behavioral Prediction.** Same as Psychology 456. See Psychology 456.
- 462. Seminar in Radio and Television.** Same as Radio and Television 462. See Radio and Television 462.
- 463. World Broadcasting.** Same as Radio and Television 463. See Radio and Television 463.
- 468. The Political Economy of Communications.** Same as Journalism 468. See Journalism 468.
- 470. Communications and Popular Culture.** Same as Journalism 470. See Journalism 470.
- 471. Proseminar in Communications, I.** Same as Journalism 471. See Journalism 471.
- 472. Proseminar in Communications, II.** Same as Journalism 472. See Journalism 472.
- 473. History and Theory of Freedom of the Press.** Same as Journalism 473. See Journalism 473.
- 474. Communications Systems.** Same as Journalism 474. See Journalism 474.
- 482. Research Methods in Advertising and Communications.** Same as Advertising 482. See Advertising 482.
- 485. Advertising Planning and Decision Making.** Same as Advertising 485. See Advertising 485.
- 490. Special Topics in Communications.** Prerequisite: Consent of chair of committee on graduate study in communications. $1/2$ to 2 units.
- 492. Research Methods in Communications.** Same as Journalism 492. Introduction to the methods of empirical research in the behavioral sciences applicable to research problems in human communication, with emphasis on studies of mass communication. Lectures, readings, and laboratory practice. Prerequisite: Consent of College of Communications. 1 unit.
- 493. Qualitative Research Methods in Communications.** Introduces qualitative concepts and strategies in the social sciences and humanities which apply to research problems in mass communications. Prerequisite: Consent of College of Communications. 1 unit.
- 499. Thesis Research.** Prerequisite: Consent of chair of committee on graduate study in communications, and of thesis supervisor. 0 to 4 units. May be repeated to a maximum of 8 units.

COMPARATIVE LITERATURE

Director of Program: Michael Palencia-Roth

Office: 2070 Foreign Languages Building, 707 South Mathews Avenue, Urbana

- 119. The Literature of Fantasy.** Same as English 119. See English 119.
- 120. Origins of Western Literature.** Same as Classical Civilization 120. See Classical Civilization 120.

141. **Masterpieces of Western Culture, I.** Comparative study of selected works reflecting main currents of western literature and thought, such as biblical stories, Homer, Greek drama, Vergil, medieval romance and love lyrics, Dante, Boccaccio, Chaucer, Petrarch, Rabelais, Cervantes, and Shakespeare. 3 hours.
142. **Masterpieces of Western Culture, II.** Comparative study of selected works reflecting main currents of western literature and thought, such as Moliere, Voltaire, Swift, Goethe, romantic lyrics, Melville, Flaubert, Dostoevsky, Ibsen, Joyce, Kafka, and Camus. 3 hours.
175. **Masterpieces of East Asian Literature.** Same as East Asian Languages and Cultures 175. See East Asian Languages and Cultures 175.
189. **Classic Masterpieces of Non-Western Cultures.** Analysis of representative works from the Middle East and Asia through the seventeenth century, portraying literary, philosophical and religious achievements of the Islamic, Hindu, Buddhist and Confucian traditions, and emphasizing comparative perspectives both within the range of non-Western traditions and in juxtaposition to Western thinking. All readings in English. 3 hours.
190. **Modern Masterpieces of Non-Western Cultures.** Analysis of representative works from the Middle East and Asia of the eighteenth to twentieth centuries, portraying literary, philosophical and religious achievements of the Islamic, Hindu, Buddhist and Confucian traditions and emphasizing comparative perspectives both within the range of non-Western traditions and in juxtaposition to Western thinking. All readings in English. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Comparative Literary Studies, I.** An introduction to various methods in comparative literary study, including genres, thematics, literary relations, literary movements, and interdisciplinary approaches. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
202. **Literature and Ideas.** An analysis of several important world-views in Western civilization (such as classical, Romantic, modern, and so forth), studied comparatively and in relation to selected figures in Western literature. Prerequisite: Comparative Literature 141 and 142; or one year of college literature; or consent of instructor. 3 hours.
203. **Introduction to Persian Culture and Literature, I.** Same as Persian 205. See Persian 205.
204. **Introduction to Persian Culture and Literature, II.** Same as Persian 206. See Persian 206.
210. **Introduction to Modern African Literature.** Same as African Studies 210 and English 211. See African Studies 210.
211. **Japanese Literature in Translation, I.** Same as East Asian Languages and Cultures 205. See East Asian Languages and Cultures 205.
212. **Japanese Literature in Translation, II.** Same as East Asian Languages and Cultures 206. See East Asian Languages and Cultures 206.
213. **African Oral Literature.** Same as African Studies and Anthropology 213. See African Studies 213.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Scandinavian 215. See Scandinavian 215.
218. **Japanese Hero Types.** Same as East Asian Languages and Cultures 218. See East Asian Languages and Cultures 218.
219. **Women in Japanese Literature.** Same as East Asian Languages and Cultures and Women's Studies 219. See East Asian Languages and Cultures 219.
224. **German Literature in Translation.** Same as German 200. See German 200.
225. **Gods and Man in Modern Japanese Drama.** Same as East Asian Languages and Cultures and Religious Studies 225. See East Asian Languages and Cultures 225.
228. **Special Topics in German Literature.** Same as German 296. See German 296.
238. **Hiroshima/Nagasaki and the Literature of Survival.** Same as East Asian Languages and Cultures 238. See East Asian Languages and Cultures 238.
240. **Italian Civilization of the Middle Ages and Renaissance.** Same as Italian 240. See Italian 240.

244. **Hispanic Literature and Culture.** Same as Spanish 244. See Spanish 244.
248. **Dostoevsky and Tolstoy.** Same as Russian 222. See Russian 222.
249. **Soviet Russian Literature.** Same as Russian 225. See Russian 225.
252. **Icelandic Sagas in Translation.** Same as Scandinavian 252. See Scandinavian 252.
253. **Medieval Literature and Culture.** Same as English 202. See English 202.
255. **Renaissance Literature and Culture.** Same as English 204. See English 204.
257. **Literature and Culture of the Enlightenment.** Same as English 206. See English 206.
262. **Sex and Gender in Classical Antiquity.** Same as Classical Civilization and Women's Studies 240. See Classical Civilization 240.
263. **The Heroic Tradition.** Same as Classical Civilization 221. See Classical Civilization 221.
264. **The Tragic Spirit.** Same as Classical Civilization 222. See Classical Civilization 222.
265. **Development of the Modern Drama.** Same as English 243. See English 243.
266. **Development of the Modern Drama.** Same as English 244. See English 244.
267. **The Short Story.** Same as English 245. See English 245.
268. **The Short Story.** Same as English 246. See English 246.
269. **Modern British and American Fiction in Relation to Continental Fiction.** Same as English 248. See English 248.
283. **Jewish Sacred Literature.** Same as English and Religious Studies 283. See Religious Studies 283.
284. **Modern Jewish Literature.** Same as English and Religious Studies 284. See English 284.
293. **Senior Thesis and Honors.** Independent research guided by tutor(s), leading to the writing of a comparative thesis. Intended primarily for candidates for honors in comparative literature, but open to other seniors. 3 to 6 hours. May be repeated to a maximum of 12 hours. (Counts for advanced hours in LAS.)
295. **Special Topics: Colloquium on Interdisciplinary Subjects.** Presentation and discussion of subjects relating literature to other disciplines; topic varies. 3 hours. May be repeated to a maximum of 6 hours.
305. **Literary Criticism from 1800 to the Present.** Same as English 383. See English 383.
306. **The Ancient Ideal in Art and Literature.** Same as History of Art 317 and Classical Civilization 332. See Classical Civilization 332.
307. **Topics in Classical Literature.** Same as Classical Civilization 390. See Classical Civilization 390.
310. **Modern African Fiction.** Same as African Studies and French 310 and English 370. See African Studies 310.
311. **The Chinese Novel.** Same as East Asian Languages and Cultures 311. See East Asian Languages and Cultures 311.
312. **Modern Chinese Literature in Translation.** Same as East Asian Languages and Cultures 312. See East Asian Languages and Cultures 312.
313. **Dante.** Same as Italian 313. See Italian 313.
314. **Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Italian 314. See Italian 314.
315. **Modern Japanese Fiction in Translation.** Same as East Asian Languages and Cultures 315. See East Asian Languages and Cultures 315.
320. **Masterpieces of Italian Renaissance Literature.** Same as Italian 320. See Italian 320.
323. **Modern German Poetry.** Same as German 330. See German 330.
326. **Ibsen in Translation.** Same as Scandinavian 361. See Scandinavian 361.
327. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Scandinavian 362. See Scandinavian 362.
334. **Studies in Francophonie.** Same as French 379. See French 379.
335. **Polish Literature in Translation, I.** Same as Polish 345. See Polish 345.
336. **Polish Literature in Translation, II.** Same as Polish 346. See Polish 346.
337. **Nineteenth-Century Literature in Translation.** Same as Russian 315. See Russian 315.
338. **Twentieth-Century Literature in Translation.** Same as Russian 317. See Russian 317.
340. **Studies in Russian Literature and Society.** Same as Russian 360. See Russian 360.
341. **Themes and Types in Western and Non-Western Narratives.** Analysis of literary themes and types in narratives of Western and non-Western literatures (e.g., the hero, east and

- west; dream visions), emphasizing comparative perspectives. Prerequisite: One year of college literature, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
351. **International Literary Movements.** Study of the development and mutation of literary movements and stylistic trends; emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
357. **Russian Modernism.** Same as Russian 324. See Russian 324.
359. **The International Folk Tale.** Same as English 367. See English 367.
361. **International Literary Genres and Forms.** Structure and development of literary genres and forms in historical perspective (for instance, drama, parody and the grotesque, poetry, fables and fabulists, and modern fiction); essential international components and significant national variations of such genres and forms. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
365. **Comedy.** Same as English 365. See English 365.
368. **Russian Drama.** Same as Russian 335. See Russian 335.
370. **Nabokov and Emigre Literature.** Same as Russian 370. See Russian 370.
371. **International Literary Relations.** Study of specific relations between authors of different countries; influences of certain works, concepts, or tastes on another work, author, or country; and literary interaction between Eastern and Western cultures. Emphasis changes from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
387. **Topics in Folklore.** Same as English, German, Slavic and Speech Communication 387. See English 387.
388. **French and Comparative Cinema, I.** Same as French and Humanities 388. See French 388.
389. **French and Comparative Cinema, II.** Same as Humanities and French 389. See French 389.
396. **Special Topics in Comparative Literature.** Selected literary topics of international significance in relation to other cultural expressions. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit. May be repeated to a maximum of 6 hours or 2 units.
401. **Theory of Literature.** Major issues of literary theory, critical approaches, and comparative research. Prerequisite: Reading knowledge of two foreign languages; consent of instructor. 1 unit.
402. **Cross-cultural Comparison.** Problems and methods of cross-cultural literary studies, concentrating on the effects of historical encounters between different civilizations and on theoretical issues in comparing literatures across cultures. Prerequisite: Advanced knowledge of two languages. 1 unit.
405. **Seminar in Stylistics.** Same as Linguistics 405. See Linguistics 405.
415. **Dostoevsky.** Same as Russian 415. See Russian 415.
419. **Tolstoy.** Same as Russian 419. See Russian 419.
420. **Chekhov.** Same as Russian 420. See Russian 420.
425. **Studies in Contemporary Critical Problems.** Same as French 425. See French 425.
441. **Naturalism, Symbolism, and Expressionism.** Same as German 451. See German 451.
451. **Seminar in Literary Movements and Periods.** Investigation of the development and mutation of literary movements (classicism, romanticism, symbolism, etc.) through a study of critical texts and their reception in various countries. The subject of the seminar varies each semester. 1 unit. May be repeated to a total of 3 units.
452. **Seminar in Romantic Literature.** Same as English 433. See English 433.
461. **Seminar in Literary Genres and Forms.** Study of a form (the lyric, the novel, the drama, etc.) to discover its essential components in all the literatures studied and the significance of national variations. 1 unit. May be repeated to a maximum of 3 units as topic varies.
462. **Seminar in Spanish-American Novel.** Same as Spanish 430. See Spanish 430.
471. **Seminar in Literary Relations.** Investigation of the impact of one literature upon another, or of some specific works upon others (the role of English literature in continental Europe, the influence of Russian novelists on French and German writers, etc.). The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.

- 472. Studies in French and Comparative Cinema.** Same as French 452. See French 452.
- 478. Seminar in Twentieth-Century French Literature.** Same as French 478. See French 478.
- 481. Seminar in Literary Themes and Types.** Study of a theme or type (the Faust myth, the romantic hero, etc.) to discover its essential components in all the literatures studied and the significance of national variations. The subject of the seminar varies each semester. 1 unit. May be repeated to a maximum of 3 units.
- 482. Seminar in Modern German Literature.** Same as German 461. See German 461.
- 490. Seminar in Contemporary Criticism, Methods and Theory.** Same as French 490. See French 490.
- 493. Special Studies.** $\frac{1}{4}$ to 1 unit.
- 499. Thesis Research.** Intended for students engaged in writing a thesis as a partial requirement for the M.A. or Ph.D. degree in comparative literature. Maximum credit for master's candidates is 2 units. 0 to 4 units.

COMPUTER SCIENCE

Head of Department: Duncan H. Lawrie

Department Office: 2270 Digital Computer Laboratory, 1304 West Springfield Avenue, Urbana

NOTE: Credit is not allowed for more than one of Computer Science 101, 102, 103, 105, and 125. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 125, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences.

- 101. Introduction to Computers for Application to Engineering and Physical Science.** A beginning course in problem solving by digital computers which covers problem formulation, algorithm development, and coding in a high-level language; use of the computer in solving a series of problems. Prerequisite: Mathematics 120 or consent of instructor. 3 hours.
- 102. Introduction to Computers and Their Application to Architecture.** Introduction to computer programming for students of architecture; higher-level programming languages and application programs of special use in architecture. Prerequisite: Mathematics 112 or high school equivalent. 3 hours.
- 103. Introduction to Computers and Their Application to Social and Behavioral Science.** Introduction to computer programming for students with an interest in behavioral and social science computation; instruction in programming languages with an emphasis on applications from statistical and data manipulative procedures. Prerequisite: Sophomore standing; one year of college mathematics or statistics. 3 hours.
- 105. Introduction to Computers and Their Application to Business and Commerce.** Introduction to computer fundamentals, higher language programming, and the use of the computer for the solution of business problems. Prerequisite: Mathematics 112 or high school equivalent. 3 hours.
- 106. Introduction to Computers for the Nontechnical Major.** A concise treatment of the computer's important and still-growing role in virtually every significant aspect of society, including commerce, quantitative and qualitative planning, science, the criminal justice system, education, and medicine. The student is first taught to program computers interactively using an elementary programming language. 3 hours. Credit is allowed for both Computer Science 106 and one of Computer Science 101, 102, 103, 105, or 125, except for students in the College of Engineering, College of Commerce and Business Administration, curriculum in architecture of the College of Fine and Applied Arts, and physical science curricula and fields of concentration of the College of Liberal Arts and Sciences.

- 125. Introduction to Computer Science.** The first course for computer science majors and other students with a deep interest in the subject. The course introduces students to basic concepts in computing and fundamental techniques for solving computational problems. Prerequisite: Three years of high school mathematics, or Mathematics 112; and credit or concurrent registration in Computer Science 173 or Mathematics 213. 3 hours.
- 173. Discrete Mathematical Structures.** Studies discrete mathematical structures frequently encountered in the study of Computer Science. Topics will include sets, propositions, boolean algebra, induction, recursion, relations, functions, and graphs. 2 hours. Students may not receive credit for both Computer Science 173 and Mathematics 213.
- 196. Honors Course in Computer Science.** This course is offered for honors credit in conjunction with other 100-level computer science courses, in which concurrent registration is required. Enrollment is strictly limited to beginning students with superior talents in computer science. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 100-level computer science course (see *Timetable*); consent of instructor. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 223. Software Laboratory.** Laboratory course in which students gain first major exposure to development and maintenance of complex software systems. Students should take Computer Science 223 after, or concurrently with, Computer Science 225. Prerequisite: Computer Science 125. 2 hours.
- 225. Data Structures.** Continuation of Computer Science 125. Data abstractions; elementary data structures: lists, stacks, queues, trees; searching and sorting techniques. Students should take Computer Science 225 before, or concurrently with, Computer Science 223. Prerequisite: Computer Science 125. 2 hours.
- 231. Computer Architecture, I.** Introduction to computer architecture, working up from the logic gate level: combinational and sequential networks; computer arithmetic; arithmetic/logic units; memory organization; control unit design. Prerequisite: Computer Science 125. 3 hours. Students may not receive credit for both Computer Science 231 and Electrical and Computer Engineering 290.
- 232. Computer Architecture, II.** Second-level course in computer architecture: machine-level programming, instruction sets, data representations; subroutines; input/output hardware and software; linking and loading; relation to high-level languages. Prerequisite: Computer Science 231. 3 hours. Students may not receive credit for both Computer Science 232 and Electrical and Computer Engineering 291.
- 257. Numerical Methods.** Same as Mathematics 257. An introduction to numerical methods for students in science and engineering; topics include floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations; discusses various applications in science and engineering; includes some programming as well as the use of high quality mathematical library routines. Prerequisite: 100-level computer science course or Computer Science 400; Mathematics 225 or 315; Mathematics 242. 3 hours. Students with earned credit in Computer Science or Mathematics 350 may not receive additional credit for Computer Science or Mathematics 257.
- 273. Introduction to Theory of Computation.** Introduction to the various aspects of the theory of computation, including the necessary background in first order predicate logic, combinatorics, and recurrence relations; asymptotics; basics of algorithm analysis; NP-completeness; formal languages and automata. Prerequisite: Computer Science 173 or equivalent or consent of instructor. 3 hours.
- 281. Introduction to Computer Hardware.** Theory and operation of circuits used in digital computers including basic electrical circuit principles, diodes, bipolar and MOS transistors, digital logic circuits, memory circuits, and the fundamentals of analog circuits. Prerequisite: Physics 102 or 107, and credit or concurrent registration in Computer Science 231. 3 hours.
- 290. Individual Study.** Prerequisite: 100-level computer science course. 1 to 3 hours.
- 296. Honors Course in Computer Science.** Group projects for honors work in computer science. Sections of this course are offered in conjunction with other 200-level computer

science courses, in which concurrent registration is required. A special examination may be required for admission to this course. Prerequisite: Concurrent registration in another 200-level computer science course (see Timetable); consent of instructor. 1 hour.

297. **Special Topics in Computer Science.** A lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 2 to 4 hours.
300. **Advanced Computer Programming.** Advanced features of programming languages; input/output disks and tapes; plotted output; and use of operating systems and job control languages. This course is intended primarily for students who are not majoring in computer science. Prerequisite: Computer Science 100-level programming course or Computer Science 400, or consent of instructor. 3 hours or 1 unit. Students majoring in computer science may not receive graduate credit for Computer Science 300.
310. **Information Systems.** Systems design and analysis: includes structured programming and programming in COBOL; file organizations and processing; sorting, validating, updating, and retrieval of information; storage devices; and data base concepts. Prerequisite: Accountancy 331 or 332, or 6 hours of computer science courses; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
311. **Database Systems.** Examines the logical organization of databases: the entity-relationship model; the hierarchical, network, and relational data models and their languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control, and distributed database systems. Prerequisite: Computer Science 225 or 310; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
313. **Combinatorial Mathematics.** Same as Mathematics 313. See Mathematics 313.
317. **Computer-Assisted Instruction.** Same as Curriculum and Instruction 335. See Curriculum and Instruction 335.
318. **Computer Graphics.** Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applications of these tools to specific problems. Prerequisite: Computer Science 225 or 300, and analytic geometry. 3 hours, or $\frac{3}{4}$ or 1 unit.
319. **Advanced Topics in Computer Graphics.** Advanced methods for representing, displaying, and rendering two-, three-, and four-dimensional scenes. General algebraic curves and surfaces, splines, Gaussian and bump-function representation, fractals, particle systems, constructive solid geometry methods, lighting models, radiosity, advanced ray-tracing methods, surface texturing, animation techniques, data visualization methods. Prerequisite: Computer Science 318. 3 hours or $\frac{3}{4}$ unit.
323. **Operating Systems Design.** Discussion of the organization and structure of operating systems for various modes of computer use from simple batch systems to time-sharing/multiprocessing systems. Prerequisite: Computer Science 225, and Computer Science 332 or Electrical and Computer Engineering 291. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Programming Language Principles.** An introduction to the structure of programming languages. Formal specification of syntax and semantics; structure of algorithmic, list processing, string manipulation, data description, and simulation languages: basic data types, operations, statement types, and program structure; macro languages and their implementation; and run-time representation of programs and data. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.
326. **Compiler Construction.** Compiler structure; lexical analysis, syntax analysis, grammars, description of programming languages, automatically constructed recognizers, and error recovery; and semantic analysis, semantic languages, semantic processes, intermediate language, optimization techniques, and extendible compilers. Prerequisite: Computer Science 323 and 325. 3 hours, or $\frac{3}{4}$ or 1 unit.
327. **Software Engineering.** Follows the software life cycle from the requirement, specification, and design phases through the construction of actual software. Topics include management of programming teams, programming methodologies, debugging aids, documentation, evaluation and measurement of software, verification and testing techniques, and the problems of maintenance, modification, and portability. Prerequisite: Computer Science 225. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 328. Computer Networks and Distributed Systems.** Same as Electrical and Computer Engineering 328. Introduction to concepts of transport connections and sessions; design issues in transport layer and session layer protocols, terminal and file transfer protocols, message handling protocols, etc.; methods to ensure network security and privacy; algorithms for deadlock detection, concurrency control and synchronization in distributed systems; models of distributed computation; networking facilities and resource control and management methods in network and distributed operating systems. Prerequisite: Computer Science 232 or Electrical and Computer Engineering 291; Computer Science 225. 3 hours or $3/4$ unit.
- 331. Microprocessor Systems.** Study of microprocessor architectures, hardware modules, and interfaces; programming, software tools, development systems, and applications; and microprocessor system design methodology. Prerequisite: Computer Science 232; Computer Science 231 or Electrical and Computer Engineering 290. 3 hours, or $3/4$ or 1 unit.
- 333. Computer System Organization.** Computer system analysis and design; organizational dependence on computations to be performed; and speed and cost of parts and overall machines. Prerequisite: Computer Science 232 or Electrical and Computer Engineering 291; Computer Science 231 or Electrical and Computer Engineering 290. 3 hours or 1 unit.
- 335. Introduction to VLSI System Design.** Same as Electrical and Computer Engineering 325. See Electrical and Computer Engineering 325.
- 336. Advanced VLSI Design Projects.** Same as Electrical and Computer Engineering 326. See Electrical and Computer Engineering 326.
- 337. Control Structure of Computers.** Asynchronous, synchronous, and microprogrammed control structures in the framework of computer architecture; interlocking of autonomous subcontrols; and case studies in typical control features: instruction look-ahead, multiprocessing interrupt, and input/output. Prerequisite: Computer Science 231, Electrical and Computer Engineering 290, or Mathematics 391. 3 hours or 1 unit.
- 338. Communication Networks for Computers.** Same as Electrical and Computer Engineering 338. Introduction to International Standards Organization Open System Interconnection (ISO-OSI) reference model, design issues and protocols in the physical layer, data link layer and network layer; architectures and control algorithms of local-area networks, point-to-point networks and satellite networks; standards in network access protocols; models of network interconnection; and overview of networking and communication software. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290. 3 hours or $3/4$ unit.
- 339. Computer Aided Design for Digital Systems.** Same as Electrical and Computer Engineering 339. Examines fundamental concepts, techniques, and tools for the computer-aided design of digital systems; topics include hardware description languages, hardware compilers, evaluation and simulation of computer architectures, logic and circuit simulation, testing, partitioning, placement and routing algorithms and the integration of CAD tools into complete design automation systems. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290; Computer Science 232 or Electrical and Computer Engineering 291; and Computer Science 281 or Electrical and Computer Engineering 340 and 342. 3 hours, or $3/4$ or 1 unit.
- 341. Mechanized Mathematical Inference.** Introduces methods of mathematical inference which can be programmed on a computer; topics include propositional calculus decision procedures, forward and backward chaining, semantics, resolution, equational systems, specialized decision procedures, applications to program verification, abstraction, and problem representation. Prerequisite: Computer Science 273 or Mathematics 314, and Computer Science 325 or 348. 3 hours, or $3/4$ or 1 unit.
- 342. Computer Inference and Knowledge Acquisition.** Systematically describes principles and algorithms underlying development of artificial intelligence systems, with special emphasis on methods of computer inference and knowledge acquisition; topics include deductive and inductive inference systems, plausible reasoning techniques, problem solving strategies, knowledge representation schemes, machine learning, conceptual data analysis, prediction and discovery programs, automatic programming, and planning strategies. Prerequisite: Computer Science 273 and 348. 3 hours, or $3/4$ or 1 unit.

- 346. Pattern Recognition and Machine Learning.** Organized review of basic theoretical concepts and methods of machine learning and recognition; decision space and linguistic and relational representation of objects; statistical and deterministic recognition algorithms; various types of learning, including adaptive, procedural, and inductive; selected applications; and medical consulting, determination of cost-optimal classification rules, inferential information systems, and computer vision. Prerequisite: Computer Science 273 and 348. 3 hours, or $3/4$ or 1 unit.
- 347. Knowledge-Based Programming.** Examines use of the computer to process human-made knowledge-bases. Topics include: trade-off of search versus knowledge; complexity of finite problem-domains; machine-aided acquisition of knowledge from experts; acquisition of knowledge by computer induction; validation and measurement methods, production-rule programming; and logic programming. Prerequisite: Computer Science 273 and 348. 3 hours, or $3/4$ or 1 unit.
- 348. Introduction to Artificial Intelligence.** Same as Electrical and Computer Engineering 348. An introductory description of the major subjects and directions of research in artificial intelligence; topics include AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Prerequisite: Electrical and Computer Engineering 291 or Computer Science 225; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 350. Numerical Analysis: A Comprehensive Introduction.** Same as Mathematics 350. Introduction to numerical analysis that includes linear system solvers, optimization techniques, interpolation and approximation of functions, solving systems of nonlinear equations, eigenvalue problems, least squares, quadrature as well as numerical handling of ordinary and partial differential equations. Prerequisite: Computer Science 101 or 121; Computer Sciences 257 or 225 or Math 315; Math 285 or 341; or consent of instructor. 3 hours, or $3/4$ to 1 unit.
- 355. Numerical Methods for Partial Differential Equations.** Same as Mathematics 355. An introduction to numerical techniques for initial and boundary value problems in partial differential equations; includes finite difference and finite element discretization techniques, direct and iterative solution methods for discrete problems, and programming techniques and usage of FORTRAN packages. Prerequisite: Computer Science 257; Mathematics 280, 285, or 341. 3 hours, or $3/4$ or 1 unit.
- 358. Numerical Linear Algebra.** Same as Mathematics 358. Direct and iterative methods for systems of linear equations; overdetermined systems of equations; eigenvalue problems; nonlinear systems of equations. Prerequisite: Computer Science 257 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 359. Numerical Approximation and Ordinary Differential Equations.** Same as Mathematics 359. Polynomial and spline interpolation; least squares and uniform approximation; numerical differentiation and integration; initial-value and boundary-value problems in ordinary differential equations. Prerequisite: Computer Science 257 and Mathematics 285 or 341, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 362. Logic Design.** Same as Electrical and Computer Engineering Engineering 362 and Mathematics 391. See Electrical and Computer Engineering 362.
- 363. Integrated Circuit Logic Design.** IC fabrication techniques; survey of different IC logic families; logic design procedures for each IC logic family; design of masks; logic design of digital networks with IC packages; use of ROMs as substitutes for gates; computer-aided design; and comparison of different implementation approaches based on different IC logic families, from the viewpoints of economy, performance, and design time. Prerequisite: Computer Science 281 or equivalent and Mathematics 391, or consent of instructor. 3 hours or 1 unit.
- 364. Introduction to Computer Arithmetic.** Review of binary number representations, logical design of adders and arithmetic units, and simple multiplication and division methods; multiplier recoding; redundant division methods; design of carry-save adders and signed-digit arithmetic units; and case studies of high-speed arithmetic units. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290. 3 hours or 1 unit.

- 373. Combinatorial Algorithms.** Same as Mathematics 373. Advanced data structures, graph algorithms, arithmetic algorithms, geometric algorithms, string problems, parallel algorithms, NP-Completeness. Prerequisite: Computer Science 225 and 273, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Mathematics 375. Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linear-bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems; recursive functions; Chomsky hierarchy; computational complexity. Prerequisite: Computer Science 273 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 376. Program Verification.** Examines formal methods for demonstrating correctness and other properties of programs; includes an overview of predicate calculus. Topics include: invariant assertions, Hoare axiomatics, well-founded orderings for proving termination, structural induction, computational induction, data structures, and parallel programs. Prerequisite: Computer Science 225, and either Computer Science 273 or Mathematics 314. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 381. Introduction to Computer Memories and I/O.** Introduction to memories, input/output devices, and optical processors; lecture and demonstration. Prerequisite: Computer Science 281, Electrical and Computer Engineering 340, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 383. Linear Programming.** Same as Mathematics 383. See Mathematics 383.
- 384. Computer Data Acquisition Systems.** Theory, operation, and design of computer data acquisition systems; analog and digital aspects, conversions between representations, interfacing and systems considerations. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290; Computer Science 281 or Electrical and Computer Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 389. Advanced Computer Circuits.** Theory, operation and use of digital integrated circuit technologies that are commonly used in modern digital computers; provides an understanding of the operation of various computer technologies, design knowledge at the integrated circuit package level, and an introduction to computer circuit design aids. Prerequisite: Computer Science 231 or Electrical and Computer Engineering 290; Computer Science 281 or Electrical and Computer Engineering 340. 3 hours, or $\frac{3}{4}$ or 1 unit. Students may not receive credit for both Computer Science 389 and Electrical and Computer Engineering 380.
- 397. Special Topics in Computer Science.** Lectures in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
- 405. Numerical Methods in Fluid Dynamics.** Same as Atmospheric Science 405. See Atmospheric Science 405.
- 411. Design of Database Management Systems.** The internal workings of database management systems: query interpretation, concurrency control, distribution, data buffering, schema management. Considers traditional database management systems and newer approaches. Presents and analyzes the course material in terms of a particular target application. Prerequisite: Computer Science 311. 1 unit.
- 419. Scientific Visualization.** Detailed study of visualization techniques useful in analysis of engineering and scientific data. Topics include study of physical models; methods of computational science; two- and three-dimensional data types; visual representation schemes for scalar, vector, and tensor data; isosurface and volume visualization methods; visual monitoring; and interactive steering. Prerequisite: Computer Science 318. 1 unit.
- 425. Programming Language Semantics.** Topics in the theory and formal description of programming languages, including: functional programming; meta-circular interpreters; typed, untyped, and polymorphic lambda-calculi; and denotational semantics. Prerequisite: Computer Science 325. $\frac{3}{4}$ or 1 unit.
- 426. Topics in Compiler Construction.** Advanced topics in compiler construction, including incremental and interactive compiling, error correction, code optimization, models of code generators, etc. Prerequisite: Computer Science 326. 1 unit.
- 433. Theory of High-Speed Parallel Computation.** Same as Electrical and Computer Engi-

- neering 433. Theoretical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; and overall computer system ideas. Prerequisite: Consent of instructor. 1 unit.
- 436. Design of Fault-Tolerant Digital Systems.** Same as Electrical and Computer Engineering 442. See Electrical and Computer Engineering 442.
- 441. Computer Systems Analysis.** Same as Electrical and Computer Engineering 441. Development of analytical models of computer systems and application of such models to performance evaluation; topics include scheduling policies, paging algorithms, multiprogrammed resource management, and queueing theory. Prerequisite: Mathematics 361 or 363, and Electrical and Computer Engineering 313, or equivalent. 1 unit.
- 444. Design of Computer Problem Solvers.** Same as Electrical and Computer Engineering 444. Principles and engineering techniques for artificial intelligence problem-solving and inference systems; pattern-directed inference systems, including context mechanisms and efficiency issues; truth-maintenance systems, including basics of justification-based, logic-based, and assumption-based systems, dependency-directed search and closed-world reasoning, and integration with other reasoning modules; constraint languages, including applications to engineering systems; symbolic relaxation systems, including applications to vision and temporal reasoning; production rule languages; MYCIN-like rule languages. Prerequisite: Computer Science 348. 1 unit.
- 445. Systems Modeling and Simulation.** Same as Business Administration 475. See Business Administration 475.
- 446. Advanced Artificial Intelligence Programming Methods.** Same as Electrical and Computer Engineering 446. Concepts and implementation techniques for advanced artificial intelligence programming algorithms and practices using Common LISP; data-driven programming, coroutines, continuations, agenda control, discrimination nets, deductive retrieval, production systems, inheritance, object-oriented programming, backtracking, and knowledge representation. Prerequisite: Computer Science 348 or consent of instructor. 1 unit.
- 448. Computer Models of Cognitive Processes.** Same as Electrical and Computer Engineering 448. Formal models and concepts in vision and language; detailed analysis of computer vision, language, and learning problems; relevant psychological results and linguistic systems; and survey of the state of the art in artificial intelligence. Prerequisite: Computer Science 348. 1 unit.
- 449. Proseminar in Cognitive Science.** Same as Anthropology 470, Educational Psychology 471, Linguistics 470, and Psychology 471. See Anthropology 470.
- 454. Parallel Numerical Algorithms.** Same as Mathematics 486. Introduction of numerical algorithms for vector and parallel computers: parallel algorithms in numerical linear algebra (dense and sparse solvers for linear systems and the algebraic eigenvalue problem), numerical handling for ordinary and partial differential equations, and numerical optimization techniques. Prerequisite: At least one of Computer Science 350, 355, 358, or 359, or consent of instructor. 1 unit.
- 456. Coding Theory.** Same as Electrical and Computer Engineering 456 and Mathematics 476. See Electrical and Computer Engineering 456.
- 457. Numerical Solution of Ordinary Differential Equations.** Same as Mathematics 457. Derivation and rigorous analysis of one-step, multistep, and extrapolation methods, variable stepsize, error estimation, stiff equations, and boundary value problems. Prerequisite: Computer Science 359 or consent of instructor. 1 unit.
- 458. Topics in Numerical Analysis.** Same as Mathematics 458. Prerequisite: Consent of instructor. 1 unit. May be repeated.
- 463. Information Theory.** Same as Electrical and Computer Engineering, Mathematics, and Statistics 463. See Mathematics 463.
- 464. Topics in Digital Computer Arithmetic.** Topics selected from the advanced theory of digital computer arithmetic, including division methods, use of redundancy, and implications of the use of number representations, such as continued products and continued fractions. Prerequisite: Computer Science 364. 1 unit.

- 465. Topics in Automata Theory.** Same as Electrical and Computer Engineering 465 and Mathematics 465. See Mathematics 465.
- 469. Introduction to Coherent Optics and Holography.** Same as Electrical and Computer Engineering 469. See Electrical and Computer Engineering 469.
- 472. Graph Theory.** Same as Mathematics 418. See Mathematics 418.
- 473. Topics in Analysis of Algorithms.** Theoretical analysis of various algorithms; topics include sorting, searching, selection, polynomial evaluation, matrix multiplication, and multiplication of real numbers. Prerequisite: Computer Science or Mathematics 373 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 474. Topics in Graph and Geometric Algorithms.** Same as Electrical and Computer Engineering 474. See Electrical and Computer Engineering 474.
- 475. Topics in Combinatorics.** Same as Mathematics 475. Selected topics from graph theory, algebraic coding theory, enumerative analysis, combinatorial design, and discrete optimization; includes other topics of current research interest, such as Ramsey's Theorem, Sperner's Theorem, Dilworth's Theorem, and the theory of matroids. Prerequisite: Computer Science 273, Mathematics 313, or consent of instructor. 1 unit.
- 479. Computational Complexity.** Same as Electrical and Computer Engineering 479 and Mathematics 479. See Electrical and Computer Engineering 479.
- 485. Topics in Computer Hardware.** Advanced features of computer hardware; topics vary, but typically are chosen from: memories, optical data processing and storage, device modeling and computer-aided circuit design, and stochastic representation and processing of information. Prerequisite: Consent of instructor. 1 unit.
- 487. Theory of Approximation.** Same as Mathematics 487. See Mathematics 487.
- 490. Individual Study.** Individual study or reading in a subject not covered in normal course offerings. Prerequisite: Consent of instructor. $1/2$ to 4 units.
- 491. Seminar in Computer Science.** Seminar on topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. 0 to 1 unit.
- 492. Individual Project Study.** Individual study of a computer-related project required of all candidates for the Master of Computer Science degree. Prerequisite: Consent of instructor. $1/2$ to 4 units (summer session $1/2$ to 2 units).
- 497. Special Topics in Computer Science.** Lecture course in topics of current interest. See Timetable for current topics. Prerequisite: Consent of instructor. $1/2$ to 1 unit.
- 499. Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

CONSUMER SCIENCES

(Including Family and Consumer Economics, Interior Design, and Textiles and Apparel)

Chair of Division: F. M. Magrabi

Division Office: 237 Bevier Hall, 905 South Goodwin Avenue, Urbana

Family and Consumer Economics

- 170. Consumer Economics.** Introduction to the study of the consumer in the American economy; sources of consumer information and consumer protection; and examination of current consumer issues within an economic framework. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Consumer Economics Internship.** A supervised off-campus experience through a cooperative program with an agency, business, industry, financial or educational institution, or legislative body having a consumer component. Prerequisite: Junior standing and consent of division chair; not available to students on academic probation. 4 hours.
- 270. Family Financial Management.** Examines principles of family financial management with attention given to research findings on the interdependence of financial decisions and energy, time, and other resources used to attain family goals and maintain family

- values. Prerequisite: Junior standing and 6 hours of sociology, psychology, and/or economics. 3 hours.
- 276. Engineering Applications in Residential Housing.** Same as Agricultural Mechanization 271 and Interior Design 271. See Agricultural Mechanization 271.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of chair of division. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of chair of division. 3 to 5 hours.
- 313. Economics of Consumption.** Same as Economics 313. Introduces the concepts, theories, and methods for analysis of the micro and macro aspects of consumption; includes standards and content of consumption and description of consumption patterns and trends in the U.S.A. and selected other countries. Prerequisite: Economics 101 or Economics 102-103 or equivalent; a course in statistics; junior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 314. Consumption in Developing Countries.** Standards and actual levels of household consumption in developing countries, including food, housing, health care, and energy, with special emphasis on the role of women in household production and consumption. Prerequisite: Family and Consumer Economics 313, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 370. Family Economics.** Same as Agricultural Economics 370, and Economics 346. Examines the economic welfare of American families: application of economic theory to the behavior of families and individuals with respect to time allocation between the home and the market; family forms; human capital accumulation; sex differences in income; income inequality; and poverty. Considers the role of public policy. Prerequisite: Economics 101 or Economics 102-103 or equivalent; a course in applied statistics; senior standing. 3 hours, or $\frac{1}{2}$ to 1 unit. Students in consumer sciences may receive 1 unit credit; students in agricultural economics may receive $\frac{3}{4}$ unit credit; and students in economics may receive $\frac{1}{2}$ unit credit.
- 371. The Family as a Consuming Unit.** Analyzes choice-making, buying, using, and disposing of consumer goods by families from a social policy perspective. Prerequisite: 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 373. Family Resource Management.** Focuses on the family as a problem-solving group with attention to the impact of decisions about resource use on various family environments and human resource development; applies management processes to personal and family life and its interdependence with work and public issues. Prerequisite: Junior standing and 9 hours in the social sciences; Family and Consumer Economics 270. 4 hours or 1 unit.
- 378. Problems in Management, Equipment, and Housing.** Individual investigations on problems in the fields of family resource management, household equipment or housing. Prerequisite: Senior standing; Family and Consumer Economics 270 or 373 or 375. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 379. Problems in Family, Consumer, and Consumption Economics.** Individual investigations and reports of specific problems in the field of family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313, 370, 371, or consent of instructor; senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 405. Research Methods in Home Economics.** Same as Textiles and Apparel 405. See Textiles and Apparel 405.
- 413. Consumption Economics.** Same as Economics 413. Examines theoretical and empirical analysis of consumer demand; topics include theory of consumer behavior, as well as extensions and applications in a static context (characteristics analysis and product quality, price indices, measurement of consumer welfare) and in a dynamic context (intertemporal choice, habit and stock adjustment modes, choice under uncertainty). Prerequisite: A course in microeconomic theory and a course in statistics. 1 unit.
- 470. Seminar in Family and Consumption Economics.** Same as Agricultural Economics 470. Discussion of current topics and review of the literature in family and consumption economics. Prerequisite: Economics 101 or equivalent; a course in applied statistics; Family and Consumer Economics 313 or 370, or consent of instructor. $\frac{1}{2}$ or 1 unit.

472. **Economics of the Family.** Discusses and analyzes advanced literature on the economics of the family, developed within the models of human capital and allocation of time; emphasizes the theory and empirical applications. Prerequisite: Economics 400 or 402; Economics 470 or Sociology 385, or equivalent. 1 unit.
493. **Advanced Studies in Family and Consumer Economics.** Research or practical experience with specific problems of limited scope. Prerequisite: Graduate standing and consent of instructor. $1/2$ to 1 unit.
499. **Thesis Research.** 0 to 4 units.

Interior Design

164. **Computer Graphics Interior Design Studio.** Introduction to the computer with emphasis on computer-aided design as related to interior design. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Interior Design Internship.** A supervised, off-campus experience in interior design through a cooperative program with selected employers. Prerequisite: Interior Design 160, 161, 262, and 263. 4 hours.
260. **Interiors and Furniture, I.** Development of interior environments from prehistoric times to the nineteenth century in Europe with emphasis on the social, economic, political, and cultural aspects which influenced the development of architecture and furniture; consideration of the adaptation and use of period styles in contemporary interiors. Prerequisite: History of Art 112 or consent of instructor. 3 hours.
261. **Interiors and Furniture, II.** Continuation of Interior Design 260. Development of interior environments through the Federal Period in America and during the nineteenth and twentieth centuries in Europe and the United States; emphasizes the social, economic, political, and cultural influences on the evolution of the styles. Prerequisite: Interior Design 260. 3 hours.
262. **Interior Design Studio, III.** Designing of interiors and their components: emphasis on design theory, presentation techniques, and evaluation of design concepts. Prerequisite: Interior Design 161; General Professional Courses in Art and Design 118, 120 and 122; Textiles and Apparel 280. 3 hours.
263. **Interior Design Studio, IV.** Examines characteristics, manufacturing processes, and application of materials as related to interior design, design process, and presentation. Prerequisite: Interior Design 262 or consent of instructor. 3 hours.
264. **Professional Practices for Interior Designers.** In-depth study of professional responsibilities of the interior designer, including: analysis of scope of services, workroom practices, and relations with trade and industry sources. Prerequisite: Interior Design 162. 3 hours.
271. **Engineering Applications in Residential Housing.** Same as Agricultural Mechanization 271 and Family and Consumer Economics 276. See Agricultural Mechanization 271.
272. **Structural Materials and Systems for Interiors.** Materials and construction methods utilized in interior environments with an emphasis on detailing. Prerequisite: Interior Design 162. 3 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
360. **Interior Design Studio, V.** Development of complete set of working drawings for an interior renovation delineating new materials in floor plans, elevations, sections, details, schedules, electrical and furniture layouts. Prerequisite: Interior Design 263 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
378. **Problems in Interior Design, Studio VI.** Individual investigations and reports of specific problems in the field of interior design. Prerequisite: Interior Design 360 or consent of instructor. 3 hours, or $3/4$ or 1 unit.

Textiles and Apparel

- 182. Apparel Production Analysis.** Introduces the nature and scope of apparel production methods in the U.S.; investigates new technology and apparel production methods; includes apparel design analysis, cutting production analysis, principles of apparel construction techniques, production control, quality control and cost control. 3 hours.
- 183. Introduction to Textiles.** Introductory analysis and study of textile fibers, yarns, fabrications, finishes, and regulatory legislation; designed to improve consumer competence in selection, use, and care of textile products. Lecture and laboratory. Prerequisite: Chemistry 100 or exemption. 3 hours.
- 184. Introduction to Apparel Design.** Elements and principles of design related to apparel design and its relation to apparel production and marketing; introduction to theories of fashion processes; style identification; designer contributions. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 250. Textile and Apparel Business Internship.** A supervised learning experience through a cooperative program with a textile and/or apparel related agency, business, or industry. Prerequisite: Sophomore standing; Textiles and Apparel 182, 183, or 184; consent of supervisor of internships. Not available to students on probation. 4 hours.
- 280. Textiles for Interiors.** Analysis of criteria for selection of textiles, emphasizing aesthetics, comfort, durability, energy conservation, cost and safety considerations for private and public interiors, including transportation interiors; introduction to standards and specifications for textiles used in residential and commercial interiors. Prerequisite: Textiles and Apparel 183. 3 hours.
- 285. History of Costume.** Costumes and their settings from the early Egyptian period through the middle of the twentieth century. 3 hours.
- 287. Dress and Human Behavior.** Applies selected principles from the behavioral and social sciences to the analysis of dress as it relates to human behavior; includes relevant historical and contemporary theory and research. Prerequisite: Sociology 201 or Psychology 201; or consent of instructor. 3 hours.
- 290. Cross-Cultural Analysis of Dress.** Cross-cultural variations in form, function, and meaning of dress analyzed in relation to physiological, psychological, and sociological needs of human beings; analysis of process of acculturation; case studies. 3 hours.
- 291. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of division. 3 to 5 hours.
- 292. Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of division. 3 to 5 hours.
- 295. Textiles and Apparel in International Economy.** History of the development of fiber, fabric, apparel, and related industries; present structure, organization, domestic and international operation, and interrelationships of these industries; trends of the major sectors of the primary and secondary markets; and application of the principles of marketing to textiles and apparel. Prerequisite: Business Administration 202. 3 hours.
- 296. Administrative Retailing.** Analysis of functions in a retail store with emphasis on textiles and apparel; relationship of the retailer to related primary and secondary markets and the consumer; and analysis of current trends and social influences in fashion retailing. Prerequisite: Business Administration 202. 3 hours.
- 350. Textile and Apparel Business Practicum.** A cooperatively supervised field experience in management and administration in a textile or apparel business and/or industry. Only one unit may be applied to the total required for a graduate degree in Human Resources and Family Studies, TAID option. At the undergraduate level, only four hours may be applied to the total TAID courses required. Prerequisite: Major in Textiles, Apparel, and Interior Design; Textiles and Apparel 295 or 296; and consent of instructor. Not available to students on probation. 4 or 6 hours, or 1 or 1/2 units. May be taken during the same semester for up to 12 hours or 3 units.
- 380. Advanced Textiles.** Examines chemical composition, polymer structure, and engineering potential of textile fibers; effect of chemical finishes and recycling procedures on performance characteristics of consumer textile products; and introduces physical and

- chemical metrology techniques useful for quality control and research purposes. Prerequisite: Textiles and Apparel 280 and Chemistry 102 or 103. 4 hours or 1 unit.
385. **History of Textiles.** Examines the aesthetic, technological, and cultural aspects of significant textiles produced by selected societies throughout history. 4 hours or 1 unit.
388. **Problems in Textiles and Clothing.** Individual problems in the fields of textiles, apparel, marketing, or textile design. Prerequisite: Senior standing, 3.5 grade-point average; consent of instructor. Credit in one of the following: Textiles and Apparel 285, 287, or 380, or Business Administration 312. 1 to 4 hours, or 1/2 to 1 unit.
395. **Macroenvironment of Textile and Apparel Businesses.** An overview of consumer behavior as related to textiles and apparel; interrelationships of foreign and domestic textile and apparel markets; current research in retailing; and analysis of fashion marketing and retailing issues through the case study method. Prerequisite: Business Administration 312. 3 hours or 1/2 unit.
405. **Research Methods in Consumer Sciences.** Same as Family and Consumer Economics 405. Theory and practice of empirical research methods that have application to such areas of home economics as textiles, apparel, and family and consumer economics. Prerequisite: An introductory course in statistics. 1 unit.
480. **Seminar in Textiles.** Reviews selected research literature in the field of textiles. Prerequisite: Textiles and Apparel 380 or equivalent; consent of instructor. 1/2 to 1 unit.
481. **Principles of Textile Metrology.** Examines textile metrology as a component of the production and use of textiles; includes case studies and investigative metrology. Prerequisite: Textiles and Apparel 380 and Agronomy 340. 1 unit.
482. **Textile Finishing: Theory and Development.** Examines developments in textile finishing technology to enhance the aesthetic and functional qualities of fibers and fabrics. Prerequisite: Textiles and Apparel 380 and Chemistry 131; graduate standing in textiles and apparel or a related area; consent of instructor. 1 unit.
483. **Social Psychology of Dress: Research and Theory.** Analyzes and evaluates recent developments in theory and research in the social psychology of dress; emphasizes the interpersonal process and social influences affecting apparel selection; focuses on future research directions and rationale of the directions in light of latest research. Prerequisite: A course in social psychology of dress; and another course in social psychology or a related area; consent of instructor. 1 unit.
484. **Analysis of Research in Apparel Marketing.** Analysis of apparel marketing emphasizing trends and future research directions. Prerequisite: A course in marketing and consent of instructor. 1 unit.
485. **High Performance Fibers.** Investigation of textile fibers and fibrous systems for nonclassical applications, such as medicine and hygiene; protective apparel systems for heat and toxic chemicals; fiber reinforced components of building structures, transportation vehicles, sports equipment; and geotextiles. Prerequisite: Textiles and Apparel 380 and graduate standing in Textiles and Apparel or a related area and consent of instructor. 1 unit.
487. **Seminar in Apparel.** Reviews and analyzes selected theory and research in the apparel fields. Prerequisite: Graduate standing in textiles and apparel, or consent of instructor. 1/2 to 1 unit. May be repeated as topics vary.
488. **International Economic and Marketing Structures of Textiles and Apparel.** Examines the history, policies, organization, performance, and trends of the international textile and apparel industries. Prerequisite: Textiles and Apparel 295 or equivalent; or consent of instructor. 1 unit.
495. **Advanced Studies in Textiles and Apparel.** Researches specific problems of limited scope. Students who do not write a thesis may substitute this course for Textiles and Apparel 489 when combined with 8 additional units for a master's degree. Prerequisite: Consent of instructor. 1/2 to 1 unit.
499. **Thesis Research.** 0 to 4 units.

CRAFTS

(See Art and Design)

CURRICULUM AND INSTRUCTION

Head of Department: Steven E. Tupper

Department Office: 301 Education Building, 1100 South Sixth Street, Champaign

101. **Introduction to the Teaching of Secondary School Subjects.** A survey of recent developments in the teaching of secondary school subjects; assesses standard and new programs; and explores research and empirical evidence as they relate to effective teaching of secondary school subjects. Special sections are provided in English, mathematics, science, social studies, speech, and computer science. Experiences in school settings are provided in Curriculum and Instruction 200. 1 hour.
199. **Undergraduate Open Seminar.** 1 or 3 hours. May be repeated.
209. **Preliminary Field Experience in Secondary Teaching.** To be taken during the sophomore year by continuing students at the University of Illinois in secondary education curricula of English, mathematics, science, social studies, and speech. For students transferring into these programs at the 60 or near 60-hour level from other colleges, universities, or junior colleges, the course may be taken during the first semester of their work on this campus. Includes at least 8 hours of instruction in public school classrooms, at least one microteaching lesson in the Teaching Techniques Laboratory, and one or more conferences with an adviser in teacher education. Students amass up to 10 hours of early field experiences toward the required total of 100 hours. 1 hour.
219. **Field Experience in Secondary Teaching.** Offered in conjunction with Curriculum and Instruction 101 in the secondary teacher education program in English, mathematics, science, social studies, speech, and computer science. Meets in subject area discussion sections one hour per week throughout the semester for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in school for at least one hour per week for the entire semester. Students amass at least 32 hours of early field experiences toward the required total of 100 hours. Prerequisite: Concurrent registration in Curriculum and Instruction 101. 0 to 2 hours.
229. **Field Experience in Secondary Education.** Offered in conjunction with Curriculum and Instruction 240 for students in secondary teacher education programs adopting this means of fulfilling early field experience requirements. Meets in discussion sections paralleling Curriculum and Instruction 240 sections, for one hour per week throughout the semester, for purposes of assignment to schools, orientation to specific field experiences, and monitoring and evaluating these experiences. Students are assigned in school and community settings for at least two hours per week for the entire semester, thereby amassing at least 32 hours of early field experiences toward the required total of 100 hours. Registration is required in secondary teacher education programs adopting this means of fulfilling early field experience requirements. Prerequisite: Concurrent registration in Curriculum and Instruction 240. 0 to 2 hours.
237. **Theory and Process in Elementary School Teaching.** Directed toward attaining prospective teacher insight with regard to classroom behavior in teaching; includes materials dealing with child learning, teaching theory, and elementary school curriculum. A six-week morning assignment to a public school classroom is part of the course structure. Prerequisite: Educational Policy Studies 201, Educational Psychology 236, and admission to the Elementary Education Teacher Education curriculum. 3 hours.
239. **Microteaching: Practice in Teaching Techniques.** Instruction and practice in basic teaching techniques; consideration of both teacher-centered and learner-centered techniques; systematic examination of each technique in terms of basic description and

- evaluative procedures; and application of techniques to specific instructional situations. Students amass 32 hours of early field experiences (laboratory component) toward the required total of 100 hours. Prerequisite: Junior standing. 2 hours.
240. **Secondary Education in the United States.** Provides each specialized educational worker with a common orientation to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Experiences in school settings, required in some curricula, are provided in Curriculum and Instruction 229. Prerequisite: Curriculum and Instruction 101; Psychology 100; concurrent registration in Educational Policy Studies 201. 2 hours.
241. **Techniques of Teaching in the Secondary Schools.** Methods of teaching specific subject matter fields in the secondary school; special sections provided in the usual high school subjects. Prerequisite: Educational Policy Studies 201; Curriculum and Instruction 240; concurrent registration in Educational Practice 242; consent of instructor. 3 to 5 hours.
247. **Teaching of Speech.** Same as Speech Communication 247. A study of methods and materials used in teaching speech in the high school. Prerequisite: Senior standing. 3 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 or 3 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
300. **Workshop and Laboratory in Curriculum Development.** Curriculum development projects in specialized fields of education. Prerequisite: Junior standing. 3 hours, or $1/2$ or 1 unit. May be repeated to a maximum of 2 units toward any one degree.
310. **Alternative Approaches to Classroom Instruction.** Improvement of classroom instruction through a study of alternative approaches to teaching with emphasis on demonstration teaching and the development of skill in observing and analyzing teaching. Prerequisite: Curriculum and Instruction 241 and Educational Psychology 211, or equivalents; or consent of instructor. 3 hours, or $1/2$ or 1 unit.
320. **Foundations of Early Childhood Education.** The study of the role of the early childhood teacher in designing, organizing, and implementing educational programs for children in preschools, kindergartens, and the first three grades of the elementary school; includes the history, philosophy, and theory of early childhood education; includes morning school practicum providing at least 90 hours of early field experience. Prerequisite: Admission to the Early Childhood Teacher Education Curriculum; Educational Psychology 236; Educational Policy Studies 201. 5 hours or 1 unit.
321. **Principles and Practices in Early Childhood Education.** Studies the principles and practices of using play as an educational tool in early childhood education; reviews historical, philosophical, and psychological foundations of nursery-kindergarten methods; assesses techniques relating play to various aspects of instruction; surveys materials and equipment; and presents methods of classroom evaluation. Prerequisite: Curriculum and Instruction 320. 3 hours, or $1/2$ or 1 unit.
322. **Parent Involvement Techniques for Teachers.** Principles and practices in working with parents in programs of involvement, education, and participation for elementary and early childhood teachers; includes techniques of reporting to parents, counseling with parents, guiding parent participation in schools, and developing relations with community agencies. Prerequisite: Curriculum and Instruction 320 or graduate standing. 3 hours, or $1/2$ or 1 unit.
324. **Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Human Development and Family Studies 305. See Foods and Nutrition 305.
330. **Principles and Practices in Mathematics Education.** Organization, scope, and sequence of the mathematics program and the functional nature of mathematics; methods, techniques, experiences, and materials of value in teaching mathematics, and the role of

classroom teacher. Prerequisite: Curriculum and Instruction 237 or 320; Mathematics 201 or equivalent. 3 hours, or $1/2$ or 1 unit. Students may register more than once for this course in the same term.

- 335. Computer-Assisted Instruction.** Same as Computer Science 317. Computer-assisted instruction (CAI) and its relation to classroom teaching; the teacher's role in development, management, and criticism of CAI lessons; treatment of topics including instructional capabilities of CAI systems, instructional programming, and the design of CAI lessons. Prerequisite: 100 level Computer Science course, or Computer Science 400, or consent of instructor. 4 hours or 1 unit.
- 336. The Computer and Mathematics Education.** Examines the role of the computer as an instructional tool in the secondary school mathematics classroom; reviews curricular materials and develops sample classroom projects in computer mathematics; analyzes computational problems and develops algorithms for their solution; and includes iteration, Monte Carlo methods, and simulation. Prerequisite: Computer Science 101 or 400, or consent of instructor. 4 hours or 1 unit.
- 340. Principles and Practices in Science Education.** The principles, place, and practice of science education in the school and in the lives of children; stresses the functional nature of science and its place in the curriculum; and considers the organization of the science program, experiences and techniques of value in teaching, and the role of the classroom teacher and specialist. Opportunity for experience in field and laboratory work. Prerequisite: Curriculum and Instruction 237 or 320; two years of college science. 3 hours, or $1/2$ or 1 unit.
- 345. Principles and Practices in Social Studies Education.** Emphasizes the role of social studies education in the school; the formal instructional program in social studies, including the knowledge, skills, and sensitivities to be taught; the teaching strategies and materials employed; and the organization of learning experiences and the total program in addition to the educative impact of the school as a social system. Prerequisite: Curriculum and Instruction 237 or 320; junior standing. 3 hours, or $1/2$ or 1 unit.
- 346. Culture in the Classroom.** Overview of the social and cultural factors that affect learning and teaching, and application of cultural information to curriculum development, classroom practices, and evaluation. 3 hours, or $1/2$ or 1 unit.
- 360. Principles and Practices in Language Arts Education.** Goals, content, and teaching problems involved in the devising of programs in the area of language arts that are cumulative and sequential. Prerequisite: Curriculum and Instruction 237 or 320. 3 hours, or $1/2$ or 1 unit.
- 367. Principles and Practices in Teaching Literature to Children and Youth.** Examines literature written for children and youth and the uses of literature in the school curriculum. Prerequisite: Curriculum and Instruction 237 and 320 and one college course in literature. 3 hours, or $1/2$ or 1 unit. Students may not receive credit for both Curriculum and Instruction 367 and Library and Information Science 303.
- 370. Principles and Practices in Reading Education.** Basic principles, techniques, and materials for the developmental reading program; emphasizes methods and materials which provide for differentiated instruction. Prerequisite: Junior standing; Curriculum and Instruction 237 or 320. 3 hours, or $1/2$ or 1 unit.
- 371. Principles and Practices for Fostering Independence in Reading.** Comprehension, study, and reference skills as they pertain to reading in the content fields; appropriate for elementary and junior high school majors, K through Grade Eight. Prerequisite: Curriculum and Instruction 370. 3 hours, or $1/2$ or 1 unit.
- 372. Teaching of Reading in Grades Four Through Twelve.** Developmental reading programs beyond the primary grades; factors related to reading speed and comprehension; vocabulary development, specific comprehension skills, study skills, and reading interests and tastes. Prerequisite: Curriculum and Instruction 370 or Education Psychology 211; junior standing. 3 hours, or $1/2$ or 1 unit.
- 399. Issues and Developments in Education.** A seminar course on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $1/2$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.

- 400. Elementary School Classroom Programs.** Explores organizational centers for determining selection and sequence of educative experiences in the elementary school classroom; emphasizes the role of the teacher in curriculum construction. 1 unit.
- 401. Fundamentals of Curriculum Development.** Examines a variety of definitions of curriculum developments; readings reflect current theories and research related to substantive issues in the field: how learning is influenced by stated goals of education, cultural background of the learners, structure of the school setting, competencies of teachers, psychological characteristics of the learners, and means of measuring student achievement. 1 unit.
- 402. Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Vocational and Technical Education 448. See Administration, Higher, and Continuing Education 448.
- 407. Problems and Trends in Specialized Fields.** An intensive examination of problems and trends in the subject fields. 1 unit. May be repeated to a maximum of 2 units.
- 409. Curriculum Research.** Reviews the principle methodologies used in research on curriculum problems; emphasizes subject-analytical, large-scale survey, experimental, case methods, and clinical studies; emphasizes the conceptual and practical problems in such research. Prerequisite: Education 400 or equivalent. 1 unit.
- 410. Linguistic and Logical Analysis of Teaching.** An analysis of teaching from the standpoint of semantic and logical factors; discussion of topics such as theories of meaning, definition, explanation, and justification as employed by a teacher. 1 unit.
- 416. Clinical Supervision of Instruction.** Same as Administration, Higher, and Continuing Education 433. Designed for persons concerned with supervision of classroom instruction. Principally concerned with strategies for helping teachers realize their full professional potential; considers techniques of classroom observation, analysis of observations, and interaction skills; and uses video, audio, and printed protocols to develop observation and analytic skills, and role playing techniques to foster interaction skills. Prerequisite: Practice teaching. 1 unit.
- 417. Interventions Used in Programs of Teacher Education.** Considers several teacher education programs, including conventional, humanistic, reinforcement, technical skills, and teacher competencies programs, in terms of selection and retention of candidates, professional preparation, general education and governance. Prerequisite: Satisfaction of college foundations requirements (Educational Psychology 311 and 312, and two $1\frac{1}{2}$ unit courses in social and philosophical foundations within Educational Policy Studies). 1 unit.
- 418. Evaluation of Educational Programs.** Same as Educational Psychology 451. Origins, assumptions, applications, and development of approaches to educational program evaluation in practice over the past twenty years; unobtrusive measures and noneducation evaluation systems; and practice in collecting evaluative data. Prerequisite: Educational Psychology 390, one year of work with children or youth in an institutional setting, or consent of instructor. 1 unit.
- 419. Methods of Child Study.** Studies ways in which teachers can evaluate child behavior and development with emphasis on classroom application; instruction and practice in the use and interpretation of observations, anecdotal records, rating scales, interviews, achievement tests, intelligence tests, questionnaires, and sociometric and projective techniques. Prerequisite: Educational Psychology 312 or consent of instructor. 1 unit.
- 420. Programs in Early Childhood Education.** Advanced course intended primarily for teachers and supervisors of younger children, ages three to eight; reviews and analyzes research findings, experimentation, and current trends in curriculum organization, procedures, and materials essential to developing classroom programs for children. 1 unit.
- 421. Curriculum Problems and Trends in Early Childhood Education.** Includes principles underlying education practices in day care centers, preschool/nursery and kindergarten settings derived from theory and research in developmental psychology, social psychology, anthropology, and other related disciplines. 1 unit.
- 430. Trends and Issues in Mathematics Education.** Deals with theories of learning, research studies, curriculum development projects, and other events which have influenced

elementary mathematics programs; also considers problems and issues in contemporary programs. Prerequisite: Curriculum and Instruction 400 or 420. 1 unit.

- 431. Development of Mathematics Programs.** Deals with procedures for developing curricula in the major content areas of mathematics and alternative instructional procedures. Prerequisite: Curriculum and Instruction 330 or equivalent; or consent of instructor. 1 unit.
- 435. Theory and Design of Instructional Simulations.** Introduces theory and design of interactive simulations for teaching decision making in schooling/training situations; includes introduction to models of simulation, a process of simulation construction, identification and interpretation of learning outcomes, computer implementation of selected simulations. Prerequisite: Curriculum and Instruction 335; Computer Science 300 or equivalent. 1 unit.
- 440. Current Issues in Science Education.** Advanced seminar in science education for teachers, consultants, and administrators. Identifies major problems and issues; analyzes current trends and research; and develops a philosophical framework related to science education. Prerequisite: Curriculum and Instruction 340 or equivalent, and two years of college science; or consent of instructor. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student, and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chair prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 2 units with consent of adviser and department head.
- 460. Research and Trends of the Language Arts Curriculum.** Investigates research, trends, issues, and innovative practices for teachers and educators on the teaching of the language arts; identifies and develops procedures for organizing and implementing new knowledge and research into the school curriculum. Prerequisite: Curriculum and Instruction 360 or equivalent. 1 unit.
- 461. Theory and Practice in Children's Composition.** Studies composition or writing, its beginning and progress, gives particular attention to the relationship between creativity and imagination and the basic skills of punctuation, spelling, and other conventions of writing; and examines research studies on functions of writing, motivation, and purposes for writing during the school years. Prerequisite: Curriculum and Instruction 360 or equivalent. 1 unit.
- 462. Linguistics and the School Curriculum.** Analyzes linguistics for the school curriculum including dialect diversities, new theories of grammar, lexicography, and variations in oral and written forms of language; gives attention to how teachers apply these principles in the construction of language arts programs. Prerequisite: Curriculum and Instruction 360, or credit in a course in English grammar or linguistics. 1 unit.
- 467. Children's Literature and the School Curriculum.** Investigates trends and issues related to teaching literature in the school; focuses attention upon the organization and planning of a balanced literature curriculum (fictional and informational). Prerequisite: Curriculum and Instruction 367 or Library and Information Science 304; and English 101, 103, 106, 115, 116, or consent of instructor. 1 unit.
- 468. Contemporary Classics in Children's Literature.** Critically examines children's books that have received major national and international awards and prizes and the requirements for that distinction; gives particular attention to the most recent publications so honored and their implications for use in the classroom. Prerequisite: Curriculum and Instruction 367 or 467, or Library and Information Science 304; and English 106 or 215, or equivalent; or consent of instructor. 1 unit.
- 470. Issues and Trends in Reading.** The timing of beginning reading, the influence of certain linguists on methodology and terminology in instructional materials, and the influence of research on methodology are dealt with in a way that provides a historical perspective for evaluating the merit of emerging issues and trends. Prerequisite: Curriculum and Instruction 370. 1 unit.
- 471. Field Instruction in Reading Programs.** Directed practice in the area of reading; students are placed in an approved and supervised field position for part of the semester. 1 unit.

- 472. The Organization and Supervision of School Reading Programs.** Studies procedures for planning, improving, and evaluating reading programs on a system-wide basis. Open only to those persons who are preparing to supervise reading programs or with approval of graduate adviser. Prerequisite: Curriculum and Instruction 475. 1 unit.
- 473. Reading Instruction in Nursery School Through Grade Three.** Planning and evaluating reading instruction and materials in nursery school through Grade Three. Prerequisite: Curriculum and Instruction 370 or 371, or equivalent; or consent of instructor. 1 unit.
- 475. Corrective Reading Instruction in the Classroom.** Nature, causes, and diagnosis of reading difficulties; translation of diagnostic information into instructional practice. Prerequisite: Curriculum and Instruction 370 or 371, or equivalent. 1 unit.
- 476. Clinical Diagnosis and Remediation in Reading.** Supervised experience in the reading center; special attention to evaluative and interpretative techniques in cases of severe reading disabilities based on the analysis of specific reading needs. Prerequisite: Curriculum and Instruction 475; a course in individual mental testing. 1 unit. May be repeated to a maximum of 2 units.
- 477. Clinical Practicum in Corrective Reading.** Diagnostic procedures and individual instruction with small groups of children who have reading difficulties. Prerequisite: Curriculum and Instruction 475. 1 unit.
- 490. Seminar for Advanced Students of Education.** Prerequisite: Admission to doctoral study. 0 to 2 units.
- 491. Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Prerequisite: Admission to doctoral study. 1 to 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

DANCE

Head of Department: P. K. Knowles

Department Office: 4-501 Krannert Center for the Performing Arts, 500 South Goodwin Avenue, Urbana

- 100. Introduction to the Art of Dance.** A survey of major works, figures, and trends in ballet, modern dance, and the dance of musical theatre from the late seventeenth century to the present; lectures supplemented with videotapes and lecture-demonstrations by visiting artists. For nondance majors. 3 hours.
- 101. Beginning Modern Dance.** Introduction to basic dance technique and movement improvisation; the study of motion as an art, group relationships in improvisation, and discussion of choreographic ideas. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
- 102. Intermediate Modern Dance.** Intermediate dance technique and improvisation. For nondance majors. Prerequisite: Dance 101 or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
- 105. Jazz.** Introduction to basic dance technique and stylistic work in the jazz idiom. For nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
- 106. Jazz Dance, II.** A progressive development of the concepts and skills in Dance 105. For nondance majors. Prerequisite: Dance 105 or equivalent; or consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.
- 107. Ballet Fundamentals, I.** Introduction to ballet for nondance majors. 1 hour. May be repeated to a maximum of 4 hours.
- 108. Ballet Fundamentals, II.** A progressive development of the concepts and skills in Dance 107; for the nondance major. Prerequisite: Two semesters of Dance 107 or equivalent; consent of instructor. 1 hour. May be repeated to a maximum of 4 hours.

- 130. Performance Practicum, I.** Performance laboratory involving the rehearsal and performance of student works under faculty supervision and/or works by faculty and visiting artists. Prerequisite: Consent of instructor. 1 to 3 hours (1 or 2 hours credit per dance). A maximum of 16 hours of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
- 131. Production Practicum.** Practical experience in the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. 1 or 2 hours (1 hour credit per concert up to 2 hours per semester). May be repeated to a maximum of 6 hours.
- 150. Orientation to Dance.** A survey of the field including dance as a theatre art, careers, injury prevention and nutrition. Also serves to orient incoming students to the faculty, programs, and policies of the Department of Dance, and the production and performing resources in the Krannert Center for the Performing Arts. Prerequisite: Major standing in Dance or consent of instructor. 2 hours.
- 160. Modern Technique, I.** Elementary technique for majors with emphasis on a conceptual understanding of movement principles and the development of technical skill and performance sensitivity. Prerequisite: Departmental audition. 1 to 3 hours. May be repeated to a maximum of 18 hours.
- 162. Improvisation, I.** Experience in selective, basic processes of movement involvement, both individual and group; special attention to organic, economical bodily use, the dynamics and quality of which are necessary to the activity being performed. 1 hour.
- 163. Improvisation, II.** Continuation of Dance 162, with emphasis on expanding bodily activity into various existing or created performing environments; use of sound and music, body coverings, and properties; and special attention to relating these experiences to dance composition. Prerequisite: Dance 162 or consent of instructor. 1 hour.
- 164. Beginning Composition.** Theory and practice in principles of dance composition; emphasis on solo creative work using various approaches to composition. Prerequisite: Dance 163 or consent of instructor. 2 hours.
- 166. Ballet, I.** Elementary ballet for dance majors; emphasizes placement, refinement of adagio, pirouette, jumps, and connecting steps. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 168. Music Theory for Dancers.** An introduction to basic music theory with a concentration on rhythm. The first half of the semester will concentrate on 1) learning, understanding, and being conversant in basic music parameters; 2) analytical listening; 3) notation; 4) transcripts; 5) reading notation/following a score; 6) performance of simple rhythm patterns. The second half will deal with form and formal analysis as it relates to choreography, as well as more advanced parameters of music theory. Prerequisite: Major standing in Dance. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated to a maximum of 9 hours.
- 243. Creative Dance for Children.** Introduction to theories and methods of teaching dance to children, grades 1-5; includes twenty-four hours of assistance, observation, and supervised practice teaching in class situations. Prerequisite: Dance 164 and 260, or consent of instructor. 3 hours.
- 250. Dance Forms.** Introduction to movement skills and stylistic elements of theatrical and folk forms to be chosen from tap, character, jazz, preclassic and Renaissance forms, and dances of other cultures. Prerequisite: Dance 160 or 166. 1 hour. May be repeated to a maximum of 4 hours.
- 260. Modern Technique, II.** A progressive development of the concepts in Dance 160, with emphasis on the qualitative and definitive performance of a variety of technical styles. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours. May be repeated to a maximum of 18 hours.
- 264. Intermediate Composition.** Experience in choreographing a minimum of one solo and two small group works utilizing various approaches to choreographic form. Prerequisite: Dance 164 or consent of instructor. 2 hours.
- 266. Ballet, II.** Intermediate ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 166, with emphasis on technical development and extended movement combinations. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.

- 269. Music Literature for Dancers.** Basic analysis of representative pieces from the renaissance, baroque, classical, romantic, and modern periods, emphasizing music of the twentieth century. Students learn to recognize general stylistic characteristics of each period and to understand dance forms related to the music. Prerequisite: Dance 168, or equivalent and consent of instructor. 3 hours.
- 298. Senior Project.** The design, execution, and production of a culminating choreographic/performance project. Prerequisite: Dance 365 and senior standing in Dance. 3 hours.
- 328. Composer-Choreographer Workshop.** Same as Music 328. For experienced composers and choreographers; explores the many relationships between musical composition and choreography. Prerequisite: For dance majors, Dance 264 or consent of instructor; for music majors, Music 106 or equivalent, other compositional experience, and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 330. Performance Practicum, II.** Laboratory for the rehearsal and performance of concert works by graduate choreographers, faculty, and guest artists. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit (1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit per dance). A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
- 331. Production Practicum.** Practical experience in all aspects of the production of dance concerts mounted in the Krannert Center for the Performing Arts and on tour with the Illinois Dance Theatre. Prerequisite: Dance 131 or equivalent, and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit (1 hour or $\frac{1}{4}$ unit credit per concert up to 2 hours or $\frac{1}{2}$ unit per semester). May be repeated to a maximum of 6 hours or $\frac{1}{2}$ unit.
- 335. Dance Repertory Workshop.** Experience in learning, rehearsing, and perfecting concert dance pieces under the direction of experienced choreographers. Prerequisite: Enrollment in advanced technique course; consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. A maximum of 16 hours or 2 units of performance credit (Dance 130, 330, 335) may be counted toward degree requirements.
- 340. History of Dance, I.** A survey of dance from its beginnings in primitive societies through the early nineteenth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 341. History of Dance, II.** A survey tracing the development of dance from the rise of Romanticism through the twentieth century. Prerequisite: Consent of instructor. 3 hours or 1 unit.
- 345. Theories and Fundamentals of Movement.** Approaches to increasing ease and efficiency of movement, including theories of Sweigard, Laban, Bartenieff, Alexander, Feldenkrais, and Rolf. Emphasis on alignment, connectedness, body awareness, strength, and mobility, in pedestrian and dance movement. Introduces study of human anatomy and dance kinesiology. Prerequisite: Major standing in dance, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 347. Labanotation, I.** Fundamentals of labanotation, including theory, reading, and writing; introduction to effort/shape analysis. Prerequisite: Dance 260 or consent of instructor. 3 hours or 1 unit.
- 348. Labanotation, II.** Intermediate level theory and vocabulary of movement notation, including reading, writing, and/or special projects. Prerequisite: Dance 347. 3 hours or $\frac{3}{4}$ or 1 unit. Graduate students enrolled for one unit credit will be expected to do additional reading and writing projects.
- 351. Independent Study and Special Topics.** Special projects in research or creative investigation taught on an individual or class basis. Prerequisite: Junior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated for a maximum of 8 hours or 2 units, which may be counted toward degree requirements.
- 360. Modern Technique, III.** A progressive development of the concepts in Dance 260, with emphasis on virtuosity and versatility. Prerequisite: Admittance by departmental placement and consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 18 hours or 2 units.
- 365. Advanced Composition.** Choreography for the experienced student; includes performance of at least one original work. Prerequisite: Dance 264 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.

- 366. Ballet, III.** Advanced ballet for dance majors; a progressive development of movement concepts and vocabulary in Dance 266. For dancers of advanced technical level with the ability to execute the ballet vocabulary; includes fundamentals of pointe work. Prerequisite: Departmental placement and consent of instructor. 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a maximum of 8 hours or 1 unit.
- 369. Accompaniment for Dance.** Same as Music 369. Theory and practice of musical accompaniment. Will survey and utilize recordings of modern and ballet accompaniment. Prerequisite: Dance 168 (for dance majors). Consent of instructor (for music majors). 1 hour or $\frac{1}{4}$ unit.
- 410. Professional Seminar.** Survey of professional organizations, publications, scholarly resources, and trends, culminating in student presentation of projects examining current issues in the field. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit.
- 420. Problems in Teaching and Administration.** Recent developments in the teaching of dance, including standards for major programs, curricula planning, performance experiences, administration, evaluation, and theoretical approaches to the teaching of studio courses. Prerequisite: Dance 410. 1 unit.
- 430. Dance Touring Company.** A repertory ensemble for the performance of lecture-demonstration programs, off-campus concerts, and short-term residencies; rehearsal and performance of works by resident faculty and guest choreographers. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
- 431. Production Practicum.** Practical experience in the technical, design, and administrative aspects of production in conjunction with department concerts. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ unit. May be repeated to a maximum of 1 unit.
- 441. Contemporary Directions in Dance.** A critical approach to 20th century dance with emphasis on the evolution of ideas that have influenced and shaped the dance of today. Prerequisite: Dance 340, 341 and graduate standing in dance; graduate students from other disciplines may be admitted with prerequisite courses and consent of instructor. 1 unit.
- 451. Supervised Teaching.** Practical teaching experience under the supervision of a faculty member; weekly conference devoted to evaluation and planning. Teaching areas include major and nonmajor university courses and classes for community adults and children. Prerequisite: Graduate standing in dance. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units with consent of instructor as topics vary.
- 460. Modern Technique, IV.** Modern technique for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.
- 465. Choreography.** A structured creative utilization of formal choreographic elements in the creation, rehearsal, staging, and performance of original dance works. Prerequisite: Graduate standing in dance and audition. $\frac{1}{2}$ unit.
- 466. Ballet, IV.** Ballet for advanced graduate students. Prerequisite: Graduate standing in dance and placement by technique faculty. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.
- 475. Production for Dance.** Examines theoretical and practical aspects of dance production with emphasis on lighting and costuming; includes scenery and props, make-up, audio, video, stage management, and public relations. The design and execution of costumes for a dance production is a required culminating project. Prerequisite: M.F.A. candidacy in dance; Dance 465; concurrent registration in Dance 498. 1 unit.
- 498. Creative Project in Dance.** The design, implementation, and completion of a culminating creative project in choreography and/or performance. Prerequisite: Seven units of graduate work in dance, including one unit in choreography. 1 unit. May be repeated to a maximum of 2 units.

EAST ASIAN LANGUAGES AND CULTURES

(Including Asian Studies, Chinese, Japanese, and Korean)

Head of Department: Thomas R. H. Havens

Department Office: 608 South Mathews Avenue, Urbana

All 200-level language courses, Chinese 301 and 302, and Japanese 301 and 302, are open to freshmen.

East Asian Languages and Cultures

(Courses taught in English)

122. **History of East Asian Religions.** Same as Religious Studies 122. See Religious Studies 122.
132. **Zen.** Same as Religious Studies 132. See Religious Studies 132.
135. **Korean Personalities.** Surveys Korean culture as exemplified by celebrated legendary, fictional, and historical personalities: founding heroes, virtuous generals, fighting monks, fanatics, martyrs and rebellious rulers, queens, concubines and courtesans, poets, kings, and mad princes; illustrates recurring themes and patterns in Korean culture. No knowledge of Korean required. 3 hours.
150. **Introduction to Japanese Culture.** A topical introduction to Japanese cultural and aesthetic life with attention to cultural and aesthetic patterns as they are reflected in literature, language, and the arts. 3 hours.
170. **East Asian Civilizations.** Same as History 170. See History 170.
175. **Masterpieces of East Asian Literature.** Same as Comparative Literature 175. Study of major works in the literary traditions of China and Japan, including haiku, noh, *Tale of Genji*, kabuki, Tang poetry, *Dream of the Red Chamber*, Ming theater, and the colloquial tale. No knowledge of Chinese or Japanese language required. 3 hours.
185. **Kabuki.** Same as Fine and Applied Arts 185. See Fine and Applied Arts 185.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
205. **Japanese Literature in Translation, I.** Same as Comparative Literature 211. A survey of Japanese literature from earliest times to 1600; readings in prose, poetry, and drama in English translation. 3 hours.
206. **Japanese Literature in Translation, II.** Same as Comparative Literature 212. A survey of Japanese literature from 1600 to recent times; readings in prose, poetry, and drama in English translation; and lectures and papers. 3 hours.
207. **Classical Chinese Literature.** Surveys Chinese literary works from the classical tradition (history, philosophy, poetry, literary criticism) with attention to intellectual and artistic values. No knowledge of Chinese is required. 3 hours.
208. **Chinese Popular Literature.** Surveys Chinese popular literary works written in the vernacular language (short story, novel, and drama), with attention to cultural and artistic values. No knowledge of Chinese is required. 3 hours.
218. **Japanese Hero Types.** Same as Comparative Literature 218. Analysis of Japanese hero and heroine archetypes in comparison with their Western counterparts: from shaman ruler, Don Juan, samurai romantic, and feudal paragons to modern superfluous hero and self-destructive hollow man; no knowledge of Japanese required. Discussion with readings and films. 3 hours.
219. **Women in Japanese Literature.** Same as Comparative Literature and Women's Studies 219. Critical study of Japanese women's history as represented in literature, emphasizing religio-social-literary significance, male views of women, female roles, and universal experience of growing up female; no knowledge of Japanese required. Readings and discussion. 3 hours.

- 222. Traditional China.** Same as History 222. See History 222.
- 224. Chinese Thought from Confucius to Mao.** Same as History 224. See History 224.
- 225. Gods and Man in Modern Japanese Drama.** Same as Comparative Literature and Religious Studies 225. An approach to modern Japanese culture through drama. Special emphasis is given to the postwar period. Readings in English supplemented by films and videotapes; no knowledge of Japanese required. 3 hours.
- 238. Hiroshima/Nagasaki and the Literature of Survival.** Same as Comparative Literature 238. Examination of the ways in which the Japanese have tried to come to terms with the experience of nuclear war through a study of memoirs, novels, essays, plays, and films; draws comparison with other literature of survival like that produced after the Nazi Holocaust. Readings in English. 3 hours.
- 261. Family and Community in China and Japan.** An introduction to Chinese and Japanese societies at the family, village, and city levels; examines traditional marriage, child-rearing, women's roles, farming, and community leadership as well as modern trends in these areas using a variety of documentary, fictional, and visual sources. 3 hours.
- 262. Popular Culture in China and Japan.** An introduction to the popular cultural traditions of China and Japan; examines popular morality, cosmology, religion, secret societies, the "way of the samurai," body and health (acupuncture, meditation, Zen, T'ai-chi chuan), aesthetics (poetry, painting, tea ceremony), and the world of the courtesan using a variety of documentary, fictional, and visual sources. 3 hours.
- 265. Contemporary Korean Society.** Same as Sociology 265. Introduces contemporary Korean society: the twentieth century struggle of Korea for an individual identity; the Korean road to modernization and its significance for the United States and the developing world. 3 hours.
- 267. History of Korea.** Same as History 267. An historical examination of the Korean experience, from the earliest times to the present day: basic political, social, economic patterns; examination of the cultural and intellectual tradition; Korea's historical role in Asia; the Korean colonial experience; Korea in the modern world. 3 hours.
- 285. Premodern Japanese History.** Same as History 285. See History 285.
- 286. Modern Japanese History.** Same as History 286. See History 286.
- 287. Introduction to Buddhism.** Same as Religious Studies 287. See Religious Studies 287.
- 290. Individual Study.** Directed readings in the languages and literatures of East Asia. The area selected depends on the student's interest. Prerequisite: Consent of instructor. 2 to 4 hours.
- 291. Honors Tutorial.** A tutorial in the civilizations of East Asia. The country and discipline depend on student interests. All students submit a substantial paper. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 6 hours.
- 295. Topics in Asian Religions.** Same as Religious Studies 295. See Religious Studies 295.
- 298. Colloquium in East Asian Languages and Cultures.** Prerequisite: Junior standing. 3 hours. (Counts for advanced hours in LAS.)
- 303. Japanese Society.** Same as Sociology 327. See Sociology 327.
- 311. The Chinese Novel.** Same as Comparative Literature 311. Reading and analysis of representative pieces of Chinese fiction from the fourth century B.C. to 1900 with emphasis on the development of Chinese fiction, its place in the literary tradition, and its role in society. No knowledge of Chinese is required. 3 hours or 1 unit.
- 312. Modern Chinese Literature in Translation.** Same as Comparative Literature 312. Reading and analysis of representative selections from Chinese literature since the May 4 Movement, with special attention to the relationship between literature and ideology in twentieth-century China. No knowledge of Chinese is required. 3 hours or 1 unit.
- 315. Modern Japanese Fiction in Translation.** Same as Comparative Literature 315. Critical study of selected 20th century writers with an emphasis on cultural background, world view, human relationships, aesthetic theories, Japanese and Western traditions, and universal literary issues. Requires no knowledge of Japanese; readings and films. Prerequisite: Junior standing or consent of instructor. 3 hours, or 1/2 or 1 unit.
- 330. Introduction to East Asian Linguistics.** Same as Linguistics 330. See Linguistics 330.
- 337. Government and Politics of China.** Same as Political Science 337. See Political Science 337.

- 348. Government and Politics of Japan.** Same as Political Science 348. See Political Science 348.
- 350. East Asian Bibliography and Research Methods.** Introduces research methods and reference works for East Asian studies through practical exercises and assignments. Students registering for 2 hours or $1/2$ unit (Part I) use only Western sources; students registering for 4 hours or 1 unit (Parts I and II) use Chinese or Japanese sources for the second part of the course. Prerequisite: (Part II) Chinese 204 or Japanese 204; Part I requires no prerequisite. 2 or 4 hours, or $1/2$ or 1 unit.
- 366. Japanese Cinema.** Same as Humanities 366. See Humanities 366.
- 380. Buddhist Meditation.** Same as Religious Studies 384. See Religious Studies 384.
- 383. Self and Society in Japan.** Same as Anthropology 383. See Anthropology 383.
- 385. Chinese Foreign Policy.** Same as Political Science 389. See Political Science 389.
- 390. China Under the Ch'ing Dynasty.** Same as History 393. See History 393.
- 393. Social-Economic History of Modern China.** Same as History 390. See History 390.
- 394. Twentieth-Century China.** Same as History 394. See History 394.
- 434. Research Seminar in Japanese History.** Same as History 434. See History 434.
- 450. Seminar in East Asian Languages and Cultures.** Seminar on selected topics. Topic varies with instructor. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 474. Problems in Japanese History.** Same as History 474. See History 474.
- 483. Problems in Chinese History.** Same as History 483. See History 483.
- 490. Individual Study and Research in Special Topics.** Supervised individual investigation or study of a topic not covered by regular course offerings. The topic selected by the student and the proposed plan of study must be approved by the adviser and the instructor. Prerequisite: Consent of instructor. $1/2$ to 3 units. May be repeated.

Asian Studies

- 104. Asian Mythology.** Same as Religious Studies 104. See Religious Studies 104.
- 186. Southeast Asian Civilizations.** Same as Anthropology 186 and History 172. See Anthropology 186.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 263. Cultural Dynamics of Modern Asia.** Same as Anthropology 263. See Anthropology 263.
- 288. Religion in Asian Societies.** Same as Anthropology, Religious Studies, and Sociology 288. A comparative study of the inter-influences of religion and society of Asian countries concentrating on the problems of social change and development with special attention to the religions and social systems of major Asian nations such as Iran, India, China, and Japan. 3 hours.
- 290. Individual Study.** Directed readings in the languages and literatures of South Asia, Southeast Asia, or the Near East. The area selected depends on the student's interest. Prerequisite: Consent of instructor. 2 to 4 hours.
- 291. Honors Tutorial.** A tutorial in the civilizations of South Asia, Southeast Asia, or the Near East. The geographical area or nation and discipline depend on student interests. All students submit a substantial paper. Prerequisite: Completion of two honors activities, work in Asian studies, and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 6 hours.
- 298. Colloquium in South, Southeast, and Southwest Asian Studies.** Prerequisite: Junior standing. 3 hours. (Counts for advanced hours in LAS.)
- 338. Governments and Politics in the Near East.** Same as Political Science 338. See Political Science 338.
- 343. Tutorials in East and Southeast Asian Languages.** Tutorials at the elementary, intermediate, and advanced levels in Asian languages not regularly offered are available with the consent of the head of the Department of East Asian Languages and Cultures. Prerequisite: Consent of head of the Department of East Asian Languages and Cultures. 2 to 5 hours, or $1/2$ to 1 unit. Graduate credit is given only for work beyond the elementary

level. May be repeated up to six semesters successively, but no more than 4 units of graduate credit may be accumulated in any one language.

347. **Governments and Politics of Southeast Asia.** Same as Political Science 347. See Political Science 347.
349. **Governments and Politics of South Asia.** Same as Political Science 349. See Political Science 349.
360. **Peoples and Cultures of Oceania.** Same as Anthropology 360. See Anthropology 360.
362. **Asian Prehistory.** Same as Anthropology 362. See Anthropology 362.
368. **Peoples and Cultures of India.** Same as Anthropology 368. See Anthropology 368.
369. **Asian Systems of Social Stratification.** Same as Anthropology 369. See Anthropology 369.
386. **Peoples and Cultures of Mainland Southeast Asia.** Same as Anthropology 386. See Anthropology 386.
387. **Peoples and Cultures of Insular Southeast Asia.** Same as Anthropology 387. See Anthropology 387.
388. **Prehistory of Oceania.** Same as Anthropology 388. See Anthropology 388.
450. **Seminar in South, Southeast, and Southwest Asian Studies.** Seminar on selected Asian topics. The topic will vary with the instructor and the seminar may be repeated for a maximum of 3 units. Prerequisite: Consent of instructor. 1 unit.
490. **Individual Study and Research in Special Topics.** Supervised individual investigation or study of a topic not covered by regular course offerings. The topic selected by the student and the proposed plan of study must be approved by the student's adviser and the instructor who supervises the work. Prerequisite: Consent of instructor. ¹/₂ to 3 units.

Chinese

101. **Elementary Chinese, I.** An introduction to Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Chinese, II.** Second term of spoken Mandarin Chinese, including conversation with a native Chinese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Chinese. Prerequisite: Chinese 101. 5 hours.
203. **Intermediate Chinese, I.** First term of second year of the Chinese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Chinese 102 or 301, or equivalent. 5 hours.
204. **Intermediate Chinese, II.** Concentration on ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on ability to read ordinary simple text in Chinese. Prerequisite: Chinese 203 or equivalent. 5 hours.
301. **Intensive Chinese, I.** Intensive introduction to the spoken and written Chinese language; emphasizes the introduction of basic vocabulary and sentence patterns. This course is equivalent to Chinese 101 and 102. For students who have no previous Chinese and who want to learn at a rapid rate. 10 hours or 2 units.
302. **Intensive Chinese, II.** Continuation of Chinese 301. Emphasizes conversation and reading. This course is equivalent to Chinese 203 and 204. Prerequisite: Chinese 102 or 301, or equivalent. 10 hours or 2 units.
305. **Advanced Chinese, I.** Continuation of intermediate-level Chinese with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 204 or 302. 5 hours or 1 unit.
306. **Advanced Chinese, II.** Continuation of Chinese 305 with emphasis on rapid reading, vocabulary acquisition, and newspaper reading. Prerequisite: Chinese 305. 5 hours or 1 unit.
307. **Introduction to Literary Chinese.** An introduction to literary language, style, and structural patterns as reflected in the Confucian classics and other literary, philosophical, and historical texts. Prerequisite: Chinese 102 or equivalent. 3 hours or 1 unit.

- 308. Readings in Literary Chinese.** Readings in texts selected from the Confucian classics and other literary, philosophical, and historical texts. Attention is given to linguistic and intellectual patterns and to problems of translation. Prerequisite: Chinese 307 or equivalent. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 309. Social Science Readings in Chinese.** Reading and translation of selected Chinese texts in the social sciences with emphasis on specialized terminology and prose style. Prerequisite: Three years of modern Chinese. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
- 321. Oral Chinese, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 204 or 302, or equivalent. 3 hours or 1 unit.
- 322. Oral Chinese, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Chinese 321 or consent of instructor. 3 hours or 1 unit.
- 390. Readings in Chinese Literature.** Guided readings in Chinese literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of Chinese and consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
- 399. Study Abroad.** Lectures, seminars, and practical work in Chinese language, literature, and civilization and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade point average of 3.5. 0 credit.
- 401. Chinese Historical Sources.** Reading and analysis of historical sources written in literary Chinese, including dynastic history biographies, other biographical sources, official memorials, legal codes, and local histories. Prerequisite: Chinese 308. 1 unit.
- 415. Premodern Fiction and Drama.** Close readings and analysis of selected pre-20th century Chinese works written in the premodern vernacular language. Prerequisite: Chinese 308. 1 unit.
- 417. Studies in Literary Chinese Texts.** Close reading and analysis of selected Chinese texts written in the Chinese literary language with emphasis on poetry and artistic prose. Prerequisite: Chinese 308. 1 unit.

Japanese

- 101. Elementary Japanese, I.** An introduction to Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
- 102. Elementary Japanese, II.** Second term of spoken Japanese, including conversation with a native Japanese-speaking tutor under the direction of a linguist-instructor; formal grammar based on conversational materials; and work on written Japanese. Prerequisite: Japanese 101. 5 hours.
- 203. Intermediate Japanese, I.** First term of second year of the Japanese language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. Prerequisite: Japanese 102 or 301, or equivalent. 5 hours.
- 204. Intermediate Japanese, II.** Concentration on ability to engage in reasonably fluent discourse in Japanese, on comprehensive views of formal grammar, and on ability to read simple ordinary written Japanese. Prerequisite: Japanese 203 or equivalent. 5 hours.
- 301. Intensive Japanese, I.** An intensive introduction to spoken and written Japanese; emphasis on basic grammatical patterns and vocabulary. Equivalent to Japanese 101 and 102; for students who have no previous Japanese and who want to learn at a rapid rate. 10 hours or 2 units.
- 302. Intensive Japanese, II.** Continuation of Japanese 301. Emphasis on conversation and reading. Equivalent to Japanese 203 and 204. Prerequisite: Japanese 102 or 301, or equivalent. 10 hours or 2 units.
- 305. Advanced Japanese, I.** Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 204 or 302; or consent of instructor. 5 hours or 1 unit.

306. **Advanced Japanese, II.** Continuation of Japanese 305. Readings in graded Japanese texts with oral practice designed to help students acquire the sophisticated vocabulary and grammatical structures of written Japanese. Prerequisite: Japanese 305 or equivalent. 5 hours or 1 unit.
309. **Social Science Readings in Japanese.** Readings in Japanese social science materials, including articles from newspapers, periodicals, and learned journals. Prerequisite: Japanese 306 or equivalent. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 3 units.
321. **Oral Japanese, I.** Conversational practice for the development of facility in spoken Japanese with emphasis on contemporary usage and style. Prerequisite: Japanese 204, 302, or equivalent. 3 hours or $\frac{3}{4}$ unit.
322. **Oral Japanese, II.** Conversational practice for the development of facility in spoken Japanese with emphasis on contemporary usage and style. Prerequisite: Japanese 321 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
360. **Teaching Japanese as a Second Language, I.** Introduction to basic theory of Japanese pedagogy; teaching methods, and theory and practice of teaching Japanese grammar. Prerequisite: Japanese 322 or equivalent. 3 hours or 1 unit.
361. **Teaching Japanese as a Second Language, II.** Application of pedalinguistics of Japanese; theory and method of instructional exercise development for teaching Japanese in practice teaching of Japanese in the classroom. Prerequisite: Japanese 360 or equivalent. 3 hours or 1 unit.
390. **Readings in Japanese Literature.** Guided readings in Japanese literature in the vernacular with regular individual conferences and a paper. Prerequisite: Reading knowledge of Japanese and consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
399. **Study Abroad.** Lectures, seminars, and practical work in the Japanese language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade-point average of 3.50. 0 to 16 hours, or 0 units.

Korean

101. **Elementary Korean, I.** An introduction to Korean, including conversation with a native Korean-speaking tutor under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
102. **Elementary Korean, II.** Second term of spoken Korean, including conversation with a native Korean-speaking tutor under the direction of linguist instructor; studies formal grammar based on conversational materials; and includes some work on written Korean. Prerequisite: Korean 101. 5 hours.
203. **Intermediate Korean, I.** First term of second year of the Korean language, including drill for advanced conversational fluency; introduces a variety of styles and levels of discourse and usage; and increases study of the written language and formal grammar. Prerequisite: Korean 102. 5 hours.
204. **Intermediate Korean, II.** Second term of second year of the Korean language including drill for more advanced conversational fluency; more variety of styles and levels of discourse and usage; more formal grammar and an introduction of basic Chinese characters. Prerequisite: Korean 203. 5 hours.
305. **Advanced Korean, I.** Concentrates on the ability to engage in fluent discourse, on comprehensive grammatical knowledge, and on the ability to read ordinary texts in Korean, including some Chinese characters. Prerequisite: Korean 204. 3 hours or $\frac{3}{4}$ unit.
306. **Advanced Korean, II.** Continuation of Korean 305; emphasizes rapid reading, fluent conversation, learned vocabulary and idiom acquisition, and reading of newspapers. Prerequisite: Korean 305. 3 hours or $\frac{3}{4}$ unit.
309. **Social Science Readings in Korean.** Reading and analysis of selected Korean texts in the social sciences, emphasizing specialized terminology and prose style. Prerequisite:

Korean 306 or equivalent; registration in a program of studies dealing with East Asia. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 9 hours or 3 units.

- 399. Study Abroad.** Lectures, seminars, and practical work in Korean language, literature, and civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: Junior standing and a grade-point average of 3.5; Korean 102 or equivalent, or consent of the Asian Studies adviser. 0 to 16 hours, or 0 units. May be repeated to a maximum of 32 hours per academic year.

ECOLOGY, ETHOLOGY, AND EVOLUTION

Head of Department: Lowell L. Getz

Department Office: 515 Morrill Hall, 505 South Goodwin Avenue, Urbana

- 105. Environmental Biology.** Introduction to ecological principles in relation to understanding environmental problems; emphasizes impacts upon ecosystems by human activities such as air and water pollution, usage of pesticides and pest control measures, expansion of agriculture in tropics and arid regions, harvesting the oceans, and development of energy sources. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Behavior of Domestic Animals.** Same as Animal Sciences 203. See Animal Sciences 203.
- 212. Basic Ecology.** Lecture, discussion, laboratory, and field course dealing with the relationships between organisms and their environment; introduction to physiological bases for adaptations, population dynamics, community organization, and the structure and function of ecosystems. Prerequisite: One year of biology or concurrent registration in Biology 122. 5 hours. (Counts for advanced hours in LAS.)
- 232. Comparative Vertebrate Anatomy.** Classification and comparative anatomy of vertebrates including functions and evolution of their organs and organ systems. Prerequisite: Biology 122 or equivalent. 5 hours. (Counts for advanced hours in LAS.)
- 243. Natural History and Social Behavior of the Great Apes.** Same as Anthropology 243. See Anthropology 243.
- 246. Vertebrate Social Organization.** Same as Anthropology, Psychology, and Sociology 246. Introduction to the biosociology of vertebrates; emphasis on the behavioral, physiological, and population aspects of vertebrate social organizations, from fishes to primates. Prerequisite: One year of introductory biology. 3 hours. (Counts for advanced hours in LAS.)
- 290. Special Topics.** Supervised participation in research and scholarly activities in ecology, ethology, or evolution, usually as an assistant to the instructor. Prerequisite: Two years of life sciences and consent of instructor. 1 to 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
- 294. Individual Topics.** Supervised independent investigation of individual topics in ecology, ethology, and evolution; requires a written report to instructor. Prerequisite: Two years of life sciences and consent of instructor. 2 to 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
- 301. Introduction to Evolutionary Biology.** Introduction to the evidence for evolution and the origin and types of genetic variation, stressing various modes of selection and modern observations and experiments illustrating the evolutionary process. Prerequisite: Biology 122 or 210. 3 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Ecology, Ethology, and Evolution 301 and Biology 107.
- 302. Molecular Evolution.** Introduction to evidence for evolutionary change at the molecular

and cellular levels of organization; origin and changes in macromolecules, genes, cells, and their organelles emphasized. Prerequisite: Biology 122 or 210. 3 hours or $\frac{3}{4}$ unit.

311. **Evolutionary Ecology.** Emphasizes the evolution of life-history strategies in plants and animals (reproductive rates, life cycles, sex ratios, breeding and mating systems) and the coevolution of animals and plants (pollination, dispersal, and herbivory). Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
320. **Invertebrate Zoology.** Invertebrates; structure and development; application of biological principles; specific and comparative morphology of the invertebrates; and coordination of structure and function, origin, development, and life histories. Prerequisite: Biology 122 or equivalent. 5 hours or 1 unit. Offered in alternate years.
332. **The Evolution of Adaptive Systems.** Evolutionary mechanisms underlying adaptations; emphasizes origin and subsequent modification of major complex systems; pertinent evidence considered from several disciplines, including population biology, developmental biology, structural analysis and paleobiology. Prerequisite: Biology 122 or 210. 3 hours or $\frac{3}{4}$ unit.
335. **Ornithology.** Structure, function, ecology, behavior, and evolution of the birds of the world; laboratory devoted to anatomy and identification; and field studies devoted to identification and behavior of birds. Independent research project and two optional weekend field trips. Prerequisite: Biology 122 or equivalent. 5 hours or 1 unit. Offered in alternate years.
336. **Mammalogy.** Classification, distribution, life history, evolution, and identification of mammals. Lecture, laboratory, and field work. Prerequisite: Biology 122 or equivalent. 4 hours or 1 unit. Offered in alternate years.
339. **Field Vertebrate Natural History.** Laboratory and field course. An intensive study of North American vertebrates with emphasis on vertebrates of Illinois; taxonomy, life histories, habitats, and feeding habits of all the common resident species. Prerequisite: Biology 122 or equivalent. 4 hours or 1 unit.
340. **Natural History of the Vertebrates.** Lectures on vertebrate adaptations for survival and reproduction. Prerequisite: Biology 122 or equivalent, and junior standing. 3 hours or $\frac{3}{4}$ unit.
342. **Fish and Wildlife Ecology.** Application of ecological principles and modeling to management of fish and wildlife populations; significance of abiotic and biotic factors, including life-history parameters in population growth and management; and techniques and procedures for the development of management strategies for animal populations, emphasizing vertebrates. Prerequisite: Biology 122 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit.
343. **Limnology.** Fresh water biology; study of the lake, pond, and river with emphasis on the physical environment as well as on the plants and animals which live in fresh water. Lectures, discussions, laboratory, and field work. Prerequisite: Biology 122 or equivalent. 5 hours or 1 unit.
344. **Introduction to Primate Morphology and Behavior.** Same as Anthropology 343. See Anthropology 343.
345. **Population and Community Ecology.** Characteristics of populations and their evolution, population dynamics and regulation, and organization and structure of communities; lecture and field research projects. Prerequisite: Ecology, Ethology, and Evolution 212 or equivalent. A course in statistics is highly recommended. 5 hours or 1 unit. Offered in alternate years.
346. **Animal Behavior.** Same as Animal Sciences and Anthropology 346. An introductory course emphasizing how patterns of behavior promote survival, change through evolution, and are modified by the environment. Prerequisite: Biology 122 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
350. **Behavior-Genetic Analysis.** Same as Anthropology and Psychology 342. See Psychology 342.
352. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Psychology 347. See Psychology 347.

353. **Hormones and Behavior.** Same as Psychology 343. See Psychology 343.
359. **Stream Ecology.** Same as Civil Engineering 347. See Civil Engineering 347.
383. **Advances in Ethology: Behavioral Ecology.** An in-depth examination of areas of current interest at the interface of behavior, ecology, and evolution; focuses on communication, foraging, and social behavior. Prerequisite: Ecology, Ethology, and Evolution 212 and 346, or consent of instructor. 3 hours or 1/2 unit. Offered in alternate years.
407. **Current Concepts in Evolution.** Examines current topics in evolutionary biology, including concepts such as modes of speciation, punctuated equilibrium vs. gradualism, neutralism, macroevolution, and molecular clocks. Prerequisite: Ecology, Ethology, and Evolution 301 or equivalent. 1 unit.
443. **Problems in Primate Behavior and Ecology.** Same as Anthropology 443. See Anthropology 443.
444. **Concepts in Ethology.** Discussion, review, and critical analysis of general concepts and specific problems in behavior with new topics each semester. Prerequisite: Ecology, Ethology, and Evolution 346. 1/2 unit. May be repeated.
445. **Seminar in Fish and Wildlife Ecology.** Modern ecological principles and concepts to specific problems in fisheries and wildlife. Prerequisite: Ecology, Ethology, and Evolution 342 or 345, or equivalent. 1/2 unit. Offered in alternate years.
452. **Concepts in Ecology.** Discussion, review, and critical analysis of general concepts and specific problems in ecology with new topics each semester. Prerequisite: An advanced course in ecology or consent of instructor. 1/2 unit. May be repeated.
490. **Individual Research.** Individual topics in research conducted under the supervision of faculty members in the Department of Ecology, Ethology, and Evolution. Prerequisite: Consent of adviser. 1/2 to 3 units.
491. **Topics in Population Biology.** Lecture and discussion of problems in population biology, with a different topic each semester. Prerequisite: Consent of instructor. 1/2 unit. May be repeated to a maximum of 4 units.

ECONOMICS

Head of Department: Daniel Orr

Department Office: 330 Commerce Building (West), 1206 South Sixth Street, Champaign

101. **Introduction to Economics.** A general survey of the operation of the economic system; emphasizes the determination of the level of national income, the pricing and allocation of products, and factors of production under existing conditions in the United States. This course will be offered through spring 1993 and is only open to students who enrolled in the University of Illinois prior to fall semester 1991. It is being replaced with the 102-103 sequence. 4 hours. Students with credit in Economics 102 or 103 may receive 2 hours credit in Economics 101. Students with credit in both Economics 102 and 103 may not receive credit for Economics 101.
102. **Microeconomic Principles.** An introduction to the functions of individual decision-makers, both consumers and producers, within the larger economic system. Primary emphasis on the nature and functions of product markets, the theory of the firm under varying conditions of competition and monopoly, the study of resource markets, the distribution of income, and the role of government in promoting efficiency and equity in the economy. 3 hours. Students with credit in Economics 101 may receive 1 hour of credit in Economics 102.
103. **Macroeconomic Principles.** An introduction to the theory of determination of total or aggregate income, employment, output, price levels, and the role of money in the economy. Primary emphasis on monetary and fiscal policy, inflation, unemployment, economic growth, and international economics. Prerequisite: Economics 102 is recommended. 3 hours. Students with credit in Economics 101 may receive 1 hour of credit in Economics 103.

- 109. Current Economic Problems.** An economic analysis of specific economic problems dealing with poverty, economic development, international economics, and other contemporary issues. Prerequisite: Credit or concurrent registration in Economics 102 or 103. 1 hour.
- 172. Economic Statistics, I.** An introduction to the modern theory and methodology of statistics in the areas of economics and business; topics include descriptive statistics, probability theory, sampling theory and methodology, sampling distributions, estimation, and hypothesis testing. Prerequisite: Credit or registration in Mathematics 134 or equivalent. 3 hours. Students may not receive credit for Economics 172 if they have received credit for Economics 171 or 372; Mathematics 361 or 366; Agronomy 340; Biology 371, 372, or 373; Educational Psychology 390; Psychology 233, 234, or 235; Sociology 185, 385, or 387; Forestry 321; Geography 185 or 370; or Statistics 100, 210, 310, or 311.
- 173. Economic Statistics, II.** Continuation of Economics 172. Emphasizes estimation and hypothesis testing for the linear statistical model; topics include contingency tables, goodness of fit, single and multiple regression, correlation, Bayesian decision theory, time series analysis, and index numbers. Prerequisite: Economics 172; Mathematics 134 or equivalent. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 214. Introduction to Public Finance.** A general survey of the economics of the public sector at the federal, state, and local levels, including government expenditures, public budgeting, cost-benefit analysis, principles of taxation, tax reform, and intergovernmental fiscal relations. Prerequisite: Economics 102 or equivalent. 3 hours. Credit is not given for Economics 214 if the student has credit for Economics 314. Current or prospective economics majors are encouraged to take Economics 314.
- 228. Survey of International Economics.** Introductory survey of major topics and issues in the theory and policy of international economics: theory of international trade, tariffs and commercial policy balance of payments, and adjustment and foreign exchange rate determination. Prerequisite: Economics 102 and 103 or equivalent. 3 hours. Credit is not given for both Economics 228 and 328.
- 236. American Economic History.** Traces the course of growth and development of the economy from the colonial period to World War I; emphasizes conceptualization of key issues of the American experience and analysis of significant episodes and turning points. Prerequisite: Economics 102 and 103 or consent of instructor. 3 hours.
- 237. Contemporary Western Europe.** Same as History 237. An interdisciplinary approach to contemporary Western Europe; cultural, historical, economic, political, and social topics; and postwar issues, including economic recovery, position of Western Europe between the United States and the Soviet Union, economic and political integration, and current policy problems. Prerequisite: Sophomore standing. 3 hours.
- 238. European Economic History.** Economic structure and development of Europe since 1000 with respect to agriculture, industry, trade, technology, finance, and government; emphasis on those forces which contribute to the economic development of Europe and on the spread of these forces throughout the world. Prerequisite: Economics 102 and 103 or consent of instructor. 3 hours.
- 240. Labor Problems.** Survey of the problems and analysis of U.S. labor markets and unions; topics include labor force participation, occupations, hours, wage determination, development and attributes of U.S. labor unions, and overview of collective bargaining and the effects of unions, unemployment, wages and inflation, and racial and sex discrimination; and selected current policy problems. Prerequisite: Economics 102 or equivalent. 3 hours. Current or prospective majors are encouraged to take Economics 341. Credit is not given for Economics 240 if student has credit for or is currently enrolled in Economics 341.
- 245. Women in the Labor Market.** Same as Women's Studies 245. Changing role of women in the labor market and the economy; supply and demand for women in the 1970s: nature, extent, and legal remedies for sex discrimination in employment; "earnings gaps" and variable employment costs, men versus women; new role of multi-earner families; and

- comparative use of women as a professional resource. Prerequisite: Economics 102 or equivalent. 3 hours. Credit is not given for Economics 245 if student has credit for or is enrolled in Economics 346.
255. **Comparative Economic Systems.** Analyzes the significant similarities and differences in the development, structure, and policies of capitalism, communism, and market socialism. Prerequisite: Economics 102 or equivalent. 3 hours.
273. **Regression and Forecasting.** Covers the methodology of multiple regression, particularly as it applies to time series data and forecasting; also examines the use of various exponential smoothing models, and autoregressive integrated moving average models in business forecasting. Prerequisite: Economics 173 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
288. **Government Regulation of Economic Activity.** Analyzes the economic bases, policies, and consequences of government regulation of economic activity; patterns of regulation in selected areas. Prerequisite: Economics 102 or equivalent. 3 hours.
294. **Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year, or consent of instructor; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
295. **Senior Research.** A research and readings course for students majoring in economics; may be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Cumulative grade-point average of 4.0 or honors in the junior year; senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
299. **Undergraduate Open Seminar, II.** An independent study course covering topics not treated by regular course offerings. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the department. While credit toward graduation is normally granted for this course, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. Prerequisite: Junior or senior standing. Economics 101 or equivalent is recommended. 0 to 9 hours. May be repeated.
300. **Intermediate Microeconomic Theory.** Microeconomic analysis including value and distribution theory; analysis of the pricing of the factors of production integrated in a micro-general equilibrium context which builds towards explaining the resource allocation process. Prerequisite: Economics 102 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive graduate credit for both Economics 300 and Business Administration 400. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
301. **Intermediate Macroeconomic Theory.** The modern theory of the determination of the level and rate of growth of income, employment, output, and the price level; discusses alternate fiscal and monetary policies to facilitate full employment and economic growth. Prerequisite: Economics 102 and 103 or equivalent; Mathematics 125 and 134 or equivalent are recommended. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit. Students may not receive credit for both Economics 301 and Business Administration 401. Upon recommendation by the adviser and approval by the Department of Economics, a noneconomics major may receive up to $\frac{3}{4}$ unit. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
303. **Macroeconomic Policy.** Analyzes current macroeconomic policy issues, problems, and techniques; discusses various policy techniques including monetary, fiscal, incomes, and exchange rate policies, and their effectiveness for treating inflation, unemployment, productivity, resource and exchange rate problems. Emphasizes current issues in the U.S. but includes some discussion of other developed economies. Prerequisite: Economics 301 or equivalent. 3 hours, or $\frac{1}{2}$ or $\frac{3}{4}$ unit.
306. **History of Economic Thought.** The development of economics; the examination of contributions of individual writers and schools of thought as they influenced economic

thought and national policy. Prerequisite: Economics 102 and 103 or equivalent. 3 hours or $1\frac{1}{2}$ unit.

- 312. Economic Dynamics and Growth.** Analyzes the causes of economic instability; the requirements for economic growth in the national economy; and considers public policy relating to instability and growth. Prerequisite: Economics 101 or equivalent; Economics 301. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 313. Economics of Consumption.** Same as Family and Consumer Economics 313. See Family and Consumer Economics 313.
- 314. Public Sector Economics.** Economic analysis of government tax and expenditure policies; topics include public good and externality theory, public choice theory, income distribution, cost-benefit analysis, principles of taxation, tax incidence, economic effects and optimal structures of major taxes, and taxation in developing economies. Prerequisite: Economics 300 or consent of instructor; consent of instructor required for student with credit for Economics 214. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 315. The Economics of Poverty and Income Maintenance.** Same as Labor and Industrial Relations 315. Analyzes the nature and causes of poverty with special emphasis on critical evaluation of programs to combat poverty in the United States. Prerequisite: Economics 102 and 103 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 328. International Economics.** Introduction to the theory of international trade and finance with selected application to current problems of commercial policy, balance of payments adjustment, and the international monetary system. Prerequisite: Economics 300 or equivalent, or consent of instructor; Economics 301 is recommended. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 329. Contemporary Issues in the International Economy.** Analysis in depth of selected current issues and policy problems of the international economy, including (but not restricted to) the following: new approaches to the theory of international trade, reform of the international monetary system, role of the General Agreement on Tariffs and Trade and the United Nations Conference on Trade and Development in expanding trade between developed and undeveloped economies, problems of stabilizing international commodity markets, and balance of payments problems of the United States and other selected countries. Prerequisite: Economics 328 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 341. Economics of Labor Markets.** Same as Labor and Industrial Relations 341. Studies the microeconomic determinants of labor demand and supply, economic effects of unions, and macroeconomic labor market problems. Prerequisite: Economics 300 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 343. Unions, Bargaining, and Public Policy.** Analyzes the legal background and economic issues associated with unions and collective bargaining in the United States including theory of the labor movement; process of union wage determination; analysis of strikes; background, strategies, and principal issues in collective bargaining; and problems and policies of government intervention. Prerequisite: Economics 102 and 103 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 345. Economics of Human Resources.** Same as Labor and Industrial Relations 345. Education and training in economic growth; labor force characteristics; occupational structure and future human resources requirements; job information networks; economics of discrimination and underutilization; national human resources policies and programs; and private industry and union human resources planning. Prerequisite: Economics 300 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Economics 345 and 444.
- 346. Family Economics.** Same as Agricultural Economics 370 and Family and Consumer Economics 370. See Family and Consumer Economics 370.
- 350. The Developing Economies.** Analyzes the economic problems associated with newly developing nations; emphasizes their economic structures, their factor scarcities, and their programs for development. Not open for graduate credit to graduate candidates in economics. Prerequisite: Economics 102 and 103 or equivalent. 3 hours, or $1\frac{1}{2}$ to 1 unit. Graduate credit is not given for both Economics 350 and Economics 450 or 451.
- 351. The Development of the Japanese Economy.** Analyzes Japan's international trade, economic structure, standards of living, policy-making process, and future prospect;

- additional attention to U.S.-Japanese economic relations and Japan's role in Asia. Prerequisite: Economics 102 and 103 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
352. **Economic Development in Latin America.** Same as Agricultural Economics 352. Studies economic activity and the processes of diversification and industrialization in Latin America, with comparative analysis of selected countries. Prerequisite: Economics 102 or 103 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
353. **Economic Development in India and Southeast Asia.** Same as Agricultural Economics 353. See Agricultural Economics 353.
354. **Economic Development of Tropical Africa.** Same as Agricultural Economics 354. See Agricultural Economics 354.
357. **The Soviet Economy.** Analytical survey of Soviet economic development; structure and performance of the economy; and problems of planning and control. Prerequisite: Economics 102 and 103 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
358. **The Economy of China.** Discusses changes in the patterns of production, exchange, and distribution in Communist China, with emphasis on their relation to social transformation; survey of Chinese economic history over the past century, dealing with the institutional background to and the structure of economic activities in China. Prerequisite: Economics 102 and 103 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
359. **The Israeli Economy.** Analyzes the economic structures, policies, and performance of modern Israel, emphasizing the pre-1948 Palestine economy; the development of the Histadrut, Kibbutz, and Moshav; the economic relations between Arab and Jewish populations; and the impact of post-1948 immigration on Israel's economic development. Prerequisite: Economics 102 and 103 or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
360. **Regional Economics.** Survey of the theory and problems of regional economic development, including regional accounts, interregional income and trade theory, principles of the location of economic activity, theories of regional growth, and public policy for development of regions. Prerequisite: Economics 102 and 103 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
361. **Urban Economics.** Same as Finance 367. Analyzes the urban economy. The theory of urban spatial structure; the theory of local public finance, pricing, and investment decisions in the urban public sector; and the application of cost-benefit analysis and user-charge pricing to such problems as housing, transportation, land-use controls, and pollution. Prerequisite: Economics 102 or equivalent; Economics 300 is recommended. 3 hours, or $\frac{1}{2}$ or 1 unit.
371. **Introduction to Applied Econometrics.** Application of economic theory and statistical inference in the estimation and analysis of economic relations and predicting the outcomes of economic variables. Prerequisite: Economics 173 or equivalent; Economics 300 or 301. 3 hours, or $\frac{1}{2}$ to 1 unit.
372. **Econometrics.** Studies econometric models and methods used in estimation and hypothesis testing in economics. Prerequisite: Mathematics 134, Economics 173, and Mathematics 225 or 315. 3 hours, or $\frac{1}{2}$ or 1 unit.
374. **Mathematical Economics, I.** Mathematical reformulation and interpretation of traditional economic theory. Prerequisite: Mathematics 242 or equivalent; Economics 300 and 301. 3 hours, or $\frac{1}{2}$ to 1 unit.
375. **Mathematical Economics, II.** Introduction to linear and nonlinear economic models; emphasizes the formulation and interpretation of modern economic theory and welfare economics. Prerequisite: Mathematics 125, 225, or 315; Mathematics 242 or equivalent; Economics 300. 3 hours, or $\frac{1}{2}$ to 1 unit.
380. **Industrial Competition and Monopoly.** Analyzes the ways firms and markets are organized, how they interact, outcomes of various types of firm behavior and performance of markets, and causes and types of market failure. Prerequisite: Economics 300. 3 hours, or $\frac{1}{2}$ or 1 unit.
383. **Health Economics.** Economic analysis of the health care industry to explain the demand for and supply of medical care. Includes analysis of behavior of consumers, producers, and insurers; and public policies to regulate the industry and to provide services for the poor and elderly. Prerequisite: Economics 300 is recommended. 3 hours or 1 unit.

- 388. Law and Economics.** Applications of economic theory to problems and issues in both civil and criminal law and the effect of legal rules on the allocation of resources; includes property rights, liability and negligence assignment, the use of administrative and common law to mitigate market failure, and the logic of private versus public law enforcement. Prerequisite: Economics 300 or equivalent. 3 hours or $1/2$ or 1 unit.
- 399. Special Topics in Economics.** Seminar or lectures on subject not covered by regular courses; for advanced undergraduates and graduates. See Timetable for current topics. Prerequisite: Economics 300 and 301 or consent of instructor. 2 to 4 hours or $1/2$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units as topics vary.
- 400. General Economic Theory.** Emphasizes microeconomic theory; principal topics include a review of value and distribution theory, the theory of choice by households and firms, general microeconomic theory, and theoretical developments of current interest. Prerequisite: Economics 102 or equivalent. 1 unit. Students may not receive credit for both Economics 400 and 422. Graduate credit for both Economics 300 and 400 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 401. General Economic Theory.** Emphasis on macroeconomic theory; principal topics include a review of Keynesian macroeconomic theory, formal growth theory, and selected business cycle theory. Prerequisite: Economics 102 and 103 or equivalent. 1 unit. Students may not receive credit for both Economics 401 and 423. Graduate credit for both Economics 301 and 401 is given only upon recommendation of the student's adviser and approval by the Department of Economics.
- 402. Microeconomic Theory, I.** Introduction to the models and methods of modern microeconomic theory, concentrating on individual and firm decision making and on industry equilibrium; brief treatment of general equilibrium theory and welfare analysis. Topics include: consumer utility and demand theory; production and cost functions; firm supply, input demand, and price behavior; competitive, monopolistic, and oligopolistic industry analysis; and distribution theory. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
- 403. Macroeconomic Theory, I.** Development of modern macroeconomic theory, including national income accounts and their relation to input-output tables; classical, Keynesian, and monetarist aggregate models; behavior hypotheses of consumption, investment, and government; properties and the role of money and interest; foreign trade and investment; price rigidity, price flexibility, and employment; wage-price interaction and inflation; and ad hoc stabilization models. Prerequisite: Economics 300 and 301, or equivalent; calculus. 1 unit.
- 404. Microeconomic Theory, II.** General market equilibrium theory and welfare economics; discusses the problems of existence, stability, efficiency, and equity of economic equilibrium; and introduces social choice and the special problems created by public goods, externalities, and uncertainty. Prerequisite: Economics 402. 1 unit.
- 405. Macroeconomic Theory, II.** Development of modern macroeconomic theory, including disequilibrium theory, optimal short-term stabilization measures, and monetary, fiscal, incomes, and exchange rate policies; large-scale econometric models; linear and neoclassical growth models; aggregate distribution theory; money, capital movements, trade, and growth; optimal growth models; and exhaustible resources and growth. Prerequisite: Economics 403. 1 unit.
- 406. History of Economic Thought.** Analyzes economic thought from the Physiocrats to World War II; evaluation of the selected materials both as reflections of their times and as contributions to contemporary economic thought. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 407. International Macroeconomics.** Deals with the international aspects of macroeconomics. Discusses issues such as the determination of exchange rates, balance of payments, the accumulation of foreign assets; considers both deterministic and stochastic systems; particularly emphasizes modelling issues. Prerequisite: Economics 405. 1 unit.
- 408. Philosophical Problems in Economics.** Studies philosophical problems in economics, with some emphasis on the methodology and epistemology of economic theory; use of the views of leading economists to show the development of broad philosophical

problems of economic theory, the relation of theory and certain of its applied areas, and the relation of economics to other selected disciplines. These problems are treated in the light of modern philosophy. Prerequisite: One unit either in economic theory or in the history of economic thought. 1 unit.

409. **Marxian Economics.** Analyzes Marx's economic theory and predictions; concentration on a critical evaluation of Marx's economic theory, a survey of contributions to the theory since Marx, and a Marxist evaluation of the neoclassical synthesis. Prerequisite: Economics 300 and 301, or consent of instructor. 1 unit.
410. **Advanced Topics in Economic Theory, I.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
411. **Advanced Topics in Economic Theory, II.** Study at an advanced level of one or more of the following possible topics: economics of externalities, advanced aggregate economic theory, theory of central planning, investment theory, consumer behavior theory, capital theory, welfare economics, inflation theory, income distribution theory, or other topics. Prerequisite: Economics 402 and 403, or consent of instructor. 1 unit. May be repeated.
413. **Consumption Economics.** Same as Family and Consumer Economics 413. See Family and Consumer Economics 413.
414. **Public Goods Theory.** In-depth analysis of the theory of public goods; includes public goods and externality theory, public choice, theory of cost-benefit analysis, optimal income redistribution, and fiscal federalism. Prerequisite: Economics 300 or equivalent. 1 unit.
415. **Economics of Taxation.** Theoretical and empirical analysis of the impact of taxation on the economic system; topics include tax equity and excess burden, incentive effects of taxation, tax incidence, structure of major types of taxes (income, consumption, and wealth), normative tax analysis, and taxation in developing economies. Prerequisite: Economics 300 or equivalent. 1 unit.
418. **Economics of Education, Health, and Human Capital.** Same as Administration, Higher and Continuing Education 418. Basic economic analysis of human capital and the value of human time, with applications to the economics of education and health; theory and analysis of consumer investment in human and physical capital over the life cycle; the returns to education and health, and their effects on growth; the theory of nonmarket time; public finance of education and health; and implications for the analysis of the distribution of income. Prerequisite: A course in microeconomic theory and a course in statistics, or consent of instructor. 1 unit.
420. **Monetary Theory.** Micro- and macroeconomic theories of the supply of and demand for money; money substitutes and their significance; review of current empirical research; money in closed economy, macroeconomic, and static general equilibrium models; and analysis of inflation and unemployment. Prerequisite: Consent of instructor. 1 unit.
421. **The Theory of Monetary Policy.** Monetarism and other current topics; stabilization policy; money in dynamic models; money in open economy macroeconomic models; and international aspects of monetary theory. Prerequisite: Consent of instructor. 1 unit.
422. **Microeconomics for Business.** Microeconomics for professional business students. Shows relevance of value and distribution theories for business managers. Includes demand and supply theory consumer choice, production and cost theory, industrial structure, and wage and capital theory. Intended for students in the Master of Business Administration program. Prerequisite: Enrollment in the MBA program. 1 unit. Students may not receive credit for both Economics 422 and 300 or 400.
423. **Macroeconomics for Business.** Development of short run macroeconomic models. Analysis of private sector behavior functions, and government policy alternatives. Extensions for open economy models and growth models. Intended for students in the Master of Business Administration program. Prerequisite: enrollment in the MBA program. 1 unit. Students may not receive credit for both Economics 423 and 301 or 401.
427. **Business International Economics.** Provides the business student with a working

- knowledge of the principles of international economics, issues in the current international business environment, U.S. and international trade law, and current policy issues and debates. Considers the basic causes and consequences of international trade, the foreign exchange market and theory of exchange rate determination, the U.S. trade deficit, the international monetary system, and antidumping and countervailing duty law, copyright and patent infringement law, the General Agreement on tariffs and trade, the rudiments of strategic trade theory, and selected policy issues varying by year. Prerequisite: Familiarity with intermediate microeconomics at the level of Economics 300. 1 unit.
- 428. International Trade Theory.** Development and use of the neoclassical theory of international trade for the analysis of tariffs, customs, unions, and the effects of trade on the distribution of income and welfare; analysis and use of the relations between the balance of payments and national income to study the role of income changes combined with price changes in the balance of payments adjustment process. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 429. International Financial Economics.** Examines the balance of payments, exchange rate, capital flows and international monetary system; fiscal and monetary policy in open economies. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.
- 430. Topics in International Economics.** Advanced topics in international economics drawn from history, application, and policy; subject matter varies. Prerequisite: Economics 428 and 429, or consent of instructor. 1 unit. May not be repeated for credit.
- 436. American Economic History.** Emphasizes, but is not limited to, the reading and criticism of current literature in American economic history; attempts to facilitate understanding of the use of economic analysis in interpreting events framed in historical context; includes British colonial policy, trade and tariffs, industrialization, technology, slavery and the southern economy, land policy, agriculture, transportation and internal improvements, capital mobilization and financial organization, and the measurement of economic growth. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 437. General Economic History.** Treatment of selected topics in the economic history of industrialized economies by applying economic theory and quantitative methods of analysis to historical problems; exploration of the implications for contemporary work in economics. Prerequisite: Graduate standing in economics or consent of instructor. 1 unit.
- 438. Economic History of Europe.** Major lines of development since 1450; comparative study of forces and institutions inimical or favorable to growth; and selected readings on organization of economic activity, role of governments and the entrepreneur, commercial policy, monetary systems, land tenure, process of capital formation, industrialization, etc. Prerequisite: Consent of instructor. 1 unit.
- 440. Labor Economics.** Same as Labor and Industrial Relations 440. Survey of recent trends in the labor force, of real and money earnings, and of the distribution of national income used as the basis for a critical economic analysis of contemporary English and American wage theory. Prerequisite: Economics 300 and 301. 1 unit.
- 441. Labor Economics.** Same as Labor and Industrial Relations 441. Economic issues and implications involved in hours of work, employment and unemployment, and trade union institutionalism (the impact of the trade union upon the basic institution of a free enterprise economy); emphasis in all cases on the development of appropriate public policy. Prerequisite: Economics 300 and 301. 1 unit.
- 442. Collective Bargaining.** Same as Labor and Industrial Relations 442. See Labor and Industrial Relations 442.
- 443. Problems and Practices of Labor Dispute Settlement.** Same as Labor and Industrial Relations 443 and Law 361. See Labor and Industrial Relations 443.
- 447. Labor Union Organization and Administration.** Same as Labor and Industrial Relations 447. See Labor and Industrial Relations 447.
- 450. The Economics of Development and Growth.** Review and analysis of the theories and patterns of growth in developed and underdeveloped economies; consideration of the problems and methods of measuring growth; critical examination of the variables thought to be strategic in the growth process; and exploration of the policy implications of different theories. Prerequisite: Economics 300 and 301, or equivalent. 1 unit.

- 451. The Developing Economies.** Analyzes the newly developing economies, with emphasis on institutional factors affecting development and economic policy relating to development. Prerequisite: Economics 450. 1 unit.
- 452. Computer-Based Models for Economic Policy Analysis.** Discusses problems and methods of building social accounting matrices and computable general equilibrium (CGE) models; provides hands-on experience with CGE models with a series of PC-based exercises that are programmed in Lotus 1-2-3. The exercises demonstrate a number of techniques for constructing CGE models and show applications of these models to a variety of economic policy problems in developing countries such as food subsidies, international trade restrictions, foreign debt, and sectoral investment priorities. Prerequisites: Economics 400 and 401 or equivalent; Mathematics 120 and 132 or equivalent. 1 unit.
- 455. Comparative Economic Systems.** Comparative analysis of the structures and policies of market-directed and planned economies. Prerequisite: Economics 102 or equivalent. 1 unit.
- 457. Economic Planning in the Soviet Union and Eastern Europe.** Intensive examination of the structure and performance of the Soviet and the East European economies, emphasizing analysis of the main theoretic and operational dimensions of economic planning; evaluation of choice, design, and efficacy of central planning instruments from both theoretical and historical perspectives. Prerequisite: Economics 300 and 301, or 357, or consent of instructor. 1 unit.
- 460. Urban Economics.** Examines the microeconomic theory of urban land-use and spatial structure (static and dynamic models); analyzes externalities caused by traffic congestion; normative and positive analysis of the provision of local public goods; and public policy issues (i.e., slums and urban decline, pollution). Prerequisite: Economics 402. 1 unit.
- 461. Urban and Regional Economic Development.** Measurement and analysis of interregional differences in economic growth. Prerequisite: Economics 300 and 301. 1 unit.
- 463. Natural Resource Economics.** Same as Agricultural Economics, Environmental Studies, and Forestry 463. See Agricultural Economics 463.
- 464. Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Environmental Studies 464. Examines both theory and policy applications in the environmental area; selectively reviews the literature to provide a framework for understanding the relevant economic relationships and the criteria appropriate for policy assessment; emphasizes the characteristics of major environmental problems and policy choices; and considers the valuation of environmental amenities and the conflict between environmental quality and growth. Prerequisite: Economics 300 or consent of instructor. 1 unit.
- 466. Quantitative Analysis for Economics.** Studies topics in optimization: implicit function theorem, multipliers and Kuhn-Tucker conditions; topics in matrix algebra including characteristic roots and vectors, partitioned matrices, quadratic forms, special matrices; topics on difference and differential equations common in economic theory. 4 hours or 1 unit.
- 467. Mathematical Economics, I: Statics.** Studies quantitative techniques useful in economic analysis and decision making; mathematical programming; input-output analysis; point-set theory and game theory; existence, optimality, and stability conditions for static general equilibrium; and activity analysis, including welfare economics. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 468. Mathematical Economics, II: Dynamics.** Studies quantitative techniques useful in economic analysis and decision making; single and systems of difference and differential equations; dynamic programming; Pontryagin maximum principle; interaction of multiplier and accelerator; von Neumann model; Turnpike theorem; growth models; and control systems. Prerequisite: Mathematics 315; Economics 402 and 403, or equivalent. 1 unit.
- 470. Economic Statistics.** Classical statistics and regression analysis; descriptive statistics, probability and point and interval estimation; decision theory; variance analysis; and linear regression and least-squares estimates. Prerequisite: A course in statistics or consent of instructor. 1 unit.

- 471. Econometric Analysis.** Part 1: the construction of econometric models; characteristics of models and choice of estimating methods; and estimates of parameters by various methods. Part 2: Bayesian statistics and decision theory. Prerequisite: Economics 470 or equivalent. 1 unit.
- 472. Applied Econometrics.** Develops a general methodological basis for searching for quantitative economic knowledge; integrates and gives operational content to the topics of economic, statistical, and econometric theory. Prerequisite: Economics 471 or 476, or equivalent. 1 unit.
- 473. Time Series Analysis in Economics.** Modern time series analysis techniques for handling economic data which arises in a happenstance fashion through time and their application to specific economic problems. Prerequisite: Economics 471 or Statistics 478, or equivalent. 1 unit.
- 476. Econometrics, I.** Estimation of parameters for single-equation models; tests of hypotheses and confidence regions for regression models; large-sample theory in single-equation models; and Bayesian statistics in regression models. Prerequisite: Mathematics 315 and Statistics 310. 1 unit.
- 477. Econometrics, II.** Considers the specification of models with systems of simultaneous equations; identification problem, distributed lag models, K-class estimators, maximum likelihood estimators, three-stage least-squares, and effects of specification errors. Prerequisite: Economics 476. 1 unit.
- 478. Bayesian Inference in Econometrics.** Examines some standard econometric problems from the Bayesian perspective and compares Bayesian and classical inference. Prerequisite: Economics 476 or equivalent. 1 unit.
- 480. Industrial Organization.** Theory of the organization of markets and firms, behavior of firms, functioning of competitive systems, and performance of markets. 1 unit.
- 481. Anti-Trust and Business Policy.** Economic analysis of public policy for market structure and conduct; topics include anti-trust and mergers, predatory pricing, advertising, and technological advance. Prerequisite: Economics 480. 1 unit.
- 482. Government Regulation of Industry.** Microeconomic and econometric analyses of market failure and government response in selected industries; topics include economic effect of regulation, bureaucratic behavior, optimal policy, and strategies for regulatory reform. Prerequisite: Economics 402; Economics 480; or consent of instructor. 1 unit.
- 490. Individual Study and Research.** Directed reading and research. 0 to 1 unit.
- 491. Workshop and Research Seminar.** Workshops are offered in all areas of specialization in which graduate students are writing Ph.D. dissertations. The specific format varies, but in general workshop sessions include presentations by graduate students of thesis research, by faculty members of their current research, and by occasional outside speakers. Prerequisite: Admission to the Department of Economics Ph.D. program. $\frac{1}{2}$ unit. A minimum of 1 unit of Economics 491 is required of all students in the Ph.D. program.
- 499. Thesis Research.** Preparation of thesis required of all students writing master's or doctoral theses in economics. 0 to 4 units.

EDUCATION

Dean of College: P. David Pearson

College Office: 110 Education Building, 1310 South Sixth Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 400. Methods of Educational Inquiry.** Critical consideration of research concepts and methods used in alternative means of contemporary educational inquiry. 0 or 1 unit.
- 449. Independent Study.** Offers opportunity of self-directed independent study, that is, develops the individual's ability as an independent student and enables the student to pursue interdisciplinary studies for which appropriate courses are not being offered

during a given semester. Prerequisite: Approval of study outline by adviser and the associate dean for graduate programs prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of adviser and department chair.

499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL POLICY STUDIES

Head of Department: C. J. Karier

Department Office: 360 Education Building, 1310 South Sixth Street, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Foundations of American Education.** Studies some of the problems of formulating and justifying aims and policies in American education, of designing and systematizing the curriculum, of organization and social context of the public school system, and of the teaching-learning process; examined in terms of perspectives provided by social philosophy, history, sociology, and philosophy of education. 3 hours.
210. **Race and Cultural Diversity in American Life.** The study of race and cultural diversity from Colonial era to present; the evolution of racial ideology in an ethnically heterogeneous society; the impact of race on the structures and operations of fundamental social institutions; the role of race in contemporary policies and popular culture. 4 hours.
249. **Independent Study.** Designed for students who wish to do advanced readings and research in greater depth and to investigate further ideas and themes that have been explored in Educational Policy Studies 199 and 201. Prerequisite: Educational Policy Studies 201; interest as attested to by instructors; and consent of adviser and staff member who supervises the work. 2 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
299. **Undergraduate Seminar in Educational Policy Studies.** An advanced undergraduate seminar that builds upon introductory work in Educational Policy Studies 201 and includes historical, philosophical, legal, and social science perspectives on education. Requests for activation of this course may come from students or faculty. Prerequisite: Educational Policy Studies 201 or equivalent, and consent of instructor. 0 to 9 hours. May be repeated.
300. **The History of Education.** Brief introductory survey of ancient and medieval education followed by a more extended study of educational developments since the Italian Renaissance; emphasis on the relation of educational trends to broader social, economic, political, and intellectual movements. Prerequisite: Junior standing. 3 hours or $\frac{1}{2}$ unit.
301. **Philosophy of Education.** Philosophical examination of selected educational issues; conveys a grasp of the complexities of the issues and some philosophical methods for dealing with them. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
302. **History of American Education.** The development of American education in relation to political, social, and cultural developments; attention to the influence of movements in the cultural environment upon evolving conceptions of educational theory and practice. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
303. **Comparative Education.** Introduction to the cross-cultural, cross-national study of educational institutions and their relationship to society. Topics may vary. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
304. **Social Foundations of Education.** Introductory survey of the interrelationship between school and society, and of the impact on public education of the major social trends and forces operating in our society. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.
305. **History of Educational Ideas.** Studies selected educational theorists and intellectual movements; provides familiarity with the major educational ideas of the past and historical perspectives on current issues and problems in education; and readings in such authors as Aristotle, Plato, Quintilian, St. Augustine, Loyola, Comenius, Rousseau, Pestalozzi, Froebel, Herbart, and Dewey. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit.

- 306. Aesthetics, The Arts, and Education.** Theoretical introduction to the problems involved in teaching critical appreciation of the arts; examines materials from aesthetics, art history, and criticism for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $1/2$ to 1 unit.
- 307. Aesthetics, Mass Communications, and Education.** Theoretical introduction to the problems involved in teaching a critical understanding of mass communications; examines materials from aesthetics, communication theory, and the social sciences for their relevance to the problems of aims, curriculum, organization, and teaching-learning. 2 to 4 hours, or $1/2$ to 1 unit.
- 308. Critical Thinking for Teachers.** An examination of critical thinking dispositions and abilities as an approach to the foundations of knowledge and structure of thinking in subject-matter areas. 2 to 4 hours, or $1/2$ to 1 unit.
- 309. The Politics of Education.** An overview of the political structure and processes through which many of the major issues in education are treated; analyzes nature of the policy-making process in education and discusses the roles of principal participants in the process of educational decision making, but focuses on fundamental recurring issues in education and the ways these issues have been resolved or not resolved by the overall system. Particular attention to the role that both the federal and state judiciary as well as legislative authority have had in shaping educational policy. 2 to 4 hours, or $1/2$ to 1 unit.
- 310. Economics of Education.** An introduction to economic concepts and their application to education, including investment and consumption theories of education and the role of human capital in economic growth and development; cost-benefit analyses in education, education and the distribution of income, and manpower and educational planning. Prerequisite: Consent of instructor. 2 to 4 hours, or $1/2$ to 1 unit.
- 315. Sociology of Education.** Same as Sociology 315. Education as a social process in various cultures and historical periods, emphasizing current systems in Westernized countries. Prerequisite: Sociology 100; or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
- 385. Anthropology of Education.** Same as Anthropology and Educational Psychology 385. Introduction to the contribution of anthropology to the cross-cultural study of education, including discussion of material from representative cultures ranging from primitive social groups to present-day national states; special attention to education of minority ethnic and subordinate cultures; and emphasis on both informal and formal education as cultural process in relation to culture transmission, evolution, change, and development. Prerequisite: A course in anthropology or sociology, or consent of instructor. 2 or 4 hours, or $1/2$ or 1 unit.
- 399. Issues and Developments in Educational Policy Studies.** Seminar on topics not treated by regularly scheduled courses; requests for initiation may be made by students or faculty members. 2 to 4 hours, or $1/2$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 400. Problems of Educational Theory.** Analysis of the kinds of problems encountered in constructing an educational theory, and of relations between educational theory and other disciplines, especially philosophy and the social sciences. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 401. Modern Theories of Education.** Critical analysis of the theories of educational research and practice as found in contrasting traditions of educational thought. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
- 402. Educational Movements in the Twentieth Century.** Historical study of significant educational trends during the past sixty years, with special reference to their influence on American education; an analytical examination of the principal transition movements in the last decade of the nineteenth century and of efforts to solve the problems since 1900. 1 unit.
- 403. The Historical Foundations of American Educational Thought.** Studies the evolution of educational theories and philosophies since the eighteenth century; particular reference to their impact upon educational developments in the United States; a broad view of the general growth of American educational thought; and attention to selected major educational theorists, or schools of thought, exploration of their fundamental ideas, and

- the relation of these ideas to significant intellectual currents in American culture. Prerequisite: Consent of instructor. 1 unit.
404. **Seminar in Educational Classics.** Reading and group discussion of a limited number of the most important writings in educational philosophy which have had a profound influence on the progress of educational thought and practice. Prerequisite: Educational Policy Studies 305 or equivalent; consent of instructor. 1 unit.
405. **Foundations of Aesthetic Education.** Philosophical approach to the problems of teaching for appreciation in formal education; appraisal of the status of aesthetic education, its nature and function, and its relation to other types of education. Prerequisite: Educational Policy Studies 306 or equivalent. 1 unit.
406. **Seminar in the History of Education.** Intensive group study of a small number of selected problems to assist individual students to develop an understanding of and the ability to use the techniques of historical research in furthering such study; problems studied are selected in the light of the interests and previous training of the group of students enrolled. Prerequisite: Two courses in the history of education or consent of instructor. 1 unit.
407. **Logical Foundations of Methods.** Studies the application of principles of logic (broadly construed) to methods and curriculum at all levels. Prerequisite: A course in philosophy of education and teaching experience, or consent of instructor. 1 unit.
408. **Epistemology in Education.** Explores knowledge and inquiry as they relate to problems of formulating educational policy, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of epistemology (for example, Philosophy 329, 330, or 371), or equivalent; consent of instructor. 1 unit.
409. **Values and Education.** Studies the nature of value as it relates to problems of formulating and justifying educational aims and policies, curriculum design, organization of the educational system at all levels, and teaching-learning. Prerequisite: Educational Policy Studies 301 and 1 unit of ethics or value theory, or equivalent; consent of instructor. 1 unit.
410. **Seminar in Theories of Educational and Social Change.** Designed to help prospective educational leaders acquire an understanding of current theories of social change as these relate to educational institutions. There is now an extensive body of knowledge on the nature and control of social change; this needs to be made available to all prospective educational leaders in order that they may go about their duties with greater understanding and skill. Designed to aid students in bringing this knowledge to bear upon the problems of leadership in educational and social change. Prerequisite: Educational Policy Studies 304 or equivalent. 1 unit.
411. **Philosophy of Educational Research.** Examines some crucial assumptions and concepts of contemporary research in education from the point of view both of the consumer and the practitioner of educational research. Prerequisite: A course in philosophy of education and a course in the quantitative treatment of educational data, or equivalent, or consent of instructor. 1 unit.
412. **Seminar: Dewey's Philosophy of Education.** Critical study of John Dewey's philosophy of education involving intensive study of original works. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit.
413. **Seminar in Educational Concepts.** Some significant concepts, such as equality, authority, freedom, neutrality, indoctrination, objectivity, and teaching, are selected and examined in depth. Prerequisite: Educational Policy Studies 301 or equivalent; consent of instructor. 1 unit. May be repeated.
417. **Ethical Dimensions of Educational Policy.** Designed to prepare students to analyze ethical issues involved in educational policy making, policy administration, and policy evaluation; includes topics such as educational equity, privacy, due process, and compliance; draws upon multiple disciplines to analyze issues developed out of practice. Prerequisite: Open to students who have fulfilled their social foundations requirements and other students with consent of instructor. 1 unit.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student and enables the

student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chair prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of adviser and department chair.

483. **Methods in Comparative Education.** Designed to develop skills and understanding for field work related to the cross-national and cross-cultural study of education. Prerequisite: Consent of instructor. 1 unit.
484. **Education in the Industrialized Nations.** Examines the social, political, and economic functions of educational systems in industrialized countries with emphasis upon the development of educational policy; focuses on Western Europe and North America. Prerequisite: Consent of instructor. 1 unit.
485. **Education in the Developing Countries.** Analyzes of the role and functions of education in social, political, and economic development, with particular reference to the new and the developing countries. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in educational policy studies; sections offered in the following fields: (a) history of education; (b) philosophy of education; (c) comparative education; (d) social foundations of education; (e) philosophy of educational research; and (f) historical methods in education. Prerequisite: Consent of instructor. 1 unit. May be repeated.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Prerequisite: Open only to students who have been admitted for doctoral study. 1 to 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

EDUCATIONAL PRACTICE

Offices for Student Teaching: Secondary Education, 398 Education Building; Elementary Education, 398 Education Building; Special Education, 288 Education Building; Vocational and Technical Education, 347 Education Building; Art Education, 143 Art and Design Building; Music Education, 3004 Music Building; Kinesiology, 129 Freer Hall; Speech and Hearing Science, 901 South Sixth Street; and Foreign Language, 398 Education Building.

Students entering teacher education curricula with 55 or more semester hours should apply for student teaching assignments during the first semester in the curriculum. However, such students must complete at least a semester before they may be admitted to educational practice.

150. **School and Community Experiences.** Early field experiences in teacher education, including observation and laboratory experiences in public schools; designed to provide opportunities for career exploration, professional orientation, the development of insight into the interrelationship of theory and practice, and the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
220. **Educational Practice in the Education of Exceptional Children.** A course in practice teaching which provides teaching experience with exceptional children. Prerequisite: Senior standing; consent of department; sufficient hours of background courses; 3.5 cumulative and University of Illinois grade-point average. 2 to 8 hours.
232. **Educational Practice in Elementary Education.** A course in practice teaching to meet certification requirements for teaching in the elementary school. Prerequisite: Curriculum and Instruction 320, or 237 as required by the student's curriculum; senior standing;

100 hours of early field experience; 3.5 cumulative and University of Illinois grade-point average. 2 to 8 hours.

- 238. Educational Practice for Special Fields in Elementary Schools.** A course in student teaching to meet requirements for certification in special fields at the elementary school level. Prerequisite: For students in the early childhood education curriculum, Curriculum and Instruction 320 required and concurrent enrollment in Curriculum and Instruction 321; consent of instructor; 100 hours of early field experience; 3.5 cumulative and University of Illinois grade-point average. 3 to 8 hours.
- 242. Educational Practice in Secondary Education.** A course in practice teaching to meet certification requirements for teaching in the secondary school. Prerequisite: Satisfactory progress in an approved teacher education program, including 100 hours of early field experience; 3.5 cumulative and University of Illinois grade-point average. 2 to 8 hours.

EDUCATIONAL PSYCHOLOGY

Chair of Department: Carol A. Ames

Department Office: 210 Education Building, 1310 South Sixth Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 211. Educational Psychology.** Basic undergraduate course in psychology of education for prospective teachers; materials and principles from the various areas of psychology (mental hygiene, psychology of learning, etc.) applied to the practical problems of teaching. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 236. Child Development for Elementary Teachers.** Study of child growth and development designed particularly for those preparing to teach in the elementary school; special emphasis on the significance of the developmental process for educational programs and procedures; and systematic experience in studying and evaluating children's behavior and in supporting their learning and development. Includes limited voluntary participation as a subject in experiments. Prerequisite: Psychology 100. 3 hours.
- 241. Sex Role Socialization: Implications for Schooling.** Reviews research and practice related to sex role socialization in education; examines sex differences in academic achievement and motivation and the effect of differential classroom environments on males and females. 3 hours.
- 249. Independent Study.** Study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclass status; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructor; consent of adviser and staff member who supervises the work. 1 to 4 hours.
- 250. Career Development Theory and Practice.** The design and implementation of an innovative life planning process; a participatory experience that includes a survey of theories, models, and research on life planning and that encourages systematic skill identification, values clarification, and the development of job search strategies. 3 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 311. Psychology of Learning for Teachers.** A study of the psychology of human learning as it applies to instruction, educational issues, and educational problems. Prerequisite: Educational Psychology 211 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 312. Theories and Problems of Adjustment in School Settings.** Examines theories of adjustment, factors that influence adjustments, and common adjustment problems of children and adolescents in school contexts. Prerequisite: Educational Psychology 211 or equivalent. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 313. Child Language and Education.** Provides an overview of current knowledge about children's acquisition of communicative competence together with a consideration of the

educational import of this developmental process. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $1/2$ or 1 unit.

- 314. Sociocultural Influences on Learning.** Provides a general overview of the relationship of language, culture, and society to the teaching-learning process; gives broad exposure to research and theory concerned with the effects of sociocultural factors on cognition, perception, and motivation; also considers the effect of such factors on classroom interaction. Prerequisite: Educational Psychology 211 or 236; or equivalent. 3 hours, or $1/2$ or 1 unit.
- 315. Personality and Social Development.** Same as Psychology 365. See Psychology 365.
- 316. Discipline and Classroom Management.** A general overview of theories related to analyzing student behaviors in the classroom; the incidence and etiology of conduct problems and behavior disorders in the classroom, with emphasis upon preventive strategies and guiding principles for maintaining classroom discipline. Prerequisite: Educational Psychology 211 or 236, or equivalent. 3 hours, or $1/2$ or 1 unit.
- 335. Ethnography of Local Cultures.** Same as Anthropology and Sociology 335. Introduction to ethnographic modes of researching culture in human activities, events, organizations, and thinking through participant observation in local settings; focus on the central tasks of ethnographic research (discovery, representation, presentation, justification) through mastery of field notes and various equipment. Prerequisite: Educational Psychology 314, Anthropology 230, or equivalent work in social sciences. 4 hours or 1 unit.
- 341. Applications of Sex Role Theory to Counseling.** Same as Women's Studies 341. Reviews research on sex role socialization related to career, family, and personal roles for both sexes; discusses counseling strategies aimed at freeing persons from attitudes and behaviors that limit their freedom to choose; and reviews strategies for change at policy, agency and individual levels. 4 hours or 1 unit.
- 343. Individual Intelligence Testing.** Fundamental concepts relevant to the general problem of the individual testing of learning aptitude; acquisition of psychometric competence in the use of the 1960 Binet and the Wechsler tests; and acquaintance and limited practice in the administration, scoring, and interpretation of results obtained by performance scales and other devices appropriate for use with individuals having sensory, associative, and/or motor impairments. Prerequisite: Consent of instructor and 6 hours of psychology and Special Education 324, or Educational Psychology 392 or Psychology 390. 3 hours or 1 unit.
- 359. Professional Skill Development Workshop in Educational Psychology.** Laboratory, prepractica, or workshops designed to teach practitioner-oriented skills in specialized areas of educational psychology; requests for initiation of sections in this course may be made by students or by faculty members. Prerequisite: Junior standing. 2 to 4 hours, or $1/2$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 362. Adult Learning and Development.** Same as Administration, Higher, and Continuing Education 362. See Administration, Higher, and Continuing Education 362.
- 363. Instructional Design.** Same as Administration, Higher, and Continuing Education 363. The design, systematic development, and evaluation of instructional programs, including delineation of performance outcomes, analysis of concepts, design of instructional sequences, assessment of student performance, and survey of current research. Each student develops an instructional program. Prerequisite: A foundation course in educational psychology or psychology. 4 hours or 1 unit.
- 364. Psychological and Social Distortion of Information.** Study of how information is psychologically and socially constructed and distorted; implications for consumerism, political involvement, media monitoring, problem solving, policy making, and education. Prerequisite: Psychology 100. 3 hours or 1 unit.
- 385. Anthropology of Education.** Same as Anthropology and Educational Policy Studies 385. See Educational Policy Studies 385.
- 387. Computer Use in Education.** Overview of the nature and development of automation in education; use of electronic data processing systems for administrative purposes, for

- instruction, and for research; discussion of problems of computer management, natural language analysis, and simulation CAI applications; and laboratory experience with on-line terminals, remote entry devices, and peripheral equipment. Prerequisite: Educational Psychology 390 or equivalent, or consent of instructor. 3 hours or 1 unit.
390. **Elements of Educational Statistics.** Designed for terminal value for professional training of students not intending to pursue advanced graduate work, and for introductory value for students continuing graduate study in education; descriptive statistics, introduction to correlation and regression, the normal curve, statistical inference, and the presentation and interpretation of statistical data in educational literature. Prerequisite: Junior standing. 3 hours or 1 unit.
391. **Construction and Use of Tests in Teaching.** The relationship of classroom testing to educational objectives and the curriculum; the construction, administration, and scoring of the various types of essay and short-answer tests; and other means of measuring the attainment of objectives and marking procedures. Designed primarily for classroom teachers. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
392. **Introduction to the Principles of Measurement.** Study of the selection, preparation, administration, and interpretation of psychological and educational tests and diagnostic devices; emphasis on theory at a beginning level, with application to hypothetical school situations as a teaching device; and consideration of the sources of standard tests, criteria for their evaluation, methods of scoring, interpretation, and general and special areas. Prerequisite: Educational Psychology 211 or 236. 4 hours or 1 unit.
398. **Evaluation Methods.** Introduces the methodology of educational program evaluation, including the design of an evaluation, the data collection techniques, approaches to data summarization, and the reporting and utilization of evaluative information; each student designs and conducts an evaluation project. Prerequisite: Educational Psychology 390. 3 hours or 1 unit.
399. **Issues and Developments in Educational Psychology.** Experimentation or seminar on topics not treated by regularly scheduled courses. Requests for initiation of the course may be made by students or by faculty members. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
411. **Psychology of Adolescence for Teachers.** Psychological significance of adolescence, its biological and social foundations, and its implications for education. Prerequisite: Educational Psychology 311 and 312. 1 unit.
412. **Advanced Child Development for Students of Education.** Considers the nature of the child and the child's development during the preschool and elementary school years; emphasis on development as a process of social learning; interpretation of the scientific literature as it concerns the educative process; and discussion of methods of studying and evaluating the behavior of the child as an individual and in group situations. Prerequisite: Educational Psychology 311 and 312. 1 unit.
413. **Social Psychology and the Problems of Education.** Consideration of the concepts and methods of social psychology as applied to the professional functions of teachers, administrators, and other persons engaged in education; opportunity to work upon field problems. Prerequisite: Educational Psychology 311, 312, and 390. 1 unit.
414. **The Psychology of College Teaching.** Designed particularly for graduate students minoring in education or preparing for college teaching. Psychoeducational problems in undergraduate and graduate teaching; special emphasis upon individual differences, remedial procedures, principles of learning, the technology of teaching and learning, adjustment problems of college students, counseling and advisory services, test construction, and analysis and use of test results and resource materials. Prerequisite: A course in psychology; consent of instructor. 1 unit.
415. **Psychological Theories Applied to Education.** An advanced course in human behavior; special attention given to contemporary systems of psychology and their relationship to educational practice. Prerequisite: Educational Psychology 311 and 312; Educational Psychology 411 or 412. 1 unit.
416. **Psychology of Reading.** Same as Psychology 426. Overview of psychological research investigating the perceptual and cognitive processes that occur during reading. Exam-

ines the development of reading ability, reading disorders, and the measurement of reading ability. Prerequisite: A previous course in experimental or cognitive psychology or linguistics, or consent of instructor. 1 unit.

- 420. Professional Seminar in Counseling Psychology.** Reviews the psychologists' professional code of ethics, the history of counseling psychology as a profession, and current theoretical and applied issues within the field of counseling psychology. 0 or 1 unit.
- 422. Basic Principles of Counseling.** Study of counseling processes that are especially applicable to the problems of normal individuals; study of the theories of education and personality which underlie counseling procedures for the purpose of developing the student's ability to evaluate these procedures. Prerequisite: Educational Psychology 311 and 312. 1 unit.
- 423. Use of Tests in Counseling.** Provides instruction and practice in the critique, selection, administration, and interpretation of tests of four basic types used in counseling: aptitude, achievement, interest, and personality; builds on knowledge and skill obtained in prerequisite courses in measurement and counseling psychology. Prerequisite: Educational Psychology 392 and 422. 1 unit.
- 424. Supervised Practice in Educational Psychology.** Intensive supervised experiences in applied educational psychology; use of a wide variety of diagnostic and observational techniques and treatment. Students may take more than one section. Prerequisite: Master's degree in educational psychology or equivalent; consent of instructor. $1/2$ to 2 units.
- 426. Interpersonal and Personal Problem Solving for Counselors and Educators.** Studies how to facilitate the growth of persons experiencing difficulty with developmental tasks, stressful transitions, and life crises; builds on a knowledge of the problem-solving process, life span development, and of counseling theory and practice. Prerequisite: Admission to doctoral study or consent of instructor. 1 unit.
- 427. Theories and Practice of Group Counseling.** Study of the principles of group process and their application in institutional and other settings; includes a review of the historical development of group processes and study of pertinent research; discussion and experiential activities are supplemented by films, videotapes, and case studies. Prerequisite: Educational Psychology 422 or consent of instructor. 1 unit.
- 428. Theories of Career Development and the Use of Occupational Information.** Results of recent occupational research and use of these results by teachers and counselors; attention given to research techniques suitable for use in local occupational studies. Prerequisite: An introductory course in counseling or consent of instructor. 1 unit.
- 429. Field Instruction in Educational Psychology.** Individual instruction designed to help the advanced student apply basic principles of education or psychology in institutional settings. Each student is assigned to a school, community agency, or other applied settings for a supervised field experience in some aspect of educational psychology. Prerequisite: Master's degree in educational psychology or equivalent, and consent of instructor. 1 to 4 units. May be repeated to a maximum of 4 units; no more than 2 units may be taken in any given semester.
- 431. Counseling Process Research.** An overview of research investigating what transpires in counseling, and psychotherapy, and what contributes to effectiveness. Focuses on current research design, methodology, and knowledge in examining how counseling contributes to change. Prerequisite: Educational Psychology 496 or equivalent, and a practicum in counseling, or consent of instructor. 1 unit.
- 440. Social Development.** Same as Psychology 440. Research and theory relating to the social development of children; special attention to processes of social learning, environmental influences on social behavior, and the role of education in facilitating the development of social skills; and emphasis on experimental research conducted in naturalistic settings. Prerequisite: Educational Psychology 236 or Psychology 216, or equivalent; and Educational Psychology 390, Psychology 235, or equivalent. 1 unit.
- 442. Cross-Cultural Studies of Literacy.** Combines anthropological and psychological approaches to literacy in theory and practice, using case studies of cultural meanings and

uses of literacy in worldwide array of traditional, historical, and modern settings; topics include origins and definitions of writing systems, psychology of scripts and math notations, issues of cultural cognitive consequences, out-of-school acquisition and uses, autonomous vs ideological meanings of texts, hegemony and writing, roles of readers, and interpretive communities. Prerequisite: Educational Psychology 311 or 314, or Curriculum and Instruction 370 or equivalent. 1 unit.

- 445. Motivation and Achievement.** Examines the social, cultural, and psychological antecedents of achievement behavior; reviews current theories of achievement motivation, research, issues, and methodologies; and emphasizes applications to such areas as education, sport, and work. Gives special attention to age-related changes in motivation and achievement patterns. Prerequisite: Educational Psychology 390 or equivalent; Psychology 373 is recommended. 1 unit.
- 449. Independent Study.** Offers opportunity and challenge of self-directive, independent study; develops the individual's ability as an independent student; and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chair prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of adviser and department chair.
- 451. Evaluation of Educational Programs.** Same as Curriculum and Instruction 418. See Curriculum and Instruction 418.
- 460. Field Research in Educational Settings.** Examination of the conduct of research in educational settings with a focus on researcher-practitioner research collaboration; considers social psychological and design aspects of field research. Students engage in research in cooperation with local schools. Prerequisite: Educational Psychology 390 or equivalent, and consent of instructor. 1 unit.
- 461. School-University Research Practicum.** Focuses on developing skills in field-initiated research; includes research methods, implementation and evaluation of new education programs, and school district policy and operation. Students do a project designed to meet specific school needs under the direction of practicum advisers. Prerequisite: Educational Psychology 460; and Educational Psychology 496 or Psychology 306, or equivalent; or consent of instructor. 1 unit.
- 470. The Methodology of Eye Movements in the Study of Cognition.** Same as Psychology 472. Teaches use of eye movement monitoring techniques to study issues concerning perception, attention and cognition. Uses of eye movement monitoring in research in several fields; use of eyetracking equipment; and writing of computer programs for this type of research. Prerequisite: Consent of instructor. 1 unit.
- 471. Proseminar in Cognitive Science.** Same as Anthropology 470, Computer Science 449, Linguistics 470, and Psychology 471. See Anthropology 470.
- 483. Single Subject Research Design.** Same as Special Education 483. See Special Education 483.
- 484. Methods of Qualitative Research.** Primarily for advanced graduate students approaching dissertation research. Develops an understanding of and skill in the use of several data collection techniques associated with naturalistic, cross-cultural, and single-culture research. These techniques, to be employed in an actual research project of the student's choice, are: (1) working with informants; (2) developing questions for use on questionnaires and in interviewing; (3) back translation; (4) conducting pilot studies; and (5) conducting depth-probe interviews. 1 unit.
- 485. Multivariate Correlational Techniques in Educational Research.** Same as Psychology 486. Emphasis on educational research applications of correlational techniques; special attention to issues in principles of research design underlying appropriate uses of such techniques as multiple, partial, and part (semipartial) correlation and factor analysis; and illustration of techniques by examples drawn from published studies and projects conducted on this campus. Emphasis will be placed on application and interpretation of

- techniques rather than on theoretical rationales. Prerequisite: Educational Psychology 496 or equivalent; consent of instructor. 1 unit.
487. **Research on Classroom Instruction.** An advanced course that reviews research findings on efficient and effective instruction in classrooms including research instruments, research procedures, and results; implementation of these findings for in-service and preservice programs; observation in ongoing classrooms; emphasis on conducting research and synthesizing research findings. Prerequisite: Educational Psychology 390; doctoral standing. 1 unit.
488. **Covariance Structure and Factor Models.** Same as Psychology, Sociology, and Statistics 488. See Psychology 488.
490. **Seminar for Advanced Students of Education.** Seminar in educational psychology; topics relate to the areas of specialization represented by the various divisions within the department. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated to a maximum of 2 units in any area of specialization.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems. Students are expected to present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Prerequisite: Limited to students who have been admitted for doctoral study. 1 to 2 units.
492. **Psychology of Learning and Instruction.** Same as Psychology 492. An advanced course in the nature and conditions of long-term cognitive learning and retention in classroom and similar situations; intended for doctoral students with a special interest in research leading to the improvement of classroom teaching and learning, in psychological aspects of curriculum research, and in the cognitive aspects of military and industrial training. Prerequisite: Consent of instructor. 1 unit.
494. **Multivariate Analysis in Psychology and Education.** Same as Psychology 494 and Sociology 494. See Psychology 494.
495. **Theories of Measurement.** Same as Psychology 495. Classical test theory (true score, error of measurement, reliability and validity of test scores, composite measures); proposed alternatives to the classical model (generalizability theory, matrix sampling, latent trait theory, criterion-referenced measurement). Prerequisite: Educational Psychology 496 or Psychology 307, or equivalent; Educational Psychology 392 or Psychology 390, or equivalent. 1 unit.
496. **Statistical Methods in Education.** Introduction to inferential statistical methods in education; includes probability theory, distribution theory, interval estimation, hypothesis testing, regression and correlational analysis, and analysis of variance. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.
497. **Advanced Statistical Methods in Education.** Advanced topics in analyses of variance and covariance, and principles of experimental design; brief introduction to multivariate analysis, including rudiments of matrix algebra. Prerequisite: Educational Psychology 496, Psychology 307, or equivalent. 1 unit.
498. **Theories of Educational Evaluation.** Study of the process of educational program evaluation, its purpose and procedures, with emphasis on settings, personnel, and performance; review of principal theories; and study of models, histories, political contexts, ethics, and epistemology of evidence as they relate to the observation, judging, and reporting of educational programs. Prerequisite: Educational Psychology 390 and 392 and a course in evaluation, or consent of instructor. 1 unit.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

ELECTRICAL AND COMPUTER ENGINEERING

Head of Department: T. N. Trick

Department Office: 155 Everitt Lab, 1406 West Green Street, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Seminar.** Discussions of educational programs, career opportunities, and other topics in electrical and computer engineering. For electrical and computer engineering students. 0 hours.
229. **Introduction to Electromagnetic Fields.** Elementary electromagnetic field theory as summarized in Maxwell's equations for time-varying fields in integral and differential forms; energy storage; static and quasistatic fields; and time-domain analysis of waves. Prerequisite: Electrical and Computer Engineering 260 or 270. 3 hours.
230. **Computer Solution of Electromagnetics Problems, I.** Solution of selected electromagnetics problems at the ECE 229 level using personal computers. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 229. 1 hour.
244. **Electrical Engineering Laboratory, I.** Introduction to electronic instruments, basic measurement techniques, and basic electronic components; preparation for experimental projects. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 260 or 270. 2 hours.
246. **Advanced Digital Projects Laboratory.** Planning, designing, executing, and documenting a microcomputer based project. Hardware is emphasized but the special projects required of student may also require an equal emphasis on software. Prerequisite: Electrical and Computer Engineering 249 or consent of instructor. 2 to 3 hours.
249. **Digital Systems Laboratory.** Introduction to the experimental analysis and synthesis of digital networks, including the use of a microcomputer as a controller. Prerequisite: Electrical and Computer Engineering 244 and 290. 2 hours.
260. **Introduction to Electric Circuits.** Elementary signals; basic principles of network analysis; and sinusoidal steady-state analysis. Prerequisite: Physics 107 and credit or concurrent registration in Mathematics 285 and Computer Science 101 or 125. 3 hours. Credit is not given for both Electrical and Computer Engineering 260 and 270.
270. **Introduction to Circuit Analysis.** Basic principles of circuit analysis including Kirchhoff's laws, node and mesh equations, matrix methods, equivalent circuits, operational amplifiers, transient analysis, sinusoidal steady-state analysis, three-phase circuits, transformers, network functions, and frequency responses. Prerequisite: Physics 107 and credit or concurrent registration in Math 285. 4 hours. Credit is not given for both Electrical and Computer Engineering 260 and 270.
271. **Electrical and Computer Engineering Special Topics.** Prerequisite: As specified by department or instructor. 0 to 4 hours.
272. **Electrical and Computer Engineering Problems.** Prerequisite: Approved written application to department as specified by department or instructor. 0 to 4 hours.
290. **Introduction to Computer Engineering.** Introduction to digital logic and computer systems. Examines representation of information, combinational network analysis and design, sequential network analysis and design, computer organization and control, and machine-level programming. Prerequisite: Computer Science 101 or 125. 3 hours. Credit is not given for both Electrical and Computer Engineering 290 and Computer Science 231.
291. **On-Line Computing.** On-line computer use; includes assembly language programming, I/O processes and devices, interrupts and priority, semaphores, real-time operations, multi-tasking, data acquisition, and computer-based control and communication. Prerequisite: Electrical and Computer Engineering 290, or consent of instructor. 3 hours. Credit is not given for both Electrical and Computer Engineering 291 and Computer Science 232.
296. **Honors Project.** A special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practices and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

299. **Thesis.** Preliminary reading and investigation. 0 to 3 hours.
302. **Electronic Music Synthesis.** Survey of methods of electronic music production; musical notation translated into engineering terms; analysis and synthesis of sound spectra; electronic circuits for synthesis of musical sounds; and digital computer sound synthesis. Prerequisite: Music 100 or equivalent; Electrical and Computer Engineering 290 and 342. 3 hours or $\frac{3}{4}$ unit.
303. **Topics in Audio Engineering.** Sound perception related to audio; review of wave phenomena; acoustics of rooms and auditoriums; characteristics of microphones and loudspeakers; magnetic recording; and topics of specialized interest. Prerequisite: Electrical and Computer Engineering 260 or 270 and 373, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
309. **Signal and System Analysis.** Introduction to continuous-time and discrete time signals and linear systems; includes difference equations, convolution, frequency response, Fourier series, Fourier transform, Laplace transform, z-transform, transfer functions, and stability. Prerequisite: Electrical and Computer Engineering 270. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in electrical and computer engineering.
310. **Digital Signals and Systems.** Discrete-time signals and systems; convolution sum; difference equations; Z-transform; sampling theorem and data conversion; digital filter design and implementation; discrete signal analysis and the Fast Fourier Transform; and state variable methods with application to digital control and communications. Prerequisite: Electrical and Computer Engineering 309, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Microcomputer Laboratory.** Design, construction, and use of a small general purpose computer with a micro-processor CPU; MSI and LSI circuits used extensively; control panel, peripheral controllers, control logic, central processor, and programming experiments; and open lab format. Prerequisite: Electrical and Computer Engineering 249; Electrical and Computer Engineering 291 or Computer Science 232. Credit or concurrent registration in Electrical and Computer Engineering 312 is recommended. 3 hours or $\frac{3}{4}$ unit.
312. **Computer Organization and Design.** Basic computer organization and design, computer arithmetic, control design and microprogramming, memory organization, I/O design, reliability, performance evaluation; laboratory for computer design implementation, simulation, and layout. Prerequisite: Electrical and Computer Engineering 290 or Computer Science 231; and Electrical and Computer Engineering 291 or Computer Science 232. 4 hours or 1 unit. Graduate credit not allowed for electrical engineering majors.
313. **Probabilistic Methods of Signal and System Analysis.** Introduction to probabilistic methods, analysis of random signals and noise, and applications to electrical engineering problems, including reliability of circuits and systems and effects of noise systems. Prerequisite: Electrical and Computer Engineering 309. 3 hours or $\frac{3}{4}$ unit. Electrical engineering majors may not receive graduate credit.
314. **Biomedical Instrumentation.** Same as Bioengineering 314. Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical transducers for measurements of biopotentials, ions and gases in aqueous solution, force, displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; and therapeutic and prosthetic devices. Prerequisite: Electrical and Computer Engineering 260 or 270 and 244, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Biomedical Instrumentation Laboratory.** Same as Bioengineering 315. Laboratory to accompany Electrical and Computer Engineering 314. Studies medical instrumentation and transducers for static and dynamic nonbiological inputs and measures actual biomedical signals; requires some animal experiments. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 314. 2 hours or $\frac{1}{2}$ unit.
319. **Applied Modern Algebra.** Same as Mathematics 319. See Mathematics 319.
320. **Digital Signal Processing Laboratory.** Development of real-time digital signal processing (DSP) systems using a DSP microprocessor; several structured laboratory exercises, such as sampling and digital filtering, followed by an extensive DSP project of the

- student's choice. Prerequisite: Electrical and Computer Engineering 310. 2 hours or $1/2$ unit.
321. **Introduction to Controlled Theronuclear Fusion.** Same as Nuclear Engineering 321. See Nuclear Engineering 321.
324. **Analog Filter Design.** Properties of passive network functions; synthesis of RC and LC passive network functions; operational amplifier; RC active circuit synthesis; sensitivity of networks; approximation theory; and practical filter design. Prerequisite: Electrical and Computer Engineering 309. 3 hours or $3/4$ unit.
325. **Introduction to VLSI System Design.** Same as Computer Science 335. Complementary Metal-Oxide Semiconductor (CMOS) technology and theory; CMOS circuit and logic design; layout rules and techniques; circuit characterization and performance estimation; CMOS subsystem design; Very-Large-Scale Integrated (VLSI) systems design methods; VLSI Computer Aided Design (CAD) tools; laboratory experience in custom VLSI chip design on workstations using concepts of cell hierarchy; final project involving specification, design and evaluation of a VLSI chip or VLSI CAD program; and written report and oral presentation on the final project. Prerequisite: Electrical and Computer Engineering 249 and 312; or Computer Science 232. 3 hours or $3/4$ unit.
326. **Advanced VLSI Design Projects.** Same as Computer Science 336. Design of Very Large Scale Integrated (VLSI) chips using either a standard cell or a custom design methodology with the help of computer-aided design (CAD) tools in the VLSI Design Laboratory. Chips designed in the course will be fabricated by an outside organization, and will be tested by students in the laboratory. Written report and oral presentation on project required. Prerequisite: Electrical and Computer Engineering 325. 2 hours or $1/2$ unit.
328. **Computer Networks and Distributed Systems.** Same as Computer Science 328. See Computer Science 328.
330. **Electromechanics.** Quasi-static electromagnetic fields; lumped-parameter electromechanics; rotating machines; dynamics of electromechanical systems; fields and moving media; and transducers and actuators. Prerequisite: Electrical and Computer Engineering 229 and 260 or 270. 3 hours or $3/4$ unit. May not be taken for credit by graduate students in electrical and computer engineering.
333. **Electric Machinery.** Theory and laboratory experimentation with three-phase power, power factor correction, single- and three-phase transformers, induction machines, DC machines, and synchronous machines; includes project work on energy control systems; digital simulation of machine dynamics. Prerequisite: Electrical and Computer Engineering 330. 4 hours or 1 unit.
336. **Advanced Electric Machinery.** Advanced rotating machine theory and practice, dynamic analysis of machines using reference frame transformations, tests for parameter determination, reduced order modeling of machines; mechanical subsystems including governors, prime movers, excitation systems, digital simulation of inter-connected machines. Prerequisite: Electrical and Computer Engineering 333. 3 hours or $3/4$ unit.
338. **Communication Networks for Computers.** Same as Computer Science 338. See Computer Science 338.
339. **Computer Aided Design for Digital Systems.** Same as Computer Science 339. See Computer Science 339.
340. **Solid State Electronic Devices.** Semiconductor materials and their electronic properties and applications to electronic devices; p-n junctions; transistors; junction field effect transistors and MOS devices; and introduction to integrated circuits. Prerequisite: Physics 108, and credit or concurrent registration in Electrical and Computer Engineering 229. 3 hours or $3/4$ unit. Graduate credit does not count toward degrees in electrical and computer engineering.
341. **Physics and Modeling of Semiconductor Devices.** Detailed presentation of advanced concepts such as generation-recombination, hot electron effects, and breakdown mechanisms; essential features of small ac characteristics, switching and transient behavior of p-n junctions, bipolar and MOS transistors; addresses fundamental issues for device modeling and discusses the perspective and limitations of Si-devices. Prerequisite: Electrical and Computer Engineering 340. 3 hours or $3/4$ unit.

- 342. Electronic Circuits.** Introduces analysis and design of analog and digital integrated circuits using bipolar and MOS field effect transistors. Prerequisite: Electrical and Computer Engineering 309 and 340. 3 hours or $3/4$ unit. May not be taken for graduate credit by students in electrical and computer engineering.
- 343. Electronic Circuits Laboratory.** Laboratory to accompany Electrical and Computer Engineering 342. Prerequisite: Concurrent registration in Electrical and Computer Engineering 342. 1 hour or $1/4$ unit. May not be taken for graduate credit by students in electrical and computer engineering.
- 344. Theory and Fabrication of Integrated Circuit Devices.** Laboratory and lecture course on the physical theory, design, and fabrication of devices suitable for integrated circuitry; includes the electrical properties of semiconductors and techniques (epitaxial growth, oxidation, photolithography diffusion, ion implantation, metallization, characterization) for fabricating integrated circuit devices such as p-n junction diodes, bipolar transistors, and field effect transistors. Prerequisite: Electrical and Computer Engineering 340. 4 hours or 1 unit.
- 345. Senior Design Project Laboratory.** Individual design projects in various areas of electrical and computer engineering; projects are chosen by students with approval of the instructor; a written report, prepared to journal publication standards, and an oral presentation are required. Prerequisite: Electrical and Computer Engineering 343. 2 hours or $1/2$ unit. No credit for graduate students in electrical and computer engineering.
- 346. Hybrid Circuit Fabrication Laboratory.** Same as Ceramic Engineering 383 and Materials Science and Engineering 383. Laboratory course on the basics of fabricating thin- and thick-film components as used in hybrid electronic circuits; experiments covering vacuum deposition, sputtering, anodization, resist processes, screen preparation, screen printing, and firing and trimming. Lectures provide background material and cover trade-offs of the two technologies. Prerequisite: Electrical and Computer Engineering 340. 2 hours or $1/2$ unit.
- 347. High-Frequency Circuit Design Using Scattering Parameters.** Laboratory and lecture on the use of scattering parameters for the design of high-frequency amplifiers. Prerequisite: Electrical and Computer Engineering 353. 2 hours or $1/2$ unit.
- 348. Introduction to Artificial Intelligence.** Same as Computer Science 348. See Computer Science 348.
- 349. Computer Solution of Electromagnetics Problems, II.** Solution of selected electromagnetics problems at the Electrical and Computer Engineering 350 level using personal computers. Prerequisite: Electrical and Computer Engineering 230 and credit or concurrent registration in Electrical and Computer Engineering 350, or consent of instructor. 1 hour or $1/4$ unit. Graduate credit is not counted toward degrees in electrical and computer engineering.
- 350. Lines, Fields, and Waves.** General plane wave solution of Maxwell's equations; reflection and transmission of plane waves; transmission lines; impedance matching; waveguides and cavities; and radiation. Prerequisite: Electrical and Computer Engineering 229. 3 hours or $3/4$ unit. Graduate credit is not counted toward degrees in electrical and computer engineering.
- 351. Automated Microwave Measurements.** Manual and computer controlled laboratory analysis of circuits at microwave frequencies. Prerequisite: Electrical and Computer Engineering 350. 3 hours or $3/4$ unit.
- 352. Electromagnetic Fields.** Plane waves at oblique incidence, wave polarization, anisotropic media, radiation, space communications, and waveguides. Prerequisite: Electrical and Computer Engineering 350. 3 hours or $3/4$ unit.
- 353. Radio Communication Circuits.** Design of a radio system for transmission of information; types of receivers, matching techniques, receiver and antenna noise, types of modulation, high-frequency circuitry, and point-to-point and satellite communications. Prerequisite: Electrical and Computer Engineering 309 and 342; credit or concurrent registration in Electrical and Computer Engineering 350. 4 hours or 1 unit.
- 354. Antennas.** Antenna parameters; polarization of electromagnetic waves; basic antenna types; antenna arrays; broadband antenna design; and antenna measurements. Prerequisite: Electrical and Computer Engineering 350 or consent of instructor. 3 hours or $3/4$ unit.

- 355. Optical Electronics.** Optical beams and cavities; semiclassical theory of gain; characteristics of typical lasers (gas, solid state, and semiconductor); and application of optical devices. Prerequisite: Electrical and Computer Engineering 350 or Physics 333 or consent of instructor. 3 hours or 1 unit.
- 357. Microwave Devices and Circuits.** Electromagnetic wave propagation, microwave transmission systems, passive components, microwave tubes, solid state microwave devices, microwave integrated circuits, S-parameter analysis, microstrip transmission lines. Prerequisite: Electrical and Computer Engineering 340 or equivalent, and Electrical and Computer Engineering 350 or equivalent. 3 hours or $3/4$ unit.
- 358. Applications of Radio Wave Propagation.** Terrestrial atmosphere, radio wave propagation, and applications to radio sensing and radio communication. Prerequisite: Electrical and Computer Engineering 350 or consent of instructor. 3 hours or $3/4$ unit.
- 359. Analog and Pulse Communication Systems.** Introduction to amplitude, phase, frequency, and pulse code modulation systems; discusses bandwidth requirements, effects of noise and applications in commercial broadcast, and telephone and satellite communications. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 313 or equivalent. 3 hours or $3/4$ unit.
- 360. Coherent Optics Laboratory.** Introduction to the properties and applications of coherent laser light; experiments in interferometry, optical processors and spatial filtering, holography, optical communications, fiber optics, and special projects. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 309 and 350; or Physics 371; or equivalent. 3 hours or $3/4$ unit.
- 361. Introduction to Digital Communication Systems.** Introduction to signals and noise in digital communication systems; analysis and design of efficient digital communication receivers; and signal design for, and performance of, practical communication systems. Prerequisite: Electrical and Computer Engineering 313 or equivalent. 3 hours or $3/4$ unit.
- 362. Logic Design.** Same as Computer Science 362 and Mathematics 391. Design of combinational networks, hazards, finite state testing machines, design of sequential networks in fundamental mode and pulse mode, state reduction, state assignment and races, and fault detection and testing. Prerequisite: Electrical and Computer Engineering 290 or Computer Science 231. 3 hours or $3/4$ unit.
- 364. Power Electronics.** Switching functions and methods of control such as pulse-width modulation, phase control, and phase modulation; dc-dc, ac-dc, dc-ac, and ac-ac power converters; power components, including magnetic components and power semiconductor switching devices. Prerequisite: Electrical and Computer Engineering 309 and 342. 3 hours or $3/4$ unit.
- 366. Introduction to Surface Acoustic Waves.** Basic ultrasonic principles; piezoelectricity; transducer equivalent circuits; and radar and communication system applications: delay lines, bandpass filters, oscillators, synthesizers, matched filters, convolvers, and Fourier transformers. Prerequisite: Electrical and Computer Engineering 309 and 350, or consent of instructor. 3 hours or $3/4$ unit.
- 369. Power Electronics Laboratory.** Laboratory study of circuits and devices used for switching power converters, solid-state motor drives, and power controllers, including dc-dc, ac-dc, and dc-ac converters and applications; high-power transistors and magnetic components; design considerations, including heat transfer. Prerequisite: Credit or concurrent registration in Electrical and Computer Engineering 364; Electrical and Computer Engineering 343 or consent of instructor. 2 hours or $1/2$ unit.
- 371. Topics in Electrical and Computer Engineering.** Lectures and discussions relating to new areas of interest. Prerequisite: Specified by department or instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated.
- 373. Fundamentals of Engineering Acoustics.** Same as Theoretical and Applied Mechanics 373. Development of the basic theoretical concepts of acoustical systems; mechanical vibration, plane and spherical wave phenomena in fluid media, lumped and distributed resonant systems, and absorption phenomena and hearing. Prerequisite: Mathematics 285 or equivalent. 3 hours, or $3/4$ or 1 unit.

- 374. Ultrasonic Techniques.** Ultrasonic wave propagation, generation, detection, and measurement in liquid and solid media, acoustic impedance concepts, ultrasonic absorption and velocity measurement techniques, piezoelectricity, and discussion of industrial, experimental, bioengineering, and medical applications. Prerequisite: Electrical and Computer Engineering 373 or equivalent, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 375. Modeling of Bio-Systems.** Same as Bioengineering 375. Application of linear systems theory and feedback control systems analysis to biological systems; sensory receptors, neuro-muscular system models, control of eye movement, the pupil control system, man-machine interactions, parameter identification in biological systems; and optional project laboratory. Prerequisite: General Engineering 222, Mechanical Engineering 265, or Electrical and Computer Engineering 309; or consent of instructor. 3 or 4 hours, or $3/4$ or 1 unit.
- 376. Power System Analysis.** Examines the development of power system equivalents, per phase network analysis, load flow, symmetrical components, sequence networks, fault analysis, and digital simulation. Prerequisite: Electrical and Computer Engineering 330. 3 hours or $3/4$ unit.
- 378. Power System Operation and Control.** Studies economic operation of power systems, system protection, power system stability, dynamics and control of power systems, high voltage DC transmission, load flow interface, digital simulation. Prerequisite: Electrical and Computer Engineering 376. 3 hours or $3/4$ unit.
- 382. Large Scale Integrated Circuit Design.** Bipolar and MOS field effect transistor characteristics; VLSI fabrication techniques for MOS and bipolar circuits; calculation of circuit parameters from the process parameters; and design of VLSI circuits such as logic, memories, charge-coupled devices, and A/D and D/A converters. Prerequisite: Electrical and Computer Engineering 290 and 342. 3 hours or $3/4$ unit.
- 383. Linear Integrated Circuit Design.** Basic linear integrated circuit design techniques using bi-polar, JFET, and MOS technologies; operational amplifiers; wide-band feedback amplifiers; sinusoidal and relaxation oscillators; electric circuit noise; application of linear integrated circuits. Prerequisite: Electrical and Computer Engineering 342. 3 hours or $3/4$ unit.
- 386. Control Systems.** Analysis and design of control systems with emphasis on modeling, state variable representation, computer solutions, modern design principles, and laboratory techniques. Prerequisite: Electrical and Computer Engineering 309 or consent of instructor. 4 hours or 1 unit.
- 387. Introduction to Quantum Electronics for Electrical Engineers.** Application of quantum mechanical concepts to electronics problems; detailed study of a calculable two-state laser system; and incidental quantum ideas bearing on electronics. Prerequisite: Physics 383 or consent of instructor. 3 hours or $3/4$ unit.
- 388. Compound Semiconductors and Devices.** An advanced semiconductor materials and devices course covering elementary band theory, heterostructures, transport issues, three-terminal devices, two-terminal devices, including lasers and light modulators. Prerequisite: Electrical and Computer Engineering 340, and either Electrical and Computer Engineering 350 or consent of instructor. 3 hours or $3/4$ unit.
- 390. Introduction to Optimization.** Basic theory and methods for the solution of optimization problems; iterative techniques for unconstrained minimization; and introductory presentation of linear and nonlinear programming with engineering applications. Prerequisite: Computer Science 101 or 125, and Mathematics 280, or consent of instructor. 3 hours or 1 unit.
- 397. Projects and Lectures in Quantum Electronics.** Studies processes involving quantum mechanical energy transfers in energized media leading to various lasering devices and their applications. A series of lectures, supplementing the special projects, offers background information on spectroscopy, collisional energy transfer, laser pumping schemes, modulation at optical frequencies, holography, and other related topics. Prerequisite: Senior standing; consent of instructor; Electrical and Computer Engineering 387 is recommended. 3 hours or $3/4$ unit.
- 400. Seminar.** Required of all graduate students. 0 units.

- 411. High Performance Computer Architectures: Hardware and Software.** Design of high performance computer systems; instruction level concurrency; memory system implementation; pipelining, superscalar, and vector processing; compiler back-end code optimization; profile assisted code transformations; code generation and machine dependent code optimization; cache memory design for multiprocessors; synchronization implementation in multiprocessors; compatibility issues; technology factors; state-of-the-art commercial systems. Prerequisite: Electrical and Computer Engineering 412; and Computer Science 326 or equivalent. 1 unit.
- 412. Computer Architecture.** Advanced concepts in computer architecture; design, management, and modeling of memory hierarchies, stack-oriented processors, associative processors, pipelined computers, and multiple processor systems; and focuses on hardware alternatives in detail and their relation to system performance/cost. Prerequisite: Electrical and Computer Engineering 312 or Computer Science 333, or consent of instructor. 1 unit.
- 413. Digital Signal and Spectral Analysis.** Fundamentals of linear least squares estimation of discrete-time signals and their spectra; minimum-norm least squares and total least squares solutions; singular value decomposition; Wiener and Kalman filtering; autoregressive spectral analysis; and the maximum entropy method. Prerequisite: Electrical and Computer Engineering 310 and 313 and Mathematics 318, or equivalent, or consent of instructor. 1 unit.
- 415. Control System Theory and Design.** Synthesis of feedback control systems to meet design specifications, including sensitivity; multivariable systems; introduction to systems with random inputs; state variable techniques; and nonlinear systems. Prerequisite: Electrical and Computer Engineering 386 or equivalent, or consent of instructor. 1 unit.
- 416. Analysis of Networks and Systems.** Dynamic equations of linear lumped networks and systems; time-domain analysis and state space methods; frequency-domain analysis and transform methods; stability criteria; and applications to various problems in electrical engineering. Prerequisite: Electrical and Computer Engineering 309. 1 unit.
- 417. Nonlinear and Adaptive Control.** Studies design of nonlinear control systems based on stability considerations; examines Lyapunov and hyperstability approaches to analysis and design of model reference adaptive systems; identifiers, observers, and controllers for unknown plants. Prerequisite: Electrical and Computer Engineering 415. 1 unit.
- 420. Electromagnetic Waves and Radiating Systems.** Fundamental electromagnetic theory with applications to transmission lines, waveguides, and antennas; introduction to the solution of advanced problems in static electric and magnetic fields. Prerequisite: Electrical and Computer Engineering 352. 1 unit.
- 421. Advanced Electromagnetic Engineering.** Reciprocity and equivalence principles; formulation of scattering and diffraction problems; approximations for large and for short wavelengths; plane, cylindrical, and spherical wave problems; variational methods; Wiener-Hopf techniques; and applications to antennas and waveguide problems. Prerequisite: Electrical and Computer Engineering 420. 1 unit.
- 422. Controlled Fusion Systems, I.** Same as Nuclear Engineering 422. See Nuclear Engineering 422.
- 423. Gaseous Electronics and Plasmas.** Basic concepts and techniques, both theoretical and experimental, which are used in the areas of gaseous electronics, gas and solid plasmas, controlled fusion, aeronomy, gas lasers, and magnetohydrodynamics. Prerequisite: Physics 383 or Electrical and Computer Engineering 352, or equivalent; or consent of instructor. 1 unit.
- 425. Nuclear-Electrical Energy Conversion.** Same as Nuclear Engineering 425. See Nuclear Engineering 425.
- 428. Analysis of Nonlinear Systems.** Same as Theoretical and Applied Mechanics 428. Treatment of singular points and stability considerations; consideration of graphical and analytical methods, including the perturbation method, variation of parameters, Galerkin's method, and the Ritz method for solving nonlinear differential equations. Prerequisite: Mathematics 341; consent of instructor. 1 unit.
- 431. Theory of Guided Waves.** Propagation of electromagnetic waves in general cylindrical

waveguides; stationary principles; nonuniform inhomogeneously filled waveguides; mode and power orthogonality; losses in waveguides; analytical and numerical techniques; microwave integrated circuits waveguides; and optical waveguides. Prerequisite: Electrical and Computer Engineering 420; Physics 440 and Mathematics 455 recommended. 1 unit.

432. **Compound Semiconductors (Optical Devices).** Properties of III-V and II-VI compound semiconductors and the devices which are unique to these materials; emphasis on materials such as GaAs, Ga(AsP), GaP, CdSe, Cd(SeS), etc., and on luminescence, semiconductor lamps, and semiconductor lasers. Prerequisite: Graduate standing in electrical engineering with some background in modern physics; elementary quantum mechanics; elementary semiconductor theory or equivalent. 1 unit.
433. **Theory of High-Speed Parallel Computation.** Same as Computer Science 433. See Computer Science 433.
434. **Random Processes.** Basic concepts of random processes; spectral analysis; linear systems with random inputs; Markov chains and Markov processes; and applications to communications and control systems engineering. Prerequisite: Mathematics 361 or equivalent, or Electrical and Computer Engineering 361. 1 unit.
435. **Theory of Semiconductors and Semiconductor Devices.** Same as Physics 435. Introductory quantum mechanics of semiconductors; energy bands; dynamics of Bloch electrons in static and high-frequency electric and magnetic fields; equilibrium statistics; transport theory, diffusion, drift and thermoelectric effects; and characteristics of p-n junctions, heterojunctions, and transistor devices. Prerequisite: Senior-level course in quantum mechanics or atomic physics. 1 unit.
436. **Integrated Optics and Optoelectronics.** Integrated optical and optoelectronic devices; theory of optical devices including laser sources, waveguides, photodetectors, and modulations of these devices. Prerequisite: Electrical and Computer Engineering 355, 387, or Physics 386; Electrical and Computer Engineering 388 recommended. 1 unit.
439. **Advanced Theory of Semiconductors and Semiconductor Devices.** Continuation of Electrical and Computer Engineering 435. Selected advanced topics of current interest in the physics of semiconductors and solid-state devices. Prerequisite: Electrical and Computer Engineering 435. 1 unit.
441. **Computer Systems Analysis.** Same as Computer Science 441. See Computer Science 441.
442. **Design of Fault-Tolerant Digital Systems.** Same as Computer Science 436. Advanced concepts in hardware and software fault tolerance; topics addressed include fault models, coding in computer systems, module and system level fault detection mechanism, reconfiguration techniques in multiprocessor systems and VLSI processor arrays, software fault tolerance techniques such as recovery blocks, N-version programming, checkpointing and recovery; survey of practical fault-tolerant systems. Prerequisite: Electrical and Computer Engineering 312 or equivalent. 1 unit.
443. **Digital System Testing and Design for Testability.** Fundamental techniques of detecting failures in complex digital systems, algorithms for automatic test generation, schemes for designing systems to be easily testable and with self test capability; hands-on experience with state-of-the-art computer-aided test tools in the laboratory. Prerequisite: Electrical and Computer Engineering 312 and 362, or equivalent. 1 unit.
444. **Design of Computer Problem Solvers.** Same as Computer Science 444. See Computer Science 444.
445. **Advanced Physical Acoustics.** Same as Theoretical and Applied Mechanics 445. Advanced topics in acoustics including physical properties of a fluid; linear propagation phenomena; nonlinear phenomena such as radiation force, streaming, and harmonic generation; cavitation; and absorption and dispersion. Prerequisite: Electrical and Computer Engineering 373 or 420, or Theoretical and Applied Mechanics 458, or equivalent; or consent of instructor. 1 unit.
446. **Advanced Artificial Intelligence Programming Methods.** Same as Computer Science 446. See Computer Science 446.
447. **Image Processing.** Examines fundamental concepts, techniques, and directions of research in image processing; topics include two-dimensional Fourier transform and

- filtering, image digitization, coding, restoration, reconstruction, analysis, and recognition. Prerequisite: Electrical and Computer Engineering 310 and 313; or equivalent. 1 unit.
448. **Computer Models of Cognitive Processes.** Same as Computer Science 448. See Computer Science 448.
449. **Computer Vision.** Examines information processing approaches to computer vision, and algorithms and architectures for artificial intelligence and robotics systems capable of vision: inference of three-dimensional properties of a scene from its images, such as distance, orientation, motion, size and shape, acquisition and representation of spatial information for navigation and manipulation in robotics. Prerequisite: Electrical and Computer Engineering 348 or Computer Science 225, or consent of instructor. 1 unit.
451. **Digital Signal Processing.** Reviews basic concepts of digital signals and systems; examines computer-aided digital filter design, quantization effects, decimation and interpolation, fast algorithms for convolution and the DFT; and introduces adaptive signal processing. Prerequisite: Electrical and Computer Engineering 310 and 313; or equivalent. 1 unit.
452. **Computational Techniques for Circuit Analysis and Design.** Formulation of circuit equations; sparse matrix algorithms for the solution of large systems, AC, DC, and transient analysis of electrical circuits; sensitivity analysis; decomposition methods. Prerequisite: Mathematics 315 and Electrical and Computer Engineering 309. 1 unit.
453. **Optimum Control Systems.** Formulation of the optimization problem; controllability; observability; stability; Lyapunov's second method; application of variational calculus, maximum principle, and principle of optimality to control problems; stochastic control; and adaptive control. Prerequisite: Electrical and Computer Engineering 415. 1 unit.
454. **Sampled-Data Control Systems.** Analysis and design of feedback control systems with digital and sampled data. Prerequisite: Electrical and Computer Engineering 415 or equivalent. 1 unit.
455. **Control of Stochastic Systems.** Stochastic control models; development of control laws by dynamic programming; separation of estimation and control; Kalman filtering; self-tuning regulators; dual controllers; decentralized control. Prerequisite: Electrical and Computer Engineering 415 and 434. 1 unit.
456. **Coding Theory.** Same as Computer Science 456 and Mathematics 476. General discussion on coding theory with emphasis on the algebraic theory of cyclic codes; error-control procedures and circuits; and applications to computers and data-transmission systems. Prerequisite: Mathematics 317 or equivalent, or consent of instructor. 1 unit.
458. **Multidimensional Digital Signal Processing.** Multidimensional signals, convolution, transforms, stability, sampling, windowing; design of two-dimensional digital filters; fast algorithms for multidimensional convolution, DFT, and corner turning; sensor array processing, including tomography and synthetic aperture radar; multidimensional interpolation. Prerequisite: Electrical and Computer Engineering 451. 1 unit.
461. **Signal Detection and Estimation.** Introduction to detection and estimation theory, with applications to communication, control, and radar systems; decision-theory concepts and optimum-receiver principles; detection of random signals in noise, coherent and noncoherent detection; and parameter estimation, linear and nonlinear estimation, and filtering. Prerequisite: Electrical and Computer Engineering 434 or equivalent, or consent of instructor. 1 unit.
462. **Topics in Signal Detection and Estimation.** Topics selected from the following: nonlinear filtering; robust detection, estimation, and filtering; detection and estimation of point processes; quantum detection; advanced computational methods in linear filtering; white noise calculus for nonlinear systems. Students must complete a project. Prerequisite: Electrical and Computer Engineering 461 or consent of instructor. 1 unit.
463. **Information Theory.** Same as Computer Science and Statistics 463. Mathematical models for information channels and sources; existence theorems for and construction of error-correcting codes. Prerequisite: Mathematics 361. 1 unit.
465. **Topics in Automata Theory.** Same as Computer Science 465 and Mathematics 465. See Mathematics 465.
467. **Communication Network Analysis.** A first high-level course in performance analysis and design of multiple-user communication systems; emphasizes rigorous formulation

- and analytical and computational methods; includes queueing networks, decentralized minimum delay routing and dynamic network flow control. Prerequisite: Computer Science 338, and either Electrical and Computer Engineering 434 or Mathematics 366; or consent of instructor. 1 unit.
- 468. Modeling and Control of Electro-Mechanical Systems.** Same as Mechanical Engineering 468. Examines fundamental electrical and mechanical laws for derivation of machine models; simplifying transformations of variables in electrical machines; power electronics for motor control; time-scale separation; feedback linearization and nonlinear control as applied to electrical machines. Typical electromechanical applications in actuators, robotics, and variable speed drives. Prerequisite: Electrical and Computer Engineering 333, Electrical and Computer Engineering 415, or consent of instructor. 1 unit.
- 469. Introduction to Coherent Optics and Holography.** Same as Computer Science 469. The diffraction transformation of aperture distributions between parallel planes and the imaging and Fourier-transforming properties of lenses; the theory of coherence; the principles of optical and digital holography; and devices and systems for optical data processing. Prerequisite: Consent of instructor. 0 or 1 unit.
- 470. Nonlinear Optics.** Light propagation in anisotropic crystals; second- and third-order nonlinear susceptibility and electro-optic effect; and discussion of the relationship of these effects along with such applications as light modulation, harmonic generation, and optical parametric amplification and oscillation. Prerequisite: Electrical and Computer Engineering 420. 1 unit.
- 471. Electromagnetic Waves in Inhomogeneous Media.** Electromagnetic waves in layered media; plane wave expansion of electromagnetic point source field; Sommerfeld integrals; transient response; WKB method with asymptotic matching; scattering by junction discontinuity; surface integral equation; volume integral equation; inverse problems. Prerequisite: Math 346 and Electrical and Computer Engineering 420 or Physics 442 or equivalent. 1 unit.
- 472. Quantum Electronics.** Brief theoretical introduction to quantum mechanics and atomic physics, with many applications in spin resonance and modern maser theory. Prerequisite: Physics 383 recommended. 1 unit.
- 473. Power System Control.** Studies energy control center functions, state estimation and steady state security assessment techniques, economic dispatch, optimal power flow, automatic generation control, and dynamic equivalents. Prerequisite: Electrical and Computer Engineering 376 or consent of instructor. 1 unit.
- 474. Topics in Graph and Geometric Algorithms.** Same as Computer Science 474. Design and analysis of computational methods for problems in graph theory and computational geometry; graph connectivity and isomorphism, flow in networks, and matching and covering; and geometric inclusion, proximity intersection and reachability, and applications to computational statistics. Prerequisite: Computer Science 373, or Computer Science 321 and either Mathematics 319 or Mathematics 313, or equivalent; or consent of instructor. 1 unit.
- 475. Ionospheric Radio Propagation.** Propagation in a stratified medium; WKB solution; ray theory; ionospheric sounding; ionospheric transmission problems; scattering by irregularities; propagation in a random medium; cross-modulation and nonlinear effects; magneto-ionic theory; Faraday effect; whistler propagation; coupling of characteristic waves; magnetohydrodynamic waves; formation of ionospheric E-region; and formation of F-region. Prerequisite: Electrical and Computer Engineering 420 or equivalent. 1 unit.
- 476. Power System Dynamics and Stability.** Detailed modeling of the synchronous machine and its controls, such as excitation system and turbine-governor dynamics; time-scales and reduced order models; nonlinear and linear multi-machine models; stability analysis using energy functions; power system stabilizers. Prerequisite: Electrical and Computer Engineering 376 or consent of instructor. Concurrent registration in Electrical and Computer Engineering 415 is recommended. 1 unit.
- 477. Advanced Antenna Theory.** Selected topics from recent engineering literature on antennas supplemented by advanced topics in electromagnetic theory needed for comprehension; current techniques for analysis of wire, slot, horn, frequency independent, quasi-

- optical, and array antennas. Prerequisite: Electrical and Computer Engineering 420. 1 unit.
478. **Advanced Electromagnetic Diffraction and Radiation.** Asymptotic solutions of Maxwell's equations, geometrical optics, edge diffraction, uniform theories, creeping waves, advanced antenna theory, and topics of current interest. Prerequisite: Electrical and Computer Engineering 420 or Physics 442; Electrical and Computer Engineering 421 or 477 is recommended for supplemental background. 1 unit.
479. **Computational Complexity.** Same as Computer Science and Mathematics 479. Turing machines; determinism and nondeterminism; time and space hierarchy theorems; speed-up and tape compression; Blum axioms; structure of complexity classes NP, P, NL, L, PSPACE; complete problems; randomness and complexity classes RP, RL, BPP; alternation, polynomial-time hierarchy; circuit complexity, parallel complexity, NC, RNC; relativized computational complexity; time-space trade-offs. Prerequisite: Computer Science 373 or 375, or consent of instructor. 4 hours or 1 unit.
480. **Optimization by Vector Space Methods.** Same as Mathematics 480. See Mathematics 480.
482. **Physical VLSI Design.** Basic physical design requirements for VLSI; performance-oriented formulation and optimization of chip partitioning, module placement and interconnection; optimized design and layout of on-chip modules; circuit extraction; high-speed VLSI circuits; yield and reliability analysis; advanced VLSI packaging and parametric testing. Prerequisite: Electrical and Computer Engineering 325 or 382. 1 unit.
490. **Seminar in Special Topics.** Lectures and discussions on current research and literature on advanced topics in electrical engineering. Prerequisite: Advanced standing; consent of instructor. 0 to $1\frac{1}{2}$ unit. May be repeated for credit.
497. **Electrical and Computer Engineering Problems.** Lectures and discussions relating to new areas of interest. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated for credit.
498. **Individual Study.** Individual projects. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

ELEMENTARY AND EARLY CHILDHOOD EDUCATION

(See Curriculum and Instruction)

ENGINEERING

Program Administrator: H. L. Wakeland

Program Office: 207 Engineering Hall, 1308 West Green Street, Urbana

100. **Engineering Lecture.** Engineering lecture for freshmen; selected topics each week. Required of freshmen in the College of Engineering. 0 hours.
101. **Cooperative Engineering Education Seminar.** Discussion seminar for on campus cooperative education students. Topics include industrial work reports, evaluations of experience, tax and financial aid regulations, and experience opportunities. Prerequisite: Enrollment in the Cooperative Engineering Education Program. 0 hours.
102. **Cooperative Engineering Education Practice.** Off-campus practice of engineering in government or industry. Prerequisite: Cooperative student in any engineering curriculum. 0 hours.
110. **Engineering Apprenticeship.** Part-time practice of engineering science in an on-campus research laboratory environment; summary report required. Prerequisite: Completion of freshman year or equivalent. 0 hours. May be repeated.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

- 200. Engineering Lecture.** Required of off-campus transfer students in the College of Engineering. Meets for first three weeks of each semester; selected topics. 0 hours.
- 210. Engineering Internship.** Full-time practice of engineering science in an off-campus industrial or research laboratory environment; summary report required. Prerequisite: Completion of sophomore year or equivalent, or consent of Director of Cooperative Education and Professional Practice. 0 hours. May be repeated.
- 298. Executives in the Technological World.** Offers a series of seminars by executives from industrial and technical organizations; provides students an opportunity to better understand the role of the technological executive as a decision-maker in the contemporary world; and discusses current trends, practices, economic conditions, productivity, government regulation, and foreign trade from the viewpoint of a wide range of industries such as transportation, steel, energy, and electronics. Prerequisite: Junior or senior standing in engineering, or consent of instructor. 1 hour.
- 299. Engineering Study Abroad.** Provides campus credit for foreign study and/or provides a mechanism for engineering students to maintain continuous enrollment on this campus. If objective is study abroad for credit, a detailed proposal must be submitted by the student for approval by a committee of the department in which the student is studying and the college office prior to such study abroad. Final determination of credit and its application toward the student's degree is made after a review of the student's work abroad by the above committee and the college office. Prerequisite: Completion of sophomore year in engineering; approval of student's proposed study program by his department and the college office. 0 to 15 hours (summer session, 0 to 7 ¹/₂ hours).

ENGINEERING HONORS

Executive Secretary of Program: H. G. Wenzel

Program Office: 207 Engineering Hall, 1308 West Green Street, Urbana

- 196. The Engineer and Society.** Prerequisite: Freshman James Scholar. 2 hours.
- 198. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester for freshman James Scholars to enable them to explore at their own level various aspects of technology that are of interest to them. Prerequisite: Honors student in the University. 1 to 4 hours.
- 297. College Honors Seminar.** Special lecture sequences and/or discussion groups arranged each semester in special interdisciplinary subjects of current interest for James Scholars in engineering. Prerequisite: James Scholar in engineering or consent of instructor. 1 to 4 hours.

ENGLISH

(Including Business and Technical Writing and Rhetoric and Composition)

Head of Department: R.P. Wheeler

Department Office: 208 English Building, 608 South Wright Street, Urbana

Business and Technical Writing

Business and Technical Writing Office: 294 English Building

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 251. Business and Administrative Communication.** Study of communication as a tool of administration and management; practice in writing a wide variety of types and forms of communication; and inclusion of oral and visual communication with the written to

- provide an integrated approach. For the student whose career will be in administration and management requiring a broad range of communication skills. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
252. **Technical Communication.** Advanced writing course dealing with the problems, principles, and techniques of presenting technical information; includes reports, proposals, procedures, manuals, and technical articles. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
271. **Persuasive Writing.** Same as Advertising 288. Students will study principles of persuasion as applied to writing and designing written communications for business and the professions. Included are ads, direct-mail campaigns, argumentative essays, proposals, and other types of writing designed to move readers to action. Prerequisite: Sophomore standing and completion of campus rhetoric requirement. 3 hours.
272. **Report Writing.** Personal direction in a report writing project which can be integrated with research in another course; study of report-writing principles and practices. Classes meet for the first month after which the student and the instructor arrange a conference schedule. Small group meetings are arranged for presentation of proposals, progress reports, and summary reports. Prerequisite: Completion of campus rhetoric requirement and sophomore standing. 3 hours.
290. **Individual Study.** Independent research with a chosen tutor leading to the writing of a formal report or preparation of some other type of major presentation of information. Enroll in Business and Technical Writing office, 294 English Building. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours.
302. **Descriptive English Grammar.** Same as English 302. See English 302.
400. **Technical and Professional Writing.** Grammar, syntax, diction, paragraph development, and logic as they relate to technical and professional exposition; practice in defining problems for scientific investigation, organizing information and outlining, preparing headings and abstracts, drafting and revising papers, and presenting information graphically and orally. Prerequisite: Graduate standing. 3 hours. No graduate credit.

English

101. **Introduction to Poetry.** Reading and discussion of representative poems of several periods and types. 3 hours.
102. **Introduction to the Drama.** Reading and discussion of representative plays of several periods and types. 3 hours.
103. **Introduction to Fiction.** Reading and discussion of representative fiction of several periods and types. 3 hours.
104. **Introduction to Film.** Understanding of narrative films through the viewing and discussion of a representative body of film classics drawn from the entire range of world cinema; emphasizes the basic elements of cinematic expression, and concerns major movements, periods, and genres. 3 hours.
106. **Literature and Experience.** Understanding of the relationship between literature and human experience through the study of significant, recurrent themes. 3 hours. May be repeated once as topics vary.
107. **Law in Literature.** The portrayal of law and the legal system in literature with particular emphasis on the impact of that system on society and the relationship between private morality and public law; includes guest speakers from the legal profession. 3 hours.
113. **The Idea of Comedy.** A selective introduction to the theory and practice of comedy; examines a number of influential theories of comedy and a variety of comic forms including poetry, novels, essays, plays, and short stories. 3 hours.
114. **The Bible as Literature.** Same as Religious Studies 101. See Religious Studies 101.
115. **Masterpieces of English Literature.** Study of selected major writings. 3 hours.
116. **Masterpieces of American Literature.** Study of selected major writings. 3 hours.
118. **Introduction to Shakespeare.** Representative readings of Shakespeare's drama and poetry in the context of his age, with emphasis on major plays; selections vary from section to section. Does not fulfill Shakespeare requirement for the English major. 3

hours.

119. **The Literature of Fantasy.** Same as Comparative Literature 119. Surveys masterworks in the romance-tradition from Shakespeare's time to the present; as distinct from science fiction, the materials feature magic and the supernatural rather than technology; and includes stage romance, fairy tale, horror tale, and fantasy-novel. Individual works are set in their historical and literary contexts. 3 hours.
120. **Science Fiction.** A literary and historical study of science fiction from Mary Shelley to Ursula K. LeGuin with particular emphasis on the achievement of science fiction as a literary form in the romance tradition. 3 hours.
180. **Drama in Production.** Study, discussion, and production of a dramatic text. 3 hours. May be repeated once as topic varies.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of honors adviser. 1 to 3 hours. May be repeated once.
198. **Freshman Honors Seminar.** Introduction to the study of literature, with emphasis on individual work in fundamental problems of literary analysis; works studied are usually a combination either of short poems and short stories or of novels and plays. Prerequisite: James Scholar standing or other designation as a superior student. 4 hours. May be repeated once as topics vary.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Medieval Literature and Culture.** Same as Comparative Literature 253. British and continental authors (including Chaucer) read in modern English. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
204. **Renaissance Literature and Culture.** Same as Comparative Literature 255. Readings in English and continental literary masterpieces with attention to the significant cultural influences of the period. 3 hours.
206. **Literature and Culture of the Enlightenment.** Same as Comparative Literature 257. Readings in English and continental literature of the eighteenth century, with attention to significant cultural influences. 3 hours.
209. **English Literature from the Beginning to 1798.** Historical and critical study of selected works of English literature to 1798 in chronological sequence. 3 hours.
210. **English Literature from 1798 to Present.** Historical and critical study of selected works of English literature after 1798 in chronological sequence. 3 hours.
211. **Introduction to Modern African Literature.** Same as African Studies 210 and Comparative Literature 210. See African Studies 210.
215. **Practical Criticism.** Introduction to applied literary criticism. Prerequisite: English 101. 3 hours.
240. **The English Romantic Poets.** Blake, Wordsworth, Scott, Coleridge, Byron, Shelley, and Keats. 3 hours.
241. **The Beginnings of Modern Poetry.** American and British poets including Frost, Robinson, Sandburg, Lindsay, Hardy, Hopkins, Housman, Yeats, Lawrence, the Imagists, and the early Pound and Eliot. 3 hours.
242. **Poetry Since 1940.** 3 hours.
243. **Development of the Modern Drama.** Same as Comparative Literature 265. Ibsen to O'Neill. 3 hours.
244. **Development of the Modern Drama.** Same as Comparative Literature 266. Pirandello to the present. 3 hours.
245. **The Short Story.** Same as Comparative Literature 267. Historical and critical study of the short story (American and European) from the early nineteenth century to World War I; major emphasis on such authors as Hawthorne, James, Crane, Gogol, Chekhov, Maupassant, Flaubert, Joyce, and Mansfield. 3 hours.
246. **The Short Story.** Same as Comparative Literature 268. Historical and critical study of the short story (American and European) from World War I to the present; major emphasis on such authors as Anderson, Hemingway, Faulkner, Porter, Mann, Kafka, Maugham, Lawrence, Salinger, and Camus. 3 hours.
247. **The British Novel.** Critical study of representative British novels from different literary periods. 3 hours.

248. **Modern British and American Fiction in Relation to Continental Fiction.** Same as Comparative Literature 269. An examination of important thematic and structural relationships—influences, parallels, and variations—among selected major works of the nineteenth and twentieth centuries; readings chosen from works of Bronte, Hardy, Lawrence, Woolf, James, Faulkner, Bellow, Oates, Dostoevsky, Tolstoy, Stendhal, Flaubert, Camus, Kafka, Mann, Hesse, Moravia, and Pavese. All works read in English. 3 hours.
249. **The American Novel.** Study of major and representative novels from the beginning to the present. 3 hours.
255. **Survey of American Literature, I.** American literature and its cultural backgrounds to 1870. 3 hours.
256. **Survey of American Literature, II.** American literature and its cultural backgrounds after 1870. 3 hours.
259. **Afro-American Literature, I.** Same as Afro-American Studies 259. Historical and critical study of Afro-American literature in its social and cultural context from the beginning to 1915. 3 hours.
260. **Afro-American Literature, II.** Same as Afro-American Studies 260. Historical and critical study of Afro-American literature in its social and cultural context since 1915. 3 hours.
273. **Intermediate Film Studies: Directors, Genres, Themes.** Critical study of narrative films, with viewing and discussion of a major film each week; in-depth study of selected directors, genres, and themes; emphasis on aspects of film aesthetics, criticism, and history. Prerequisite: English 104 or a college-level course in literature or film. 3 hours.
274. **Literature and Society.** Major literary works presented within the context of social issues of their time. 3 hours.
275. **Literature and Psychology.** Psychological and psychoanalytical theories as they bear on the interpretation of literature. 3 hours.
280. **Women Writers.** Same as Women's Studies 280. Study of British and American women authors. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
281. **Women in the Literary Imagination.** A study of the way various writers, both men and women, have portrayed woman's image, social role, and psychology in English or American literature. 3 hours. May be repeated to a maximum of 6 hours as topic varies.
283. **Jewish Sacred Literature.** Same as Comparative Literature and Religious Studies 283. See Religious Studies 283.
284. **Modern Jewish Literature.** Same as Comparative Literature and Religious Studies 284. Surveys imaginative literature by Jewish authors from the Enlightenment to the present; fiction, poetry, drama, and autobiography written in English or translated from other languages. 3 hours.
285. **Third World Literature in English; the Post-Colonial Period.** Introduction to great works of modern African, Asian, and Caribbean fiction, drama, and poetry within their historical contexts. Emphasis on the emergence of new traditions of literature written in English in the Third World. 3 hours.
290. **Individual Study.** Study of selected topics. Prerequisite: Consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours. Students may register in this course more than once in the same term.
291. **Honors Individual Study.** Study of selected topics. Restricted to English and English education majors with a 4.25 average who are working towards the degree with Distinction in English or in English education. Enrollment in appropriate honors office necessary. Prerequisite: Consent of English honors or English education honors adviser. 1 to 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Independent research with a chosen tutor leading to the writing of a thesis. Restricted to English or English education majors with a 4.25 average who have satisfied all other requirements towards the degree with distinction; registration in the English Honors Office necessary. 3 hours. (Counts for advanced hours in LAS.)
296. **Honors Seminar, I: Themes, Movements, and Forms in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department majors, a 4.25 grade-point average or consent of director of honors program. Registration

- through the English Honors Office necessary. 3 hours. Offered every semester with varying topics; may be repeated as topics vary. (Counts for advanced hours in LAS.)
297. **Honors Seminar, II: Periods in British and American Literature.** Prerequisite: James Scholar status in any department; for English Department majors, a 4.25 grade-point average or consent of director of honors program. Registration through the English Honors Office necessary. 3 hours. Offered every semester with varying topics; may be repeated as topics vary. (Counts for advanced hours in LAS.)
298. **Honors Seminar, III: Major British and American Authors.** Each seminar considers one or two major authors. Prerequisite: James Scholar status in any department; for English Department majors, a 4.25 grade-point average or consent of director of honors program. Registration through the English Honors Office necessary. 3 hours. May be repeated as topics vary. (Counts for advanced hours in LAS.)
301. **Introduction to the Study of the English Language.** Language theories and modes of language study applied to English. 3 hours or 1 unit.
302. **Descriptive English Grammar.** Same as Business and Technical Writing 302. 3 hours or 1 unit.
303. **Historical Introduction to the English Language.** 3 hours or 1 unit.
311. **Chaucer.** A selection read in Middle English. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
315. **Poetry and Prose of the English Renaissance, 1500-1600.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
316. **The Drama of Shakespeare's Contemporaries.** Tudor and Stuart drama. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
318. **Shakespeare, I.** Earlier tragedies, comedies, and history plays. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
319. **Shakespeare, II.** Mature tragedies, dark comedies, and late romances. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
321. **Poetry and Prose from the Metaphysicals to 1660.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
323. **Milton.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
326. **Literature of the Restoration and Early Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
327. **Literature of the Later Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
328. **English Drama of the Restoration and Eighteenth Century.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
329. **Restoration and Eighteenth-Century Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
331. **English Romantic Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
334. **Victorian Poetry and Nonfiction Prose.** Study of such major poets as Tennyson, Browning, Arnold, and Hardy; and of prose writers including Carlyle, Mill, Arnold, Pater, and Huxley. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
335. **Nineteenth-Century British Fiction.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
341. **British Literature in the Twentieth Century to 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
342. **British Literature in the Twentieth Century Since 1930.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
343. **The Plays of Bernard Shaw.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
347. **Literature of the American Renaissance.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
350. **American Literature from the Civil War to the First World War.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.

351. **American Literature from the First World War to the Present.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
355. **Major Authors.** Intensive study of the work of one or two major authors. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
361. **Topics in English and American Literature.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topic varies.
362. **Topics in Modern Fiction.** Topics including theme, genre, and literary movements, predominantly in English or American nineteenth- and twentieth-century fiction, with occasional consideration of continental fiction in English translation; topics may vary from semester to semester. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated once as topic varies.
365. **Comedy.** Same as Comparative Literature 365. History and theory of stage comedy. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
366. **Topics in Modern Drama.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.
367. **The International Folk Tale.** Same as Comparative Literature 359. Origin, nature, and distribution of the folk tale. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
368. **The Ballad and Folksong in the United States.** English-language traditional songs and ballads, transplanted and native. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
370. **Modern African Fiction.** Same as African Studies, Comparative Literature, and French 310. See African Studies 310.
373. **Special Topics in Film Studies.** Extended investigation of major subjects and issues in narrative film; topics vary and typically include studies of author/directors, genres, historical movements, critical approaches, and themes. Prerequisite: One college-level film studies course and one additional college-level course in film studies or literature; or consent of instructor. 3 hours or 1 unit. May be repeated up to 6 hours or 2 units as topics vary.
375. **Topics in the Relation of Other Disciplines to the Study of Literature.** See *Timetable* for current topics. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit. May be repeated once as topics vary.
381. **Theory and Practice of Written Composition.** History and theory of written composition; basic rhetorical principles; and guidance and criticism of student writing. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
383. **Literary Criticism from 1800 to the Present.** Same as Comparative Literature 305. Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
385. **Literature for the High School.** Prerequisite: One year of college literature, or consent of instructor. 3 hours or 1 unit.
387. **Topics in Folklore.** Same as Comparative Literature, German, Slavic and Speech Communication 387. Presents selected topics in folklore studies that deal with a particular theme, ethnic group, region, genre, or interpretive approach; topics vary. Prerequisite: One year of college literature or consent of instructor. 3 hours or 1 unit. May be repeated as topics vary to a maximum of 6 hours or 2 units.
400. **Introduction to Research and Critical Techniques.** Introductory course in methods and techniques in research and literary criticism. 1 unit.
404. **Seminar in the English Language.** Study of English linguistics. 1 unit.
407. **Old English.** Introduction to the language before 1000 A.D. 1 unit.
408. **Beowulf.** Prerequisite: English 407 or consent of instructor. 1 unit.
411. **Chaucer.** An intensive study of important works by Chaucer with emphasis on *The Canterbury Tales* or *Troilus and Criseyde*. 1 unit. May be repeated to a maximum of 2 units as topics vary.
414. **Seminar in Medieval Literature.** Prerequisite: A college course devoted entirely to an aspect of medieval studies, or consent of instructor. 1 unit. May be repeated as topic varies.
419. **Seminar in Shakespeare.** Prerequisite: A college course devoted entirely to an aspect of Shakespeare's work, or consent of instructor. 1 unit. May be repeated as topics vary.

- 420. Seminar in Sixteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 424. Seminar in Seventeenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of Renaissance studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 427. Seminar in Restoration and Eighteenth-Century Literature.** Prerequisite: A college course devoted entirely to an aspect of eighteenth-century studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 433. Seminar in Romantic Literature.** Same as Comparative Literature 452. Prerequisite: A college course devoted entirely to an aspect of Romantic studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 437. Seminar in Victorian Literature.** Prerequisite: A college course devoted entirely to an aspect of Victorian studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 443. Seminar in Modern British Literature.** Prerequisite: One college course devoted entirely to an aspect of modern British studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 447. Seminar in Earlier American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 453. Seminar in Later American Literature.** Prerequisite: One college course devoted entirely to an aspect of American studies, or consent of instructor. 1 unit. May be repeated as topics vary.
- 463. Seminar in Literary Themes and Movements.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topics vary.
- 464. Seminar in Literary Modes and Genres.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topics vary.
- 478. Seminar in the Relation of Other Disciplines to the Study of Literature.** Prerequisite: One year of graduate study of literature, or consent of instructor. 1 unit. May be repeated as topics vary.
- 481. Seminar in Literary Theory and Criticism.** Prerequisite: A college course devoted entirely to criticism, or consent of instructor. 1 unit. May be repeated as topics vary.
- 491. Research in Special Topics.** Independent study under the guidance of a member of the graduate faculty. 1 unit. May be repeated to a maximum of 2 units.
- 492. Master's Area Examination Tutorial.** Reading for the Master's Area Examination under the guidance of the candidate's graduate adviser. 6 or 12 hours. May be taken once for 12 hours or twice for 6 hours each. No graduate credit.
- 493. Professional Seminar in the Teaching of College English.** Prerequisite: Graduate standing in the Department of English or consent of instructor. 0 or 1 unit. May be repeated by Ph.D. candidates as the topics vary but without credit after two units have been earned in this course. Students needing the proseminar for their programs will be given priority enrollment.
- 499. Thesis Research.** Guidance in writing theses for doctoral degrees. Prerequisite: Doctoral candidate standing. 0 to 4 units.

Rhetoric and Composition

- 102. Introduction to Composition.** Instruction in basic formats of expository writing; provides preparatory semester of composition for students with special needs; to be taken prior to Special Options Rhetoric 105. Does not fulfill campus rhetoric requirement. Prerequisite: Concurrent registration in Rhetoric 103; placement by the English Department based on ACT-English scores, reading test when pertinent, and writing samples. 3 hours.
- 103. Writing Laboratory.** Intensive tutoring in basic writing skills to be scheduled at the Writing Laboratory. Open only to students in the EOP Rhetoric Program or to those in the

special option sections. Prerequisite: Concurrent registration in Rhetoric 102, 104 or 105; or written consent from the EOP Rhetoric Program Office. 1 hour. May be repeated to a maximum of 2 hours.

104. **EOP Rhetoric.** An introductory writing course designed for EOP students. Concentrates on exposition; to be taken prior to EOP Rhetoric 105. Does not fulfill campus rhetoric requirement. Prerequisite: Concurrent registration in Rhetoric 103. 3 hours.
105. **Principles of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. This course fulfills the campus rhetoric requirement. 4 hours. Students with credit in Rhetoric 105 may not receive additional credit for Rhetoric 108 or Speech Communication 111 and 112.
108. **Forms of Composition.** Study of the methods of exposition, the problems of argument, the use of evidence, and style; practice in expository writing. Students are admitted on the basis of ACT verbal scores or equivalent. Students will type and revise their work at the computer. This course fulfills the campus rhetoric requirement. 4 hours. Students with credit in Rhetoric 108 may not receive additional credit for Rhetoric 105 or Speech Communication 111 and 112.
133. **Principles of Composition.** Practice in exposition, with emphasis on organization, paragraphing, and sentence structure. For the student whose career will require competence in writing clear, precise prose as an adjunct to another professional activity. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours. Credit is not given for Rhetoric 133 and Rhetoric 143.
143. **Intermediate Expository Writing.** Practice in expository types, with emphasis on style and critical analysis. Recommended for rhetoric majors. Prerequisite: Fulfillment of campus rhetoric requirement, or consent of instructor. 3 hours. Credit is not given for Rhetoric 143 and Rhetoric 133.
144. **Introductory Narrative Writing.** Practice in the writing of narrative prose, with primary emphasis on short fiction. Prerequisite: Fulfillment of campus rhetoric requirement. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 146 or 306. 3 hours.
146. **Introductory Poetry Writing.** Practice in the writing of poetry; experimentation with a number of fixed forms and free verse, but emphasis mainly on the student's freedom to develop a personal style. Prerequisite: Fulfillment of campus rhetoric requirement. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 144, 204, or 304. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Communications Workshop.** Independent writing projects and examination of literature as the cultural basis of the student's specialized fields. 3 hours.
204. **Intermediate Narrative Writing.** Practice in the writing of fiction, with emphasis on the short story. Prerequisite: Rhetoric 144 or equivalent. Student must petition the Director of Creative Writing to take this course concurrently with Rhetoric 306 or 146. 3 hours.
227. **Advanced Expository Writing.** Types of nonfiction prose, including the essay, criticism, biography, and historical writing. Prerequisite: Rhetoric 133 or 143, or equivalent, or consent of instructor. 3 hours.
302. **Advanced Writing Topics.** Practice in various literary genres and in their combinations for mature students who have some writing experience and a background of data and impressions which they wish to develop in writing of near-professional quality. Individual conferences at hours to be arranged. Prerequisite: Rhetoric 133 or 143, or equivalent, or consent of instructor. 3 hours or 1 unit.
304. **Advanced Narrative Writing.** Continued practice in the writing of fiction, with emphasis on the longer story. Prerequisite: Rhetoric 204 or equivalent. Student must petition Director of Creative Writing to take this course concurrently with Rhetoric 306 or 146. 3 hours or 1 unit.
306. **Advanced Poetry Writing.** Practice of the writing of poetry aided by intensive study of examples. Prerequisite: Rhetoric 146 or equivalent. Student must petition Director of Creative Writing to take this course concurrently with Rhetoric 304. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units.

- 355. Creative Writing Tutorial.** Personal direction in a writing project: fiction (novel or short stories), poetry, criticism, narrative, etc. Frequency of conference to be determined by the type of project. Prerequisite: Rhetoric 227, 304, or 306 and consent of the Director of Creative Writing. 3 hours or 1 unit. May be repeated to a maximum of 6 hours or 2 units. Undergraduate Rhetoric majors with a 4.25 average who are working towards the degree with Distinction or High Distinction in Rhetoric may, with the consent of the Director of Creative Writing and the English honors adviser, take this course for honors credit.

ENGLISH AS AN INTERNATIONAL LANGUAGE

(Including English as a Second Language)

Director of Division: Eyamba Bokamba

Division Office: 3070 Foreign Languages Building, 707 South Mathews Avenue, Urbana

English as an International Language

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 214. ESL in the Elementary School.** On-site practical experience in an elementary school, involving at least 100 hours of classroom observations, consultations, teaching, tutoring, and assisting, to acquaint students with the many facets of ESL/bilingual education in a public school setting. Hours to be arranged with the cooperating teacher. Satisfies one requirement for those who wish to obtain an Illinois ESL endorsement on an Illinois teaching certificate. 2 hours.
- 215. ESL in the Secondary School.** On-site practical experience in a secondary school, involving at least 100 hours of classroom observations, consultations, teaching, tutoring, and assisting, to acquaint students with the many facets of ESL/bilingual education in a public school setting. Hours to be arranged with the cooperating teacher. Satisfies one requirement for those who wish to obtain an Illinois ESL endorsement on an Illinois teaching certificate. 2 hours.
- 301. Topics in Applied TESL/TEFL Theory.** Implications of TESL/TEFL theory and research for classroom practice: preparation of teaching and testing materials; evaluation of materials on the basis of ESL/EFL teaching experiences; adaptation to needs of different learner ages, language, and achievement backgrounds; and new teaching formats. Prerequisite: Consent of instructor. 2 to 4 hours, or $1\frac{1}{2}$ to 1 unit. May be repeated as topics vary to a maximum of 8 hours or 2 units.
- 302. Descriptive English Grammar for ESL Teachers.** Adapts modern English grammar to the needs of the ESL teacher, emphasizing the development of analytical skills that can be applied to syntactic and lexical analysis. 3 hours or $\frac{3}{4}$ unit.
- 305. Introduction to Applied Linguistics.** Same as Linguistics 305. See Linguistics 305.
- 311. ESL Methods and Materials.** A survey and demonstration of all major ESL teaching methods and techniques; an examination of criteria for evaluating and selecting ESL teaching/learning materials for a variety of skills at the beginning level; and an introduction to ESL curriculum and syllabus design. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 312. ESL for Beginning-Level Adult Learners.** Practical experience teaching ESL (grammar, listening, speaking, and pronunciation) to beginning-level adult learners. Includes opportunities to observe master teachers demonstrate teaching methods and techniques, to prepare and adapt materials, to teach the materials in classroom and tutorial teaching situations, and to discuss the relationship between teaching theory and practice. Prerequisite: Credit or concurrent registration in English as an International Language 311. 2 hours or $\frac{1}{2}$ unit.
- 335. Neurolinguistics and Second Language Learning.** Same as Linguistics 335. Introduces theoretical, methodological and applied research on the relationship between

- neurolinguistics and second language acquisition with special emphasis on the "bilingual brain." Prerequisite: Linguistics 200, 225, 300, or 400; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 350. Introduction to Sociolinguistics.** Same as Linguistics 350. See Linguistics 350.
- 356. Impact of Cultural Differences in TESL.** Examines people as cultural beings; studies the effect of cultural differences on communication, both in the ESL classroom and in the community; and presents various methods of incorporating relevant elements of American culture into the ESL classroom. 3 hours or $\frac{3}{4}$ unit.
- 360. Principles of Language Testing.** Same as French, German, Italian, Portuguese, and Spanish 360. Studies theoretical and practical aspects of language testing; examines purposes and types of language tests in relation to theories of language use and language teaching goals; discusses testing practices and procedures related to language teaching and language research; and includes the planning, writing, and administration of tests, basic descriptive statistics, and test analysis. A project is required. Prerequisite: English as an International Language 389. 3 hours or $\frac{3}{4}$ unit.
- 367. Communicative Approaches to Second and Foreign Language Teaching.** Introduces students to current issues in the theory and practice of communicative language teaching. Discusses the notion that communication is a social event from three perspectives: theoretical linguistics; applied linguistics; and classroom teaching. Specific questions addressed range from a consideration of the nature of applied linguistics to issues related to student autonomy. 3 hours or $\frac{3}{4}$ unit.
- 371. Teaching Composition in the ESL Classroom.** Applies select principles of linguistics, rhetoric, crosscultural communication, and second language acquisition to developmental instruction in ESL writing; required projects: article reviews, instructional materials analysis and preparation, and ESL class observation. Prerequisite: English as an International Language 311 and 312. 3 hours or $\frac{3}{4}$ unit.
- 380. Classroom Language Acquisition.** Same as French, German, Italian, Portuguese, and Spanish 380. See Spanish 380.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, French, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 386. Reading in a Second Language.** Same as Linguistics 385. Treats current research and reading theory with a view toward developing maximally efficient materials designed to teach reading in a second language; analyzes and evaluates teaching practices, however, places primary emphasis on materials development. Project is required. Prerequisite: English as an International Language 302 and an introductory course in linguistics. 3 hours or $\frac{3}{4}$ unit.
- 388. English Phonology and Morphology for ESL Teachers.** Same as Linguistics 388. Application of linguistics to language learning with special emphasis on learning the sound system of English. Prerequisite: Two years of a foreign language or equivalent; consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 389. Theoretical Foundations of Second Language Acquisition.** Same as Linguistics 389. Exploration of the relationship between second language acquisition (SLA) theory and research, and classroom language learning and teaching. Prerequisite: Linguistics 200 or 400, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 402. Introduction to General Linguistics.** Same as Anthropology and Linguistics 400. See Linguistics 400.
- 410. Generative Phonology in English Teaching.** Generative phonological analyses of English and the teaching of English pronunciation: reevaluation of teaching goals, content, presentation, and methodology; required projects involve research into English phonology leading to the development and evaluation of lesson materials for ESL classes. Prerequisite: English as an International Language 311, 312, and 388. 1 unit.
- 412. Pedagogical Grammar.** Same as Linguistics 413. Surveys English grammar and texts for teaching grammar in ESL, with special emphasis on the development of skills in explanation of grammatical phenomena in ESL classes. Prerequisite: English as an International Language 302 or equivalent. $\frac{3}{4}$ unit.
- 419. Contrastive Linguistics.** Same as Linguistics 419. See Linguistics 419.

- 435. Seminar in Neurolinguistics and Second Language Learning.** Research-oriented seminar in neurolinguistics of second-language learning; students conduct supervised research projects on topics including bilingual speech perception, cerebral laterality, age-related effects upon L2 learning, and aphasia in bilinguals and multilinguals; consult *Timetable* for specific topics. Prerequisite: English as an International Language 335. 1 unit.
- 460. Research Methods in Language Learning.** Seminar focusing on the formulation of language learning and teaching issues as research questions. Specific topics include: types of research problems, research designs, methods, and strategies; and the analysis, interpretation, and reporting of research findings. Discusses illustrative research and evaluation studies. Students participate in seminar presentations and develop a research proposal. Prerequisite: English as an International Language 360 or consent of instructor, and English as an International Language 389. ³/₄ unit.
- 463. College Teaching of Foreign Languages.** Same as French, German, Italian, Portuguese, Russian and Spanish 463. See French 463.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as French, German, Italian, Portuguese, Russian, and Spanish 481. See French 481.
- 487. Seminar in the Teaching of English as a Second Language.** Discussion of and research into various topics of current interest to persons involved in teaching English as a second language; emphasis on new approaches to problems facing the field and the development of understanding methods; study of materials leading to possible solutions. Prerequisite: English as an International Language 388 or 302, or consent of instructor. ¹/₂ to 1 unit. May be repeated as topics vary.
- 491. Research in Special Topics.** Independent study under guidance of a member of the graduate faculty. Prerequisite: Consent of instructor. ¹/₄ to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** Individual direction of research and thesis writing. Prerequisite: Consent of thesis supervisor. 0 to 2 units. May be repeated to a maximum of 2 units.

English as a Second Language

- 109. English as a Second Language.** Intensive course in basic English structure for international students who are inadequately prepared for either English as a Second Language 111 or 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois ESL Placement Test. 0 hours.
- 110. English as a Second Language.** Study of the sounds and intonation patterns of American English and the relation of sound to spelling; designed to improve the international student's ability to speak and understand English at normal conversational speed. May also be taken with English as a Second Language 111 and 114. Prerequisite: Reading knowledge of English and ability to understand simple instructions; recommendation from Illinois ESL Placement Test. 0 hours.
- 111. English as a Second Language.** Continuation of English as a Second Language 109. Rapid and intensive review of basic English structure and a study of more complicated sentence patterns with practice in simple oral and written composition. Designed for international students inadequately prepared for English as a Second Language 114. Prerequisite: English as a Second Language 109, recommendation from Illinois ESL Placement Test. 0 hours.
- 113. English Structure and Paragraph Development.** Examines basic English structure and paragraph development for undergraduate international students. Recommendation from Illinois ESL Placement Test determines placement in course and in section for specified credit. Prerequisite: Recommendation from Illinois ESL Placement Test. 3 or 6 hours. Students should consult their college concerning use of credit from this course toward graduation.
- 114. English as a Second Language.** Composition for undergraduate international students. The University rhetoric requirement is fulfilled by this course in conjunction with English

as a Second Language 115. Prerequisite: English as a Second Language 113 or recommendation from Illinois ESL Placement Test. 3 hours.

115. **Research Paper Writing Skills for ESL Students.** Composition for undergraduate international students. The University rhetoric requirement is fulfilled by this course in conjunction with English as a Second Language 114. Prerequisite: English as a Second Language 114 or equivalent, recommendation from Illinois ESL Placement Test. 3 hours.
400. **Verbal Communication in English as a Second Language for Graduate International Students, I.** Language laboratory course concentrating on the typical writing problems that an international graduate or research student encounters in an American university. Prerequisite: Graduate standing and English as a Second Language 111, or consent of instructor. 0 to 4 hours. No graduate credit.
401. **Verbal Communication in English as a Second Language for Graduate International Students, II.** Language laboratory course dealing with individual, immediate, and specialized speaking and writing problems, with particular attention to orienting international graduate or research students to the techniques of the American university in thesis and other specialized writing, and in the oral presentation of such material. Prerequisite: Graduate standing and English as a Second Language 400. 0 to 4 hours. No graduate credit.
404. **English Pronunciation for Teaching Assistants.** Sounds, rhythms, and melody of spoken English for current and potential international teaching assistants who are required to teach in English. Includes word and phrase level study; special emphasis on the pronunciation of English vocabulary in students' own academic disciplines. Prerequisite: Placement based upon SPEAK or Illinois ESL Placement Test score. 0 units.
406. **Oral Communication for International Teaching Assistants.** Focuses on use of English at the discourse level, with videotaping and critique of student presentation and development of teaching strategies related to university classroom and laboratory contexts. Prerequisite: Consent of instructor. 0 units.

ENTOMOLOGY

Head of Department: S. Friedman

Department Office: 320 Morrill Hall, 505 South Goodwin Avenue, Urbana

105. **Insects and People.** Same as Biology 105. Fundamentals of insect biology as reflected in human culture; insect physiology, ecology, and behavior discussed in the context of art, literature, movies, medicine, sports, law, and history. Optional two-hour laboratory for 1 hour additional credit. 3 or 4 hours.
120. **Introduction to Applied Entomology.** Same as Forestry 120. Lectures, laboratory, and field practice in the recognition and management of important insect pests of agricultural, forest, and urban ecosystems: classification, structure, and physiology; life histories and behavior involved with injury; methods of control. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Special Problems.** For students ready to undertake a special investigation to be completed as an undergraduate study or as the beginning of a thesis problem for an advanced degree. It also may be used to prepare a thesis for honors at graduation. Prerequisite: Consent of instructor. 2 to 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
301. **Introduction to Entomology.** Integrated studies of the principle morphological, physiological, ecological and behavioral relationships among insects. Tutorials, field experience, and/or insect collections will be required for 4 or 5 hours, or 1 unit credit. Prerequisite: Biology 122 and Chemistry 131. 3 to 5 hours, or $\frac{3}{4}$ to 1 unit.

- 302. Classification and Evolutionary History of Insects.** Analytical survey of the classification and evolution of the orders and principal families of insects, with practical experience in the identification of insects at these taxonomic levels; field trips required. Prerequisite: Entomology 301 or consent of instructor. 4 hours or 1 unit.
- 304. Genomic Analysis of Insects.** A comprehensive and integrated presentation of insect genomic analysis from the molecular level to that of the population; concepts are applied to certain aspects of insect population regulation. Prerequisite: Biology 122 or 210, and Biology 371, and Biochemistry 350, or equivalents; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 310. Insect Physiology.** Study of the principal physiological and biochemical functions of insects. Prerequisite: Entomology 301 or equivalent, organic chemistry, and consent of instructor. 4 hours or 1 unit.
- 315. Insect Ecology.** Discussion of the practical and theoretical aspects of ecology in relation to insects as individuals, populations, and communities; emphasis on the role of insects in the environment. Prerequisite: Ecology, Ethology, and Evolution 212 or consent of instructor. 3 or 5 hours, or $\frac{3}{4}$ or 1 unit. (Lecture only, 3 hours or $\frac{3}{4}$ unit; with laboratory, 5 hours or 1 unit.)
- 319. Fundamentals of Insect Pest Management.** Study of the principles underlying the control of important insect pests of agriculture and of human and animal health; emphasis on integrated pest management involving a systems approach which combines biological, cultural, and chemical suppressive factors into ecologically sound and socially and economically acceptable technology. Prerequisite: Entomology 120, or 301 and 302, or consent of department. 4 hours or 1 unit.
- 320. Insect Pathology.** Examines the general principles of pathology as they apply to insects; includes noninfectious and infectious diseases caused by viruses, bacteria, fungi, protozoa, and nematodes. Studies the epizootiology of naturally occurring insect disease and the use of insect pathogens as microbial control agents. Lecture and laboratory. Prerequisite: Entomology 319 and Microbiology 200 or equivalent. 4 hours or 1 unit.
- 321. Biological Control of Insect Pests.** Same as Agronomy 321. Examines the use of biological methods for the control of insect pests; emphasizes the use of natural enemies in control programs; and discusses life history characteristics of parasitoids and predators, ecological principles of population regulation, techniques and protocols in implementation of control programs and related topics. Prerequisite: Entomology 315 or 319, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 413. Medical and Veterinary Entomology.** Training in recognition, classification, methods of injury, habits, and control or destruction of insects, mites, and ticks which are predators, parasites, or disseminators of disease among humans and domestic animals. Prerequisite: Entomology 302; or consent of instructor. 1 unit.
- 426. Seminar in Entomology.** Discussions, reviews, and appraisals of special topics in the field of entomology. Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 490. Individual Topics.** Individual topics in research and/or reading conducted under the supervision of faculty members in the Department of Entomology; particularly designed for students enrolled in the entomology program who would like to become more familiar with specialized fields of study prior to committing themselves to a specific area for their advanced degrees. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units. May be repeated.
- 499. Thesis Research.** Work may be taken in the following subjects: insect genetics; insect behavior; applied entomology; systematic entomology; biology and ecology of insects; and insect physiology. 0 to 4 units.

ENVIRONMENTAL STUDIES

Director of Institute: R. A. Minear

Institute Office: 1101 West Peabody Drive, Urbana

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
236. **Tomorrow's Environment.** Same as Health and Safety Studies 266. Introduction to interdisciplinary methods of analysis of environmental problems in a finite world; examination of the concept of the limits to growth; development of a working understanding of natural systems and environmental economics; and examination of various management strategies (technical, economic, and social) that can be used to improve environmental quality. Prerequisite: One course in the life sciences and one course in the social sciences, or consent of instructor. 3 hours.
241. **Introduction to Radiation Protection.** Same as Nuclear Engineering 241. See Nuclear Engineering 241.
283. **Introductory Ecology for Educators.** Same as Forestry 283. See Forestry 283.
299. **Individual Studies of Environmental Topics.** Individual studies of environmental problems and their solutions. Studies are accomplished under the immediate supervision of faculty of the Institute for Environmental Studies. Prerequisite: Consent of instructor. 0 to 4 hours.
317. **Introduction to Natural Resources Economics.** Same as Agricultural Economics and Forestry 317. See Agricultural Economics 317.
319. **Environment and Plant Ecosystems.** Same as Agronomy and Forestry 319. See Agronomy 319.
331. **Toxic Substances in the Environment.** Explores toxicological, environmental, public health, occupational and ecological aspects of the use and release of toxic substances in the environment; features case histories of environmental contamination that illustrate ecological, health, and social aspects of pollution; emphasizes biochemical mechanisms and ecosystem consequences. Prerequisite: One year of college chemistry or one year of college biology or consent of instructor. 3 hours or $3/4$ unit.
332. **Genetic Toxicology.** Same as Agronomy 332 and Microbiology 332. Introduces the field of genetic toxicology; includes the study of physical and chemical induced mutagenesis, survey of genetic indicator organisms and genetic assays, distribution of environmental mutagens and their biochemistry, analysis of case histories of environmental mutagens and risk assessment. Prerequisite: Biology 210 or Agronomy 110; Chemistry 102; Biochemistry 350, or 352 and 353, or consent of instructor. 3 hours or $3/4$ unit.
341. **Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Geography 341, and Urban and Regional Planning 375. See Civil Engineering 341.
344. **Social Impact Assessment.** Same as Forestry, Landscape Architecture, Leisure Studies, Rural Sociology and Urban and Regional Planning 344. Provides the student with a theoretical understanding and the methodology to conduct social impact assessment and social soundness analysis within the context of planned change as a component of environmental impact assessment and development projects within both First and Third World countries. Prerequisite: Rural Sociology 110 or Sociology 101 or equivalent introductory social science course. For Urban and Regional Planning students only: Urban and Regional Planning 101, 240, and 247. 3 hours, or $3/4$ or 1 unit.
347. **Environmental Sociology.** Same as Rural Sociology 347 and Sociology 347. Examination of historical and modern consequences of environmental alteration and pollution and resource limitations on human populations in the context of various social change theories. Explores the environmental movement, population explosion, the "limits to growth debate," and the impacts of environmental change on food production, land, and water quality. Prerequisite: Rural Sociology 110 or Sociology 101 or equivalent introductory social science course. 3 hours or $3/4$ unit.
348. **Atmospheric Chemistry.** Same as Civil Engineering 348. See Civil Engineering 348.
349. **Basic Toxicology.** Same as Veterinary Biosciences 349. Emphasizes the physiology and biochemistry of intoxication; discusses the types of cellular response to toxic compounds

and the role of species variation in the economic use of toxins as pesticides and therapeutic agents. Prerequisite: Biochemistry 350 or 352, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

351. **Organic Compounds in the Aquatic Environment.** Surveys the natural and anthropogenic constituents of water and their physical, chemical, and biological transformations; emphasizes adsorption, evaporation, photochemical reactions, hydrolysis, and microbial metabolism; discusses oxidative processes in detail. Prerequisite: Chemistry 131 or 136, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
369. **Environmental Health.** Same as Health and Safety Studies 369. See Health and Safety Studies 369.
372. **Environmental Psychology.** Same as Psychology 372. Survey of theory and research in environmental psychology; topics include environmental perception and cognition, environmental stress, environmental quality assessment, ecological psychology, and historical and theoretical perspectives on the interaction between people and their environments. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours, or $\frac{3}{4}$ to 1 unit.
374. **Principles of Epidemiology.** Same as Health and Safety Studies, Medical Sciences, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
397. **Selected Environmental Problems.** Advanced study of problems related to the environment. Each unit of instruction focuses on a coherent problem area centered primarily within the subject matter of one or more interrelated disciplines comprising the Institute and taught by one or more faculty members from these disciplines. Prerequisite: Senior or graduate standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
414. **Neurotoxicology.** Same as Psychology 414 and Veterinary Biosciences 414. Examines toxic responses of the mammalian nervous system to xenobiotics (therapeutic agents, drugs of abuse, toxins, environmental and industrial chemicals) from the molecular and cellular levels to the behavioral level. Also covers neuroteratology, sensitive periods for neurotoxicity and the potential role of environmental factors/xenobiotics in the etiology of nervous system disorders. Prerequisite: Credit or concurrent registration in Biochemistry 350 or 352, and Veterinary Biosciences 310 or equivalent. $\frac{3}{4}$ unit.
427. **Statistical Techniques in Epidemiological Research.** Same as Health and Safety Studies 427, Medical Sciences 463, and Veterinary Pathobiology 426. See Health and Safety Studies 427.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Forestry 440, Landscape Architecture 440, Leisure Studies 440, Rural Sociology 440, and Urban and Regional Planning 440. Current topics in public involvement in resource management and environmental planning. Topics include public involvement methods, theory, program evaluation, and needs assessment. Case studies of public involvement programs are used to illustrate concepts and methods. Prerequisites: Graduate standing and three hours of Social Science, or Environmental Studies 236, or consent of instructor. $\frac{3}{4}$ or 1 unit.
449. **Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Mechanical Engineering 412. See Civil Engineering 449.
463. **Natural Resource Economics.** Same as Agricultural Economics, Economics, and Forestry 463. See Agricultural Economics 463.
464. **Environmental Economics: Theory and Applications.** Same as Agricultural Economics and Economics 464. See Economics 464.
468. **Molecular Toxicology.** Same as Veterinary Biosciences 468. Examines the biochemical processes involved in the interaction of toxic compounds and their metabolites with the body; enzyme alteration, membrane integrity, receptor interaction, and the biochemical basis for the primary site of toxicity. Prerequisite: Environmental Studies 349 or consent of instructor. $\frac{3}{4}$ unit.
495. **Environmental Studies Seminar.** Interdisciplinary seminar on topics of current interest. Students, faculty, and visiting lecturers present seminars based upon their study, research, and/or professional activities in the selected environmental topic area. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated as topic varies.
496. **Interdisciplinary Toxicology Seminar.** Same as Veterinary Biosciences 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.

- 497. Studies of Environmental Topics.** Individual or group research and study of environmental topics. Subjects for individual study, selected by the student, must be approved by the student's adviser and by the Director of the Institute. (Note: This is not a thesis research course.) Group study focuses on environmental problems and their solutions. Prerequisite: Consent of instructor. 0 to 4 units. May be repeated.

FAMILY AND CONSUMER ECONOMICS

(See Consumer Sciences)

FINANCE

Chairperson of Department: Charles M. Linke

Department Office: 340 Commerce Building (West), 1206 South Sixth Street, Champaign

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 235. Investment Analysis.** The investment environment; analysis of the aggregate market, industry, and the individual firm analysis; valuation methods, with a concentration on applications to common stocks and bonds. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 237. Portfolio Analysis.** Examines alternative investment instruments; conceptual foundations of portfolio theory; methods of selecting, evaluating, and revising portfolios of assets. Prerequisite: Finance 235. 3 hours. (Counts for advanced hours in LAS.)
- 238. Speculative Markets.** Examines speculative securities: options and futures contracts for nonagricultural commodities and financial assets; introduction of the markets; pricing the speculative securities; examination of institutional aspects; trading strategies; hedging strategies, portfolio insurance. Prerequisite: Finance 235. 3 hours. (Counts for advanced hours in LAS.)
- 252. Structure, Regulation, and Management of Financial Institutions.** Studies the functions, policies, organization, historical development, management, and regulation of financial institutions. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 254. Introduction to Business Financial Management.** Development and study of a decision framework for financial management; an introduction to the analysis of past and future needs; an analysis of the management of short-term assets; an introduction to a decision framework for capital investment management with an analysis of the cost and sources of long-term capital; and integration of the concepts of financial management into a total systems approach to business decision making. Prerequisite: Accountancy 200 or 202; credit or concurrent registration in Economics 172. 3 hours.
- 258. Money, Credit, and Financial Markets.** Surveys the structure and activity of the financial sector of the economy; impact of money on output, employment, and prices; financial asset types and their uses; interest rates; roles played by financial intermediaries; influence of macroeconomic policies on the financial sector. Prerequisite: Economics 301. 3 hours. (Counts for advanced hours in LAS.)
- 260. Economics of Insurance.** Survey course in insurance which serves as a common introductory course to the fire, marine, casualty, surety, and life branches of the insurance business. Prerequisite: Economics 101 or equivalent. 3 hours.
- 262. Life Insurance and Related Financial Services.** Introductory study of the life insurance industry and related financial services, including banks, investment companies, and government financial security programs, personal income, gift, and estate taxation, inflation, risk-adjusted returns, legal rights, and savings-investment alternatives; develops techniques for contingent present value calculations, life insurance cost comparisons,

- and personal financial analysis; uses computer systems, including PLATO, as tools for financial analysis. Prerequisite: Economics 101 or equivalent. 3 hours.
- 264. Fundamentals of Real Estate.** Surveys real estate finance, appraisal, investment brokerage, and management; gives special attention to the analysis of aggregate real estate and mortgage markets to the individual transactions of which the markets are composed and to the legal and institutional factors which have an impact on these markets. Prerequisite: Economics 101 or equivalent. 3 hours.
- 280. Advanced Financial Management.** Integration of the capital investment, long-run financing working-capital decision processes; use of simulation, cases, and other techniques to study each decision process. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 281. Short-Run Financial Management.** Introduces short-run financial planning and integrates it into the capital investment model; uses cases and simulation to study fund-flow analysis and the management of liquidity, receivables, inventory, payables, and operating leverage. Prerequisite: Finance 254. 3 hours. (Counts for advanced hours in LAS.)
- 294. Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas who meet one of the following requirements: (1) have a cumulative grade-point average of 4.0 or better; (2) have attained Honors Day recognition in the junior year; or (3) have consent of instructor. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 295. Senior Research.** Research and reading course for students concentrating in finance, insurance, urban land economics, or related areas. May be taken by students in the college honors program in partial fulfillment of the honors requirements. Prerequisite: Senior standing; and cumulative grade-point average of 4.0 or better, Honors Day recognition in the junior year, or consent of instructor. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 354. Multinational Business Finance.** Development and study of a framework for the financial decisions of multinational business; includes the management of working capital, investment and financing decisions of the firm in an international environment, foreign exchange markets, exchange risk, and international diversification. Prerequisite: Finance 254. 3 hours, or $3/4$ or 1 unit.
- 357. Financing Small Business.** Size and nature of small business; significance and limitations of small business; financial structure and problems; financial assistance to small business; and future prospects of small business. Prerequisite: Finance 254. 3 hours, or $3/4$ or 1 unit.
- 360. Employee Benefit Plans.** Same as Labor and Industrial Relations 360. Analysis of the economic and financial issues involved in designing and administering employee benefit plans; major emphasis on group life, disability income, and medical care plans, and on qualified pensions and profit-sharing plans for regular employees; and some attention to special supplementary plans for the executive employees. Prerequisite: Finance 260, Economics 240, or Business Administration 351, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 363. Life Insurance in Estate Planning.** Studies wealth accumulation, conservation, and liquidation; analyzes personal and business financial planning techniques, methods of developing and marketing financial products, and case studies of planning applications. Gives special emphasis to federal and state income, gift and estate taxes; concentrates on the role the life insurance industry plays in financial planning. Prerequisite: Credit or concurrent registration in Finance 262, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 365. Urban Real Estate Valuation.** Examines the terminology, theory, and techniques of real estate appraisal; a modern view of the three approaches to value: market comparison, income, and cost. The first half of the course emphasizes residential property, while the second half emphasizes income property. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 366. Real Estate Investment.** An approach to the evaluation of real estate investment opportunities; begins with the identification of the investor's goals and ends with an investment

- decision; also considers legal, physical, locational, and financial constraints, aggregate real estate and financial markets, tax considerations, and investment criteria. Prerequisite: Finance 264 or 464, and Finance 254; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
367. **Urban Economics.** Same as Economics 361. See Economics 361.
368. **Real Estate Financial Markets.** Discusses theory and institutions of the real estate credit market and the impact of the credit market on the real estate markets; emphasizes creative financing techniques. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
369. **Legal Environment of Real Estate.** Overviews the legal environment in which the real estate business functions; stresses terminology, sources, principles, and issues of real estate law. Prerequisite: Finance 264 or 464; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
370. **Risks and Risk Management.** Analysis of the financial problems in the risks of property damage or bodily injury (in business situations), and evaluation of the alternative methods for dealing with such problems. Prerequisite: One of the following: Accountancy 200 or 202, or Finance 254; Economics 101 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
371. **Seminar in Property and Liability Insurance.** Seminar devoted to discussions of current financial, legal, and social problems involving property-liability insurance; analysis of legal problems involving insurance coverages, financial aspects, and governmental regulation of the property-liability insurance enterprise, and economic aspects of the insurance industry. 3 hours, or $\frac{3}{4}$ or 1 unit.
400. **Theory of Financial Decision Making.** Examines theoretical frameworks for financial decision making under certainty and uncertainty, as well as perfect and imperfect capital markets; discusses state preference, mean-variance, and continuous time models; emphasizes the structure of individual utility functions. Prerequisite: Economics 402; Statistics 310; and admission to doctoral program or consent of instructor. 1 unit.
420. **Macrofinance: Policies, Institutions, and Markets.** Overview of the workings of the financial sector of the macro economy; includes the roles of financial institutions, financial markets, macroeconomic policies, interest rates, and the flows of funds. Prerequisite: Economics 301 or 401. 1 unit.
425. **Management of Financial Institutions.** Studies financial intermediation emphasizing analysis of problems faced by commercial bank managers. The three main areas covered are: the role of financial intermediation and its relation to the macro-economy, information technology, and government regulation; examination of the problems of pricing and evaluating the risk of bank financial services such as loans, loan commitments, and swaps; and consideration of bank portfolio risk management. Prerequisite: Finance 254 or 451; or equivalent. 1 unit.
427. **Seminar in Macrofinance and Financial Institutions.** Reports and explores research in areas of commercial bank models and behavior, bank structure and regulation, interest rate theories, financial markets, and the impact of macroeconomic policies and procedures on financial markets and institutions; discusses current research and research procedures. Prerequisite: Finance 400 and Economics 403. 1 unit.
444. **International Financial Management.** Studies international financial markets to include Euromarkets and foreign exchange markets; studies the financing and investment decisions of multinational organizations to include working capital, capital budgeting cost of capital, and capital structure decisions in an international environment. Prerequisite: Finance 254 or 451; or equivalent. 1 unit.
451. **Financial Management.** An introduction to financial management and decision making. Topics include risk-return relationships for financial securities; financial statement analysis and forecasting; working capital management; capital budgeting and the resource allocation process; long-term and short-term sources of funds; capital structure and the cost of capital; dividend policy. Prerequisite: Enrollment in the MBA program. 1 unit.
452. **Long-Term Financial Decision Making.** An analytical approach to the theoretical and applied aspects of decision making in business finance; assumes a long-term planning horizon; and emphasizes valuation and cost of capital theories, capital investment decisions, risk analysis, and capital structure and dividend policies. Prerequisite: Finance

- 254 or 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
453. **Working Capital Management.** A study of working capital management processes and of theoretical linkages between working capital and long-run financial management; uses a variety of models to study the theory of working capital management and to analyze relationships among variables in the short-run financial decision-making process; and combines theory and applications to provide insight into the total financial decision-making process. Prerequisite: Finance 254 or 451, or equivalent; Economics 470, Business Administration 472, or concurrent registration in either course. 1 unit.
454. **Seminar in Corporate Financial Theory.** Theories, paradigms, and models of nonfinancial corporations; investigates the theoretical foundations and empirical evidence regarding corporate resource allocation, capital structure decisions, and dividend policies; covers in detail contingent claim analysis, signaling theory, and agency theory. Prerequisite: Finance 400 and Economics 471. 1 unit.
455. **Seminar in Investments.** Investigates portfolio theory, CAPM, OPM, and arbitrage pricing theory theoretically and empirically; uses both mathematical statistics and modern econometric models to empirically analyze investment decisions and portfolio management. Prerequisite: Finance 400 and Economics 471. 1 unit.
456. **Investment.** Introduction to investment analysis, including the functioning of capital markets, changes in markets, and analysis and tests of the efficient markets hypothesis; introduction to portfolio theory; and consideration of valuation theory applied to the aggregate market, alternative industries, and individual firms. Prerequisite: Finance 451 or equivalent. 1 unit.
457. **Security Analysis.** A theoretical and empirical analysis of selected financial markets; considers markets for stock options, bonds, warrants, and convertibles, as well as foreign exchange and financial futures; covers the mechanics of participation in these markets in addition to the analytical material. Prerequisite: Finance 456. 1 unit.
458. **Portfolio Management.** Conceptual foundations and implementation of strategies for the selection, evaluation, and revision of portfolios of financial assets; examination of research related to portfolio and capital market theory. Prerequisite: Finance 456. 1 unit.
464. **Real Estate and Urban Land Economics.** Discusses the theory and practice of real estate and urban land economics; emphasizes real estate market analysis, finance, appraisal, and investment. Prerequisite: Economics 300, or consent of instructor. 1 unit.
469. **Problems in Urban Land Economics.** Examines theoretical and empirical research into selected problems in urban land economics. Prerequisite: Finance 264 and Economics 300; or Finance 464; or consent of instructor. 1 unit.
470. **Risk Management and Control.** Analysis of the risk management problem in the business enterprise with emphasis on methodology for risk analyses; techniques for risk and loss control; models for risk management decision making; and procedures for administering risk management policy relating to nonspeculative (insurable) risk. Prerequisite: Finance 452 and Business Administration 460, or equivalent, or consent of instructor. 1 unit.
471. **Seminar in Insurance.** Reviews recent contributions to the insurance literature concentrating upon current issues and research methodology; requires students to review selected recent articles on a variety of topics; gives attention to application of finance and economic theory to insurance issues and to empirical techniques for testing hypotheses. Examples of issues include the application of asset pricing models to insurance pricing, portfolio optimization for insurance companies, capital markets and insurance cycles, moral hazard and adverse selection. Prerequisite: Finance 400. 1 unit.
490. **Individual Study and Research.** Directed reading and research. $\frac{1}{2}$ to 1 unit.
499. **Thesis Research.** Required for those writing master's and doctoral theses in finance. 0 to 4 units.

FINE AND APPLIED ARTS

Program Administrator: K. A. Martin

Program Office: 116 Architecture Building, 608 East Lorado Taft Drive, Urbana

185. **Kabuki.** Same as East Asian Languages and Cultures 185. Combines academic studies in the Japanese and Asian theatre arts and the actual production of a Japanese classic kabuki play or some other Asian theatre art form. Includes all the essential elements of the theatrical arts. 2 hours. May be repeated once with consent of instructor.
190. **Exploring the Arts.** An introduction to the fine arts through lecture-discussions with a teacher-practitioner in each of the arts and through written critiques of exhibits, concerts and plays. Provides creative experiences by a final individual or small group project. 2 or 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 0 to 5 hours. May be repeated.
206. **Practicum in Teaching the Arts to Preschool Children.** Laboratory for teaching art and music to preschool children augmented with a seminar, including classroom preparation and evaluation. Prerequisite: Art Education 203 and Music 240. 4 hours. Arrange 2 hours set-up Friday afternoon.
299. **FAA Study Abroad.** Provides campus credit for foreign study and/or travel. A detailed proposal for study abroad must be submitted for approval by the appropriate committee of the department in which the student is studying and the college dean's office prior to such study abroad. Final determination of credit and its application toward the degree is made after a review of the student's work abroad by the above committee and college office. Prerequisite: Junior standing in the department; approval of the student's proposal by the departmental committee and the college office. 0 to 12 hours (summer session, 0 to 6 hours).
399. **Off Campus Study.** Provides opportunity for off-campus study. Detailed proposal for study off campus must be submitted for approval to the appropriate committee in the College prior to such study. Final determination of credit and its application toward the degree is made after a review of the student's off-campus work by the above committee and the Associate Dean. Prerequisite: Junior or graduate standing in Fine and Applied Arts and approval of program prior to registration. 0 to 12 hours, or 0 to 3 units.

FOOD SCIENCE

Head of Department: Bruce M. Chassy

Department Office: 103 Agricultural Bioprocess Lab, 1302 West Pennsylvania Avenue, Urbana

101. **Food in Modern Society.** Emphasizes the importance of food in providing adequate nutrients for modern society; introduction to processing and preservation of foods as well as the historical, geographical, chemical, and microbiological ramifications which exist in the food industry. 3 hours. Credit is given only for freshmen, sophomores, and first-semester transfer students; credit may be given to juniors and seniors with consent of instructor.
201. **Introductory Food Chemistry for Nonmajors.** Survey of food chemistry principles, terminology, and food constituents. Prerequisite: Chemistry 102 or consent of instructor. 1 hour. Students may not receive credit for both Food Science 101 and Food Science 201.
202. **Sensory Evaluation of Foods.** Same as Foods and Nutrition 202. See Foods and Nutrition 202.
203. **Food Microbiology for Nonmajors I.** Introduction to the role of microorganisms in the food supply with emphasis on food preservation techniques. Prerequisite: Sophomore standing. 1 hour. Students may not receive credit for both Food Science 101 and 203.
204. **Food Microbiology for Nonmajors II.** Introduction to food plant sanitation and the role of microorganisms in food manufacture. Prerequisite: Sophomore standing. 1 hour. Students may not receive credit for both Food Science 101 and 204.

213. **Food Analysis, I.** Principles and application of the chemical, physical, and instrumental methods used to determine the constituents of foods; special considerations applicable to the analysis of certain foods. Lecture and lab. Prerequisite: Chemistry 131. 4 hours.
214. **Survey of Food Chemistry.** Chemical composition of foods and the chemistry of the processing of meats, vegetables, fruits, milk, and cereals. Prerequisite: Chemistry 131. 3 hours. Credit is not given for both Food Science 214 and 314.
260. **Raw Materials for Processing.** Problems involved with procurement, harvesting, handling, and storage of fruits, vegetables, cereal grains, dairy products, red meat, poultry, fish, and eggs for the food-processing industry. Field trips to specialized operations. Prerequisite: One course in biological science and Food Science 101. 4 hours.
298. **Senior Seminar.** Discussion of specialized topics and literature relating to Food Science. Required of all seniors in the food science or food industry curricula. Prerequisite: Senior standing. 1 hour.
300. **Special Problems.** Supervised research on special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. Not open to undergraduates who are on probation. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department with consent of the instructor. 1 to 5 hours, or $\frac{3}{4}$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 2 units.
301. **Food Processing, I.** Principles, unit operations, and applications of food preservation and processing by high temperature, refrigeration, and freezing processes; includes heat transfer, kinetics, chemical and microbial changes in food as a result of processing; lecture, laboratory, and field trip. Prerequisite: Food Science 213, 260, and 363 and Food Science 214 or 314 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
302. **Food Processing, II.** Principles and applications of food preservation and processing including evaporation, dehydration, freeze-concentration, membrane processing, extrusion and water activity control; lectures, laboratories, and field trips. Prerequisite: Food Science 301 or consent of instructor. 3 hours or $\frac{3}{4}$ units.
303. **Processing of Dairy Products.** Principles of dairy processing; unit operations and process design for the manufacture of fluid, fermented and frozen products; dairy analogs; control of dairy plant effluents; by-product utilization, and enzymatic and microbial changes in milk components during processing. Prerequisite: Food Science 260, 363, and 214, or 314, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Food and Industrial Microbiology.** Same as Microbiology 311. Relationship of microorganisms to food manufacture and preservation, to industrial fermentation and processing, and to sanitation. Prerequisite: Microbiology 101 or 201 or equivalent; credit or concurrent registration in organic chemistry laboratory, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Food Chemistry and Nutrition, I.** Examines the chemical aspects of major food components: water, carbohydrates, proteins, and lipids; properties of pigments, salts, and food dispersions. Prerequisite: Chemistry 131 and 134. 4 hours or 1 unit. Credit is not given for both Food Science 214 and 314.
315. **Food Chemistry and Nutrition, II.** Metabolism and nutritional aspects of lipids, carbohydrates, proteins, vitamins, minerals, food additives, and toxicants of foods; chemical changes which occur in these components during processing and storage and their effects upon nutritional quality. Prerequisite: Food Science 314 and Chemistry 131 and 134 or equivalent. 4 hours or 1 unit.
316. **Food Analysis, II.** Emphasizes the application of modern analytical techniques to food component analysis; consists of laboratory exercises, lectures/discussions, and assigned readings. Prerequisite: Chemistry 122 or equivalent; Food Science 314 and 315. 4 hours or 1 unit.
324. **Biochemical Aspects of Human Nutrition.** Same as Foods and Nutrition 324 and Nutritional Sciences 324. Advanced treatment of human nutrition, with emphasis on the biochemical functions of nutrients essential for humans; integrates throughout the course, the molecular mechanisms by which individual nutrients interact to allow for homeostasis or create imbalances. Prerequisite: Biochemistry 350 or both Biochemistry 352 and 353, and a course in nutrition. 3 hours or $\frac{3}{4}$ unit.

- 332. Sanitation in Food Processing.** Studies the principles of sanitation with emphasis on practical considerations as they apply to various food-processing industries; control of insects, rodents, and micro organisms; fundamentals of detergency; sanitation of water supplies; waste disposal methods; and government and public health regulations. Field trips to local food-processing plants. Prerequisite: Chemistry 102 and Microbiology 101. 2 hours or $1/2$ unit.
- 335. Economics of Food Marketing.** Same as Agricultural Economics 335. See Agricultural Economics 335.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Forestry and Horticulture 340. See Agronomy 340.
- 363. Food Engineering.** Examines application of process engineering principles to the conversion of raw agricultural materials into finished food products. Topics include units and dimensions, materials balances, energy balances, thermodynamics, heat transfer, psychrometry, refrigeration and mechanical separations. Prerequisite: Physics 101 and Mathematics 120; or consent of instructor. 3 hours or $3/4$ unit.
- 401. Physical Chemistry of Food Processes.** Studies physicochemical processes in foods during food processing; places special emphasis on methodological and experimental aspects of food processes, such as water activity, rheology of foods, food extrusion, protein hydration, gelation, aggregation, and food process analyses. Prerequisite: Food Science 314 or Biochemistry 350. 1 unit.
- 402. Advanced Topics in Food Science.** Studies of selected topics in Food Science. Study may be on specialized topics in any one of the following fields: food chemistry, food microbiology, nutrition, food processing/engineering. Lectures and/or laboratory. Prerequisite: Consent of instructor. $1/4$ to 1 unit. Students may register only once for a given topic.
- 406. State and Metabolism of Lipids.** Advanced study of the state of lipids in animal tissues and in biological fluids, and of the metabolism of lipids in relation to dietary fats and other food constituents. Prerequisite: Biochemistry 350 or consent of instructor. 1 unit.
- 410. Current Topics in Nutritional Research.** Same as Animal Sciences 410 and Nutritional Sciences 410. See Nutritional Sciences 410.
- 411. Chemistry of Nutritional Processes.** Same as Animal Sciences and Nutritional Sciences 411. See Nutritional Sciences 411.
- 421. Seminar.** Discussions on specialized topics and current literature relating to food technology. Required of all graduate students in food science. 0 or $1/4$ unit.
- 450. Membrane Separations Technology.** Examines theory and applications of synthetic semipermeable membranes in reverse osmosis, ultrafiltration, microfiltration, and electrodialysis processes; thermodynamics of bioseparations, membrane chemistry and properties, process engineering, equipment design, fouling of membranes, selected applications. Prerequisite: Food Science 363 or consent of instructor. $1/2$ or $3/4$ unit. (Lecture is $1/2$ unit and lab is $1/4$ unit.)
- 473. Advanced Food Microbiology.** Detailed examination of food and industrial processes dependent on fermentation and other microbial activities. Prerequisite: Organic chemistry, calculus, and Microbiology 311. $3/4$ unit. Offered in alternate years.
- 475. Genetic Manipulation of the Clostridia.** An overview of recent advances in the genetic manipulation of the industrially significant clostridia is presented with specific reference to the food poisoning bacterium, *C. perfringens*, and the acetone-butanol-ethanol producer, *C. acetobutylicum*. Specifically, this will involve an examination into mutagenesis techniques, plasmid genetics, gene transfer methods, shuttle vector development, cloning and expression of *Clostridium* genes and prospects for the future. Prerequisite: Food Science 311 and Microbiology 100 or 200. $1/2$ unit.
- 481. Advanced Special Problems in Food Science.** Supervised individual study on advanced special problems in food science. Prerequisite: Written consent of instructor must be obtained prior to enrollment. $1/4$ to 2 units (summer session: $1/2$ to 1 unit).
- 491. Chemistry of Lipids in Foods.** Detailed examination of the chemical and physical properties of lipids in foods. Offered in alternate years. Prerequisite: Food Science 314 or consent of instructor. $3/4$ unit.
- 499. Thesis Research.** 0 to 4 units.

FOODS AND NUTRITION

Chair of Division: Shelly J. Schmidt

Division Office: 386 Bevier Hall, 905 South Goodwin Avenue, Urbana

120. **Contemporary Nutrition.** Fundamental principles of human nutrition and their application to the selection of adequate diets; current topics of nutritional importance. 3 hours.
130. **Food Selection and Preparation.** Elementary study of foods in relation to market selection, preparation methods, and standards; comparative costs and food values; and principles of meal planning. 3 hours.
131. **Food Management.** Application of food preparation principles and techniques in the preparation of standard food products; principles of food management and their application in the planning and preparation of meals. A laboratory fee is assessed each student. Prerequisite: Foods and Nutrition 130. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
202. **Sensory Evaluation of Foods.** Same as Food Science 202. The physiology, psychology, and chemistry of flavor and flavor perception; tactual, visual, and auditory components affecting food acceptability; principles and application of preference and discrimination testing; and interpretation of panel evaluation data. 3 hours.
220. **Principles of Nutrition.** Nutritive value of foods and metabolism of essential nutrients; application of principles of nutrition to the requirements of normal individuals throughout the life cycle. Prerequisite: Chemistry 102 or 103; Physiology 103. 3 hours.
231. **Science of Foods.** Fundamental composition and behavior of foods; applies chemistry and other physical sciences to principles of food preparation and preservation. A laboratory fee is assessed. Prerequisite: Chemistry 102 or equivalent; Foods and Nutrition 131. 3 hours.
240. **Quantity Food Production and Service.** Application of the principles of food preparation and service to institutional and commercial food service facilities. Prerequisite: Foods and Nutrition 231. 4 hours.
250. **Foods and Nutrition Internship.** Supervised learning experience through a cooperative program with a foods and nutrition related agency, business, or industry. Prerequisite: Junior standing and consent of department head; not open to students on probation. 4 hours.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
305. **Pediatrics and Nutrition.** Same as Curriculum and Instruction 324 and Human Development and Family Studies 305. Basic principles of nutrition, health and disease relevant to infants and children in group settings. Presents bio-medical concepts necessary for an understanding of subject matter. Not recommended for students majoring in nutrition or related field of study. Prerequisite: 3 hours of social sciences and 6 hours of natural sciences courses. 3 hours, or $3/4$ or 1 unit.
320. **Nutritional Aspects of Disease.** Same as Nutritional Sciences 320. Examines nutritional, biochemical, and physiological aspects of disease processes and studies the role of nutrition in prevention, management, and treatment of disease. Prerequisite: Foods and Nutrition 220 or comparable course with a physiology prerequisite; Biochemistry 350 or equivalent. 3 hours or $3/4$ unit.
322. **Nutrition Through the Life Cycle.** Examines physiological changes that occur during gestation, postnatal growth, and aging and the influence of these changes on nutritional requirements. Prerequisite: Foods and Nutrition 220; senior standing or consent of instructor. 3 hours or $3/4$ unit.
323. **Recent Advances in Foods and Nutrition.** New developments in foods and nutrition; readings, lectures, and discussions. Offered every other summer only. Prerequisite: Foods and Nutrition 220 and 231, or equivalent. 2 hours or $1/2$ unit.
324. **Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Nutritional Sciences 324. See Food Science 324.

- 325. Problems in Nutrition Research.** Individualized instruction in experimental nutrition. Prerequisite: Biochemistry 350, Biochemistry 355, and credit or concurrent registration in Foods and Nutrition 324. 1 to 5 hours, or $\frac{1}{4}$ to $1\frac{1}{4}$ units.
- 326. Communications in Foods and Nutrition.** Selection of problems and organization of materials for demonstrations and other presentations in foods and nutrition subject matter. A laboratory fee is assessed. Field trip; see *Timetable* for approximate cost. Prerequisite: Foods and Nutrition 120 or 220 and 231, or equivalent; senior standing. 4 hours or 1 unit.
- 328. Community Nutrition. Same as Nutritional Sciences 328.** Application and integration of the principles of nutrition and their delivery in the context of social, political, and economic environments in local, national, and international settings. Prerequisite: Foods and Nutrition 220 or equivalent, one introductory statistics course, and one course in the social or behavioral sciences. 3 hours or $\frac{3}{4}$ unit.
- 329. Therapeutic Nutrition and Assessment.** Application of the principles of normal and therapeutic nutrition, nutrition assessment, nutrition intervention and evaluation as related to the management and treatment of disease states. Laboratories will allow for the development of skills in each of these areas. Prerequisites: Foods and Nutrition 320 or concurrent enrollment. 3 hours or $\frac{3}{4}$ unit.
- 330. The Experimental Study of Foods.** Principles and techniques of foods research, including consideration of the effects of formula and preparation variations on chemical, physical, and sensory qualities of food. A laboratory fee is assessed. Prerequisite: Foods and Nutrition 231 or equivalent. 4 hours or 1 unit.
- 331. Problems in Foods.** Individual problems in food preparation and preservation. Prerequisite: Foods and Nutrition 330. 3 hours or $\frac{3}{4}$ unit.
- 345. Food Purchasing and Equipment Selection.** Purchasing food and selecting equipment for quantity food service; factors affecting the purchase of food; and the relationship of floor plans and equipment to service. Field trip; see *Timetable* for approximate cost. Prerequisite: Credit or concurrent registration in Foods and Nutrition 240; Economics 101. 3 hours or $\frac{3}{4}$ unit.
- 350. Institution and Restaurant Management: Organization and Administration.** Organization and administration of food service operations; management problems in various types of food services; personnel, costs, and sanitary control. Field trips; see *Timetable* for approximate cost. Prerequisite: Foods and Nutrition 120 and 240. 4 hours or 1 unit.
- 355. Specialized Quantity Food Production and Management.** Advanced application of food production and management principles to specific food service demands; emphasis on artistry in preparation, serving, and merchandising high quality food in quantity. Prerequisite: Foods and Nutrition 345 and credit or concurrent registration in Foods and Nutrition 350. 4 hours or 1 unit.
- 422. Seminar in Nutrition.** Discusses and evaluates current literature related to topics in nutrition. Prerequisite: Undergraduate degree in foods and nutrition, or comparable undergraduate degree in biochemistry, microbiology, physiology, or other biological science; consent of instructor. $\frac{1}{2}$ unit.
- 430. Selected Topics in Foods Chemistry.** Advanced studies of recent research in specialized topics in food chemistry. May be repeated to a maximum of $1\frac{1}{2}$ units. Prerequisite: Foods and Nutrition 330 or Food Science 314 or 315. $\frac{1}{4}$ to 1 unit.
- 432. Seminar in Foods.** Discusses and evaluates current literature related to specialized topics in foods. Prerequisite: Undergraduate degree in foods and nutrition, or comparable background in chemistry, microbiology, physiology, or other biological science; consent of instructor. $\frac{1}{2}$ unit.
- 445. Current Topics in Food Service Systems Research.** Studies recent research related to food service systems; extensive investigation of research data and techniques on special topics each semester. Prerequisite: Graduate standing in foods and nutrition or related fields; Food Science 340; consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 1 unit.
- 493. Advanced Studies in Foods and Nutrition.** Library or experimental research on specific problems of limited scope; cannot be supervised by thesis adviser. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 1 unit.

499. **Thesis Research.** Original research designed and conducted under graduate faculty supervisor. 0 to 4 units.

FORESTRY

Head of Department: G. L. Rolfe

Department Office: 110 Mumford Hall, 1301 West Gregory Drive, Urbana

101. **Introduction to Forestry.** The forest as a renewable natural resource; the aims and scope of forestry; economic and social importance of forests to the nation; the principal forest regions and species; forests for timber supply, for water conservation, for recreation, and for wildlife; the principles of forest management and protection; and the development of public and private forestry in the United States. 3 hours.
120. **Introduction to Applied Entomology.** Same as Entomology 120. See Entomology 120.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Special Problems.** Supervised research on special problems in forestry. Prerequisite: A minimum grade-point average of 3.75; senior standing; consent of instructor and head of department. Specific approval of the associate dean is required in advance of registration for a second and/or third special problem course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 3 hours.
201. **Wildland Recreation (Summer Field Studies).** Field study of wildland recreational resources and facilities, user characteristics and preferences, and management techniques within the multiple-use concept. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
211. **Forest Ecology (Summer Field Studies).** Introduction to forest ecology and the application of ecological principles in silviculture and management practices. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
213. **Silviculture.** The art and science of controlling forest establishment, composition, and growth to best fulfill the objectives of the owner. Required field trip. Prerequisite: Forestry 211 and 220. 3 hours.
220. **Dendrology.** Taxonomy, geographical distribution, economic importance, and elementary silvics of the important forest trees in the United States and Canada. Prerequisite: Plant Biology 100. 4 hours.
221. **Forest Measurements (Summer Field Studies).** Introduction to forest measurements, including individual tree and stand measurements, inventory methods, and determination of the growth of trees and stands; topics in surveying and aerial photogrammetry. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
231. **Wood Utilization, I (Summer Field Studies).** Field and classroom exercises in logging and milling, conversion of raw wood to useful products, visits to plants, and industrial aspects of wood use. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 1 hour.
232. **Wood Utilization, II.** Principles and methods of harvesting trees; conversion processes and uses of lumber, veneer, plywoods, pulp, paper, particles and chemical derivatives. Harvesting and the environment, recycling, and wood for energy are also discussed. 3 hours.
236. **Physical Properties of Wood and Wood-Base Materials.** Physical properties of wood materials, emphasizing the influence of anatomy, density, and moisture content; wood-liquid relations; thermal, electrical, and acoustical properties; and study of the theory and practice of wood seasoning for determining dimensional stability. Prerequisite: One year of college physics and one year of college chemistry, or consent of instructor. 3 hours.

256. **Surveying Agricultural and Forest Lands.** Same as Agricultural Engineering 256. See Agricultural Engineering 256.
260. **Forest Land Policy and Administration.** Examines forest land policies and their administration emphasizing the relations among resources, politics, and people; current major problems in forest land policy administration and progress toward their solution. Prerequisite: Economics 101 or consent of instructor. 3 hours.
271. **Wood Anatomy and Its Applications.** Study of the structure of wood and its relationship to the physical properties and uses of wood. 3 hours.
273. **Wood Composites.** Theory of adhesion; wood bonding; the effects of physical properties and processing parameters on the performance of wood composites. 3 hours.
277. **Interpretation of Aerial Photographs.** Same as Geography 277. See Geography 277.
281. **Introduction to Forest Resource Management (Summer Field Studies).** Field introduction to forest resource management, including wildlife management, watershed management, and forest protection. Prerequisite: Competence in the courses prescribed in the first two years of the forestry curriculum. 2 hours.
283. **Introductory Ecology for Educators.** Same as Environmental Studies 283. Intended primarily for education students. Basic ecological concepts and how they may be incorporated into the classroom; includes ecosystem structure and function, communities and population, energy flow and nutrient cycling, and integrating ecology/environmental education into the classroom. Eight-hour field trip required; see *Timetable* for approximate cost. 3 hours.
290. **Urban Forestry.** The management of wooded areas in urban and community settings, including how trees improve the urban environment and how they react to urban stresses. Includes laboratory. Prerequisite: Forestry 220, Horticulture 202, or Landscape Architecture 252, or equivalent. 3 hours.
312. **Diseases of Urban Trees.** Same as Plant Pathology 312. See Plant Pathology 312.
313. **Forest Genetics and Tree Improvement.** Principles contributing to heritable variation in forest trees, tree improvement strategies, and genetic considerations in silviculture; topics include: genetic concepts (including population and quantitative genetics), experimental methods, population dynamics in forest regeneration, and strategies for tree improvement and management of genetic resources. Overnight weekend field trip required. Prerequisite: Forestry 213 or consent of instructor. 3 hours or $3/4$ unit.
314. **Diseases of Forest Trees.** Same as Plant Pathology 314. See Plant Pathology 314.
315. **Forest Soils.** Advanced study of the chemical, physical, and biological properties of forest soils; includes the relationship of forest soils to site productivity, forest fertilization, intensive forest management, and environmental problems. Prerequisite: Soils 101. 3 hours or $3/4$ unit.
316. **Advanced Forest Ecology.** Relationship between environmental factors and the structure and function of forests, including carbon, water and nutrient cycles. Integrates a basic understanding of forest ecology into forest resource management. Two Saturday field trips required. Prerequisite: Forestry 211 or consent of instructor. 3 hours or $3/4$ unit.
317. **Introduction to Natural Resources Economics.** Same as Agricultural Economics and Environmental Studies 317. See Agricultural Economics 317.
318. **Tropical Forest Ecosystems.** Examines the interactions between climate and soils and the structural and functional characteristics of natural and managed tropical forests, and the relation of tropical forests to global issues such as greenhouse effect and biodiversity. Prerequisite: Forestry 316 or 319, or Plant Biology 381 or equivalent. 3 hours or $3/4$ unit.
319. **Environment and Plant Ecosystems.** Same as Agronomy and Environmental Studies 319. Examines relationships between environmental factors and structural characteristics and processes in ecosystems; impact of human activities on the environment and their effect on plant ecosystems. Draws examples from agricultural and forest ecosystems. Prerequisite: One course in biology, and Chemistry 102 or equivalent; or equivalent. 3 hours or $3/4$ unit.
321. **Forest Biometrics.** Examines statistical methods and modeling techniques used in the management of forest and natural resources; includes applied regression analysis, sampling techniques and conceptual modeling. Prerequisite: Math 120 and Forestry 221; and Statistics 100 or Agricultural Economics 261, or equivalent. 3 hours or $3/4$ unit.

- 326. Tree Physiology.** The study of tree functions as they relate to tree structure, environment, and cultural practices; emphasizes photosynthesis, carbohydrate metabolism, nitrogen metabolism, water relations, and symbiotic associations of trees. Prerequisite: Plant Biology 100 and Chemistry 102 or 103. 3 hours or $\frac{3}{4}$ unit.
- 340. Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science and Horticulture 340. See Agronomy 340.
- 344. Social Impact Assessment.** Same as Environmental Studies, Landscape Architecture, Leisure Studies, Rural Sociology, and Urban and Regional Planning 344. See Environmental Studies 344.
- 345. Statistical Methods.** Same as Agricultural Engineering and Animal Science 345. See Animal Science 345.
- 351. Forest Resource Economics.** Applies principles of economics to the establishment, development, and use of forest and related natural resources; major concepts studied include production economics, capital budgeting, forest taxation, financial maturity, and supply, demand, and valuation of major forest products. Prerequisite: Economics 101 and Forestry 321; or consent of instructor. 4 hours or 1 unit.
- 372. Mechanical Properties of Wood and Wood-Base Materials.** Static mechanics, strength properties, and structural designs of wood, plywood, particleboard, and hardboard, emphasizing the standard methods of testing wood and fibrous material, wood beam and column designing, and other factors concerning the strength of wood materials, particularly the derivation of allowable stresses. Prerequisite: Physics 101. 3 hours or $\frac{3}{4}$ unit.
- 377. Introduction to Remote Sensing.** Same as Geography 377. See Geography 377.
- 381. Forest Resource Management.** An integration and synthesis of forestry concepts and quantitative decision making techniques applied to managing forests to meet the objectives of both public and private forest land owners. Prerequisite: Forestry 351 or consent of instructor. 4 hours or 1 unit.
- 400. Forestry Seminar.** Discussions of current research and specialized topics in forestry; a seminar must be given by all students in order to receive credit. Required of all graduate students in forestry. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 401. Special Problems.** Individual studies or investigations in selected branches of forestry. 0 to 1 unit. Not more than 2 units may be offered toward an M.S. degree.
- 402. Research Methods in Forest Resources.** Treats the theory and practice of research methods in forestry. Provides an overview of experimental design and sampling techniques, and includes discussions that pertain to discipline-specific statistical methods used in forestry. Prerequisite: Forestry 321 and 300- or 400-level courses in statistics; or consent of instructor. 1 unit.
- 405. Discussions in Forest Resources.** Provides a forum for discussions of advanced topics related to forest resources. General areas for discussion include wood science, forest biology, and quantitative science. Discussions of specific topics are led by faculty and students, on a rotating basis. Assigned readings are drawn from current and classical literature. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
- 415. Linear and Nonlinear Statistical Models for Biologists.** Same as Animal Sciences 415. See Animal Sciences 415.
- 416. Biogeochemistry and Modeling of Forest Ecosystems.** Lecture, discussion, and modeling course with advance study of biological, geological, and chemical processes of forest ecosystems. Examines effects of environmental pollutants on forest ecosystem processes. Students will complete individual modeling projects. Prerequisite: Forestry 315 and 316 or consent of instructor. 1 unit.
- 440. Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Landscape Architecture, Leisure Studies, Rural Sociology, and Urban and Regional Planning 440. See Environmental Studies 440.
- 446. Plant Gene Regulation.** Same as Agronomy 446 and Horticulture 436. See Agronomy 446.
- 447. Gene Expression During Seed Development.** Same as Agronomy 447 and Horticulture 437. See Agronomy 447.
- 450. Advanced Forest Biometry.** Examines and discusses developments and techniques used

in forest inventory, growth models and ecological models. Prerequisite: Forestry 321, Agronomy 440, or consent of instructor. $\frac{1}{2}$ unit. Offered in alternate years.

460. **Discussions in Forest Policy and Administration.** Individual and group discussions of the major relevant problems in the field of forest resources policy and administration (both public and private) based on current literature. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
463. **Natural Resource Economics.** Same as Agricultural Economics, Economics, and Environmental Studies 463. See Agricultural Economics 463.
499. **Thesis Research.** Research may be conducted in various phases of forestry; subject must be approved by departmental committee. 0 to 3 units.

FRENCH

Head of Department: Emile J. Talbot

Department Office: 2090 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 114 or 124). Approval to do so must be obtained from the department.

101. **Elementary French, I.** Four-skill course leading to proficiency in oral expression, listening comprehension, reading, writing, and cultural understanding. Open only to students with no previous study of French. All students are required to attend language laboratory sessions several times a week, as needed. 4 hours. Credit is not given for both French 101 and 105.
102. **Elementary French, II.** Continuation of French 101. Introduces cultural and supplementary enrichment materials; requires laboratory sessions as in French 101. Prerequisite: French 101 or one year of high school French. 4 hours. Credit is not given for both French 102 and 105 or 106.
103. **Intermediate French, I.** Continuation of French 102. Introduces students to a full range of structures to complete their initial study of the grammatical system; emphasizes the development of all four skills and cultural understanding through readings and audio-visual enrichment materials. Students planning to major or minor in French should take French 133 in lieu of French 103. Prerequisite: French 102 or equivalent, or a placement score showing high school achievement equivalent to French 102. 4 hours. Credit is not given for both French 103 and 106.
104. **Intermediate French, II.** Continuation of French 103. Comprehensive grammar review with emphasis on oral expression and the continued development of reading and written skills. Completion satisfies graduation requirement in the College of Liberal Arts and Sciences. Students planning to take advanced French courses should take French 134 in lieu of French 104. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
105. **French Active Review, I.** Reviews materials covered in French 101 and 102 in preparation for entrance into French 103 or 133. Open to students with high school French; by placement score or consent of department only. Not open to students with credit in French 101 or 102. Prerequisite: One or two years of high school French and placement score in 101 range. 4 hours.
106. **French Active Review, II.** Reviews materials covered in French 102 and 103 in preparation for entrance into French 104, 114, or 134. Not open to students with credit in French 101, 102, 103 or 105. Open to students with high school French; by placement score or consent of department only. Prerequisite: Three or four years of high school French with placement at 102 level. 4 hours.
113. **Conversational Practice.** Oral practice for the development of elementary conversational skill and the improvement of pronunciation; designed as a supplement to third and

fourth semester French courses. Prerequisite: Concurrent registration in third or fourth semester French course, or consent of instructor. 1 hour.

- 114. Conversational French.** Practice in spoken French. May be substituted for French 104 to satisfy the graduation requirement in the College of Liberal Arts and Sciences; does not serve as a prerequisite for advanced courses in French without departmental approval which usually requires a proficiency examination at the 104 level. Prerequisite: French 103 or equivalent, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 133. Accelerated Intermediate French, I.** Similar to French 103, but accelerated for those interested in pursuing French in advanced courses; includes comprehensive grammar review and readings in literature and culture. Prerequisite: French 102, 105 or two semesters of college French, or a placement score showing high school achievement equivalent to French 102. Normally for students with a "B" average in French or with consent of instructor. 4 hours.
- 134. Accelerated Intermediate French, II.** Continuation of French 133. Comprehensive grammar review and readings in French literature and culture preparatory for continued work at the advanced level; emphasizes all four skills and culture. Prerequisite: French 133 or 106, or French 103 with department approval, or three semesters of college French, or a placement score showing high school achievement equivalent to French 103. 4 hours.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Oral French, I.** Training for the development of oral facility; exercises for the improvement of pronunciation and diction; and optional practice in the language laboratory. Prerequisite: French 104, or 103 and 113, or four years of high school French. 3 hours.
- 206. Oral French, II.** Continuation of French 205; optional practice in the language laboratory. Prerequisite: French 205. 3 hours.
- 207. Grammar and Composition.** Training in French syntax, translation from English into written French, and directed composition. Prerequisite: Four years of high school French or equivalent, or French 134 or, with departmental approval, French 104. 3 hours.
- 209. Introduction to French Literature, I.** Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 210. Introduction to French Literature, II.** Continuation of French 209. Prerequisite: French 104, four years of high school French, or equivalent. 3 hours.
- 217. Advanced Oral French.** Intensive practice in oral French to improve fluency, vocabulary, comprehension, pronunciation and syntax; activities include reports, discussion and role-play on topics selected and prepared by class participants; also includes weekly written assignments based on class activities. Prerequisite: French 206 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
- 220. Sixteenth-Century Literature.** General survey of the literature of the French Renaissance. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 223. French Literature of the Seventeenth Century, I.** Major French writers of the preclassical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 224. French Literature of the Seventeenth Century, II.** Major French writers of the classical period. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 227. French Literature of the Eighteenth Century, I.** Montesquieu, Voltaire, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 228. French Literature of the Eighteenth Century, II.** Diderot, Rousseau, and their contemporaries. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
- 230. French Literature of the Nineteenth Century, I: 1800-1850.** Major prerealist and romantic writers. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 231. French Literature of the Nineteenth Century, II: 1850-1900.** The evolution of romanticism and realism into the naturalist and symbolist movements. Prerequisite: French 210 or equivalent, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)

233. **French Literature of the Contemporary Period, I.** Modern poetry from Baudelaire to Valéry; prose writers from 1900 to 1940. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
234. **French Literature of the Contemporary Period, II.** Continuation of French 233. Prerequisite: French 209 and 210. 3 hours. (Counts for advanced hours in LAS.)
270. **Parateaching.** Same as German, Latin, Russian, and Spanish 270. Parateaching prior to the practicum in local schools under the direct supervision of University of Illinois faculty and the teaching staff of participating schools. Students must preserve a 4-hour block of time for observation in the schools. Prerequisite: Enrollment in a foreign language teaching curriculum or consent of an adviser in a foreign language teaching curriculum and Humanities 279. 2 hours. May be repeated.
279. **Introduction to Foreign Language Education.** Same as German, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
280. **Teachers' Course.** Survey of resources, classroom materials, standard practices, and problems in the teaching of French with practical application to actual classroom situations. Required for teacher training majors in French. This course does not meet during the period teacher-training majors are off campus. Prerequisite: French 205, 206, 207, 209 and 210; or equivalent. 4 hours.
290. **Individual Study: Major Tutorial.** A tutorial taken by students during two of their last four semesters of undergraduate study. Students read the works on a departmental reading list with the guidance of a tutor, repeating enrollment for a total of 2 hours credit, normally at the rate of 1 hour per semester. Prerequisite: French 205, 207, 209, and 210, or equivalent; a declared major in French; junior standing. 1 to 2 hours. (Counts for advanced hours in LAS.)
292. **Senior Thesis.** For candidates for honors in French and for other seniors. Prerequisite: Senior standing. 2 hours. May be repeated for a maximum of 4 hours credit. (Counts for advanced hours in LAS.)
298. **Senior Seminar.** Studies in authors, genres, themes, and movements in French literature; conducted entirely in French. Prerequisite: Senior standing. 3 hours. May be repeated. (Counts for advanced hours in LAS.)
299. **Study Abroad.** Lectures, seminars, and practical work in French language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: French 209 and two of the following: French 205, 206, or 207; 3.75 overall average; 4.0 average in French courses. 0 to 17 hours per semester, to a maximum of 34 hours per academic year.
310. **Modern African Fiction.** Same as African Studies and Comparative Literature 310 and English 370. See African Studies 310.
313. **French Phonetics and Diction.** A systematic study of the sounds and sound patterns of French; training in the improvement of French pronunciation with special attention to the problems of teachers. Prerequisite: French 206, or equivalent. 3 hours or $\frac{3}{4}$ unit.
314. **Advanced Grammar and Style.** Advanced theoretical and practical study of present-day French, with free composition and some consideration of stylistics. Prerequisite: French 207 (with a grade of C or better), or equivalent. 3 hours or $\frac{3}{4}$ unit.
316. **Structure of the French Language.** Same as Linguistics 316. General survey of the linguistic structure of modern standard French, including phonology, morphology, and syntax; emphasis on the differences between its spoken and written forms. Prerequisite: French 313 or equivalent training in phonetics. 3 hours or $\frac{3}{4}$ unit.
319. **Techniques in Translating.** A practical course in the techniques of translating technical, commercial, scientific, and literary texts from English into French and vice versa. Prerequisite: French 314 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
320. **Techniques in Interpreting.** A practical course in the technique of oral translation of spoken material covering a wide range of subject matter in a variety of settings. Prerequisite: French 319 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
335. **French Civilization, I.** Survey of French life and French institutions, intended as a background for literary studies and as a preparation for the teaching of French; given in French. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.

- 336. French Civilization, II.** Continuation of French 335. May be taken independently of French 335. Prerequisite: French 205, 207, 209, and 210, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 343. Studies in French.** See *Timetable* for current topics. Prerequisite: Junior standing. 3 hours, or $\frac{3}{4}$ to 1 unit. May be repeated to a maximum of 12 hours or 4 units. Students may register for this course more than once in the same term.
- 355. France Today, I.** Social structures of France today and their manifestation in daily life and culture; study of the workings of various institutions and systems (political judicial, economic, educational, etc.) for an understanding of current problems, providing background for closer study, in the second semester, of the forces affecting daily life. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 356. France Today, II.** Study of the conditions of daily life in France today, its organization, the major forces and issues affecting it; topics include class structure, youth culture, urban and minority problems, the press, media, and popular culture and the arts. 3 hours, or $\frac{3}{4}$ to 1 unit.
- 360. Principles of Language Testing.** Same as English as an International Language, German, Italian, Portuguese, and Spanish 360. See English as an International Language 360.
- 362. Introduction to Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
- 379. Studies in Francophonie.** Same as Comparative Literature 334. Studies of various genres, periods, and topics of French literature outside of France, with a different geographical emphasis each semester. Regions include black Africa, the Caribbean, Canada, North Africa, the Middle East, and Switzerland. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 12 hours or 4 units.
- 380. Classroom Language Acquisition.** Same as English as an International Language, German, Italian, Portuguese, and Spanish 380. See Spanish 380.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
- 385. Commercial and Economic French, I.** Studies French business practices: company structures, selling and buying techniques, banking, import/export and other commercial negotiations, employment, formalities, and conventions of letter-writing; involves both theory and practice. Prerequisite: French 314 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 386. Commercial and Economic French, II.** Emphasizes business correspondence and simulation of business practices in the areas introduced in French 385; also focuses on geographic and economic topics pertaining to France within the European community and Europe in general. Prerequisite: French 385 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
- 388. French and Comparative Cinema, I.** Same as Comparative Literature and Humanities 388. The art, techniques, sociology, politics of French cinema in the context of French culture, world history, and general film development from 1895 to approximately 1950. Selected trends studied through films from several countries with stress on major French filmmakers including Lumiere, Melies, Gance, Clair, Vigo, Renoir, Carne, Cocteau, Prevert, Clouzot. Meets six hours a week. Prerequisite: One college-level cinema studies course or consent of instructor. No knowledge of French necessary. 4 hours or 1 unit.
- 389. French and Comparative Cinema, II.** Same as Comparative Literature and Humanities 389. The art, techniques, sociology, politics of French cinema in the context of French culture, world history, and general film development from approximately 1950 to the present. Selected trends studied through films from several countries with stress on major French filmmakers including Clouzot, Bresson, Chabrol, Resnais, Godard, Truffaut, Berri, Varda, Blier, Marker, Rohmer, and Costa-Gavras. Meets six hours a week. Prerequisite: One college-level cinema studies course (French 388 preferred) or consent of instructor. No knowledge of French necessary. 4 hours or 1 unit.
- 399. Study Abroad.** Lectures, seminars, and practical work in francophone literature and civilization, in a French-speaking country. Prerequisite: French 209 and 210, and two of the following: French 205, 206, and 207; or equivalent. Not open to undergraduates in the Paris program. 0 to 16 hours, or 0 to 4 units.

400. **Beginning French for Graduate Students.** Basic grammar, vocabulary, and reading practice; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. 4 hours. No graduate credit.
401. **Reading French for Graduate Students.** Grammar, vocabulary, and general and special reading; designed for graduate students desiring help in preparing for the French reading requirements for the Ph.D. Prerequisite: French 400, or French 101 and 102, or equivalent. 4 hours. No graduate credit.
403. **The Study of Culture: Fine Arts, History, and Literature, I.** A study of major artistic, historical, political, and literary aspects of France up to the French Revolution with emphasis on the relationship between literature and other aspects of French culture. 1 unit.
404. **The Study of Culture: Fine Arts, History, and Literature, II.** Continuation of the approaches and emphases of French 403 from the French Revolution to the present. Prerequisite: French 403 or consent of instructor. 1 unit.
405. **Techniques in Teaching College and Secondary French.** Examination and discussion of classroom procedures and language laboratory techniques in teaching French at the college and secondary level, associated with demonstration class and supervision of teaching practice. Required of new teaching assistants in the Department of French. 1/2 unit.
425. **Studies in Contemporary Critical Problems.** Same as Comparative Literature 425. Introductory course to some aspect of modern French critical theory; normally taught in English and texts may be read in English. 1 unit. May be repeated as topics vary.
429. **Studies in French Linguistics.** A variable topics course dealing with both synchronic and diachronic aspects of the French language. 1 unit. May be repeated as topics vary.
430. **Introduction to Research and Textual Criticism.** Proseminar in literary studies: research and methods; approaches to the literary text. Required of all M.A. and Ph.D. candidates. 1 unit.
431. **Introduction to Old French Language.** Outline of Old French grammar and training in reading Old French (twelfth and thirteenth centuries). 1 unit.
432. **Studies in Medieval French Literature.** Close study of one or more topics in Old French literature. See *Timetable* for current topics. Prerequisite: French 431 or consent of instructor. 1 unit.
433. **Studies in Sixteenth-Century French Literature.** Close study of one or more topics in sixteenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topics vary.
435. **Studies in Seventeenth-Century French Literature.** Close study of one or more topics in seventeenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topics vary.
437. **Studies in Eighteenth-Century French Literature.** Close study of one or more topics in eighteenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topics vary.
439. **Studies in Nineteenth-Century French Literature.** Close study of one or more topics in nineteenth-century French literature; see *Timetable* for current topics. 1 unit. May be repeated for credit as topics vary.
441. **Studies in Twentieth-Century French Literature, I.** 1 unit.
442. **Studies in Twentieth-Century French Literature, II.** 1 unit.
443. **French Studies.** A flexible course limited only by the concentration of its material in French; may be activated by student request or faculty proposal. 1 unit.
445. **Studies in French Canadian Literature.** Close study of one or more topics in French Canadian literature; see *Timetable* for current topics. 1 unit. May be repeated as topics vary.
452. **Studies in French and Comparative Cinema.** Same as Comparative Literature 472. Historical, aesthetic, social, and technical studies of the French cinema; its development and relation to world cinema and to literature. 1 unit. May be repeated to a maximum of 3 units.
462. **Seminar in Romance Linguistics.** Same as Italian, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.

- 463. College Teaching of Foreign Languages.** Same as English as an International Language, German, Italian, Portuguese, Russian, and Spanish 463. Rationale for curricular objectives for college courses in foreign languages; the teaching and testing of pronunciation, listening comprehension, speaking, reading, writing, cultural understanding, and literary appreciation; the use of technology; and recent experimentation. $\frac{1}{2}$ or 1 unit.
- 470. Seminar in Old French Literature.** Discussion and research on some specialized topic in Old French literature. See *Timetable* for current topic. Prerequisite: French 431 or consent of instructor. 1 unit. May be repeated.
- 471. Seminar in Sixteenth-Century French Literature.** Discussion and research on some specialized topic in sixteenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
- 472. Seminar in Seventeenth-Century French Literature.** Discussion and research on some specialized topic in seventeenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
- 473. Seminar in Eighteenth-Century French Literature.** Discussion and research on some specialized topic in eighteenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
- 474. Seminar in Nineteenth-Century French Literature.** Discussion and research on some specialized topic in nineteenth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
- 478. Seminar in Twentieth-Century French Literature.** Same as Comparative Literature 478. Discussion and research on some specialized topic in twentieth-century French literature. See *Timetable* for current topic. 1 unit. May be repeated.
- 479. Seminar in French Literature.** Discussion and research on some specialized area in French literature. See *Timetable* for current topic. 1 unit. May be repeated.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, German, Italian, Portuguese, Russian, and Spanish 481. Language teaching problems considered in the light of theoretical and experimental work in language acquisition, verbal learning and memory, motivation, speech perception, reading, error analysis, and language as an aspect of culture and societal relations. Prerequisite: Consent of instructor. 1 unit.
- 490. Seminar in Contemporary Criticism, Methods and Theory.** Same as Comparative Literature 490. Deals with a particular individual, school, method or problematic in structuralist or poststructuralist thought; normally taught in English, and texts may be read in French or English, if available. Prerequisite: An introductory course in criticism, or consent of instructor. 1 unit. May be repeated as topics vary.
- 491. Individual Topics.** Prerequisite: Graduate standing with a major or minor in French. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

GENERAL ENGINEERING

Head of Department: T. F. Conry

Department Office: 117 Transportation Building, 104 South Mathews Avenue, Urbana

- 103. Engineering Graphics and Design.** Use of traditional and microcomputer methods as instructional tools in engineering graphics; topics include: text creation, formal and sketch-mode drawing, scaled inquiry and layout; charts and diagrams; pictorial representations; multiview orthographic representations; principal auxiliary views; sectioned views; dimensioning; production drawings; introduction to engineering design; and fundamental descriptive geometry. 3 hours.
- 193. Special Problems.** Individual investigations of any phase of general engineering selected by the students and approved by the department. Prerequisite: Consent of instructor. 0 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

- 221. Introduction to General Engineering Design.** Fundamental concepts in the analytical modelling, classical and computer-based analysis and design of structural and machine components and assemblies; external loads, internal forces and displacements in statically determinate and indeterminate configurations; kinematics of linkages, gears, and cams; static forces in machines. Prerequisite: Theoretical and Applied Mechanics 212 and 221, and Computer Science 101. 3 hours.
- 222. Simulation and Analysis of Dynamic Systems.** Introduction into the operational techniques used in describing the behavior of dynamic systems; elements of modeling; equilibrium points and linearization; Laplace transformation techniques; system response via the transfer function; block diagrams and computer simulation; matrix operations; system response via state variables; stability and performance specifications; controller design via transfer functions and state space techniques. Prerequisite: Mathematics 285; concurrent registration in Computer Science 101. 3 hours.
- 232. Engineering Design Analysis.** Studies stress/strain conditions, both analytical and numerical (CAD) solution techniques, analysis of various engineering materials and configurations, as applied to the development and application of design analysis criteria. Prerequisite: General Engineering 221. 4 hours.
- 234. General Engineering Laboratory.** Prepares students for experimental projects, introduces mechanical and electrical instruments; basic measurement techniques; simulation of dynamic systems; applies microcomputers to control problems; measurement errors, relative and absolute; determines mechanical properties of selected materials; transducers and signal conditioning. Prerequisite: General Engineering 221 and 222. 3 hours. Credit is not given for both General Engineering 234 and either Theoretical and Applied Mechanics 223 or Mechanical Engineering 261.
- 241. Component Design.** Design of basic engineering components: structural members, machine parts, and connections; principles applied include: material failure (yield, fracture, fatigue); buckling and other instabilities; design reliability; application of design codes; and design synthesis. Prerequisite: General Engineering 222 and 232. 4 hours.
- 242. Project Design.** Design of various engineering devices and systems. Teams of two to four students work toward the development of engineering solutions to problems supplied by industry. A midterm and final report summarize the work of the semester for sponsor and faculty. Prerequisite: Credit or concurrent registration in General Engineering 241 and senior standing. 3 hours.
- 288. Economic Analysis for Engineering Decision Making.** Introduction to an operations research approach to engineering decision making; covers economic analysis of alternatives, methods of optimization, including linear, integer, and dynamic programming, decision theory and and probability, and simulation. Prerequisite: Junior standing or consent of instructor. 3 hours.
- 291. General Engineering Seminar.** Series of lectures and discussions by department faculty and visiting professional engineers on ethics, professional registration, the role of technical societies, and the relation of engineering to such disciplines as economics, sociology, and government. 0 hours.
- 292. Engineering Law.** Nature and development of the legal system; legal rights and duties important to engineers in their professions; contracts, torts, product liability, agency, labor law, intellectual property, environmental law, property. Prerequisite: Senior standing or consent of instructor. 3 hours.
- 293. Special Problems.** Individual investigations or studies of any phase of general engineering selected by the students and approved by the department. Prerequisite: Junior standing; consent of instructor. 0 to 4 hours.
- 324. Digital Control of Dynamic Systems.** Examines theory and techniques for control of dynamic processes by digital computer; linear discrete systems, digital filters, sampling signal reconstruction, digital design, state space methods, computers, state estimator, laboratory techniques. Prerequisite: General Engineering 222 or equivalent. 4 hours or 1 unit.
- 334. Introduction to Reliability Engineering.** Same as Industrial Engineering 334. See Industrial Engineering 334.
- 389. Robot Dynamics and Control.** Kinematics, dynamics, and control of robotic manipulators; emphasis on fundamental concepts and analytical methods for analysis and design

of robotic systems; laboratory experiments and computer simulation complement the theoretical development. Prerequisite: General Engineering 222; or Aeronautical and Astronautical Engineering 258; or Electrical and Computer Engineering 386 or Mechanical Engineering 240. 4 hours or 1 unit.

392. **Legal Problems in Engineering Design.** The law as it affects engineering design; products liability and legislation; professional liability; intellectual property problems; computer law. Prerequisite: Senior standing or graduate standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
393. **Special Problems.** Studies advanced problems related to general engineering. Prerequisite: Senior standing and consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
444. **Decision Making with Multiattribute Utility Analysis.** Provides the student with background and practice in applying tools for subjective multiple attribute decision making when present or future states of nature are uncertain. Includes exploration of current research in developing computer aids to decision making under risk. Discusses issues in descriptive versus normative approaches in the context of the interface between operations research and artificial intelligence. Covers multiattribute utility analysis from theoretical foundations through assessment procedures, practice, and pitfalls of potential cognitive biases. Prerequisite: Graduate standing; General Engineering 288, Industrial Engineering 386, Mathematics 361, or equivalent; or consent of instructor. 1 unit.
491. **Simulation of Dynamic Systems.** Modeling and simulation of dynamic engineering systems; distinct modeling approaches for engineering devices; analog and digital computer simulation of dynamic systems; design criteria and performance and design measures; and extensive use of case studies and projects. Prerequisite: General Engineering 222 and Industrial Engineering 385, or equivalent. 1 unit.
493. **Special Problems.** Advanced problems related to general engineering. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated.
495. **Evaluation and Management of Engineering Design Projects.** Quantitative evaluation and optimization of project plans, using mathematical programming, multiple-criteria decision making and discrete event simulation; optimal design and sizing of engineering projects; reliability of designs, studied by acyclic network analysis and network simulation; and implementation and control of engineering designs by network analysis. Prerequisite: General Engineering 288 and Industrial Engineering 385, or equivalent. 1 unit.
497. **Project Design.** Engineering design projects emphasizing advanced engineering analysis, synthesis, optimization, and engineering economics. $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.
499. **Thesis Research.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units for credit toward the Master's degree.

GEOGRAPHY

Head of Department: John A. Jakle

Department Office: 220 Davenport Hall, 607 South Mathews Avenue, Urbana

101. **Geography of Developing Countries.** Examines the manner in which climate, land-forms, resources, and cultural factors promote and inhibit change in developing countries (i.e., India, Iran, Egypt, Nigeria, China, Kenya, Brazil, Venezuela, Guatemala); makes comparisons between these countries and others in both the developing and the developed world. 3 hours.
102. **Weather and Climate.** Introduction to the processes responsible for the spatial variation of weather and climate with a survey of world climatic patterns. 4 hours.
103. **Earth's Physical Systems.** Systems approach to the physical environment, including landform, soil, vegetation, and animal elements, from a human ecological perspective. 4 hours.
104. **Social and Cultural Geography.** Introduces the basic concepts of social and cultural geography, and the application of these concepts to a variety of topics; mental maps,

territoriality, cultural regions, cultural elements and their diffusion, population movement and migration, settlement patterns, environmental hazards, and spatial patterns of social problems. 4 hours.

110. **Geography of International Conflicts.** Focuses on contemporary cultural conflicts, competition among nations for economic and mineral resources; treats territorial disputes from a cultural and geographic perspective. Case studies vary to illustrate types of contemporary conflicts. 3 hours.
185. **Introduction to Social Statistics.** Same as Sociology 185. See Sociology 185.
198. **Freshman Honors Seminar.** Through discussions and research projects, the seminar is designed to provide an in-depth understanding of topics in the field of systematic or regional geography which are selected for group study. Appropriate geographic methodology is emphasized. Prerequisite: James Scholar standing or other designation as a superior student. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **Regional Analysis of Landforms.** Examines global and regional variations in the morphology of the earth's surface; emphasizes the role that climate plays in producing these variations. Prerequisite: Geography 103 or Geology 101, 107, or 143. 3 hours.
204. **Cities of the World.** Introduces the form and function of cities around the world; emphasizes cross-cultural comparisons of urban landscapes and living environments as illustrated by case studies of specific cities. 3 hours.
205. **Business Location Decision-Making: Theory and Practice.** Same as Business Administration 205. Analyzes location decision-making emphasizing industrial and commercial location patterns; identifies important institutional factors and their changing roles over the recent past; and focuses on plant closings, economic disruptions, and problems of structural change. Prerequisite: Economics 102 or 103, or equivalent. 3 hours.
210. **Contemporary Social and Environmental Problems.** Geographic perspectives on contemporary national and international problems. Topics vary each semester and include such themes as environmental quality, food production, urban problems, and particular social and political conflicts. 3 hours.
214. **Conservation of Natural Resources.** Survey of distribution of natural resources and major forms of utilization of these resources; emphasizes consequences of utilization systems which deplete or degrade resources and systems which conserve these resources with respect to future needs of human populations. 3 hours.
224. **Geographic Patterns of Illinois.** A systematic analysis of the environmental and human processes that have shaped the regional landscapes of rural and urban Illinois. 3 hours.
271. **Spatial Analysis.** An overview of the spatial analysis (nomothetic) approach to geographic research, both physical and human; includes discussion of the scientific method, with explanations and uses of analytic geographic concepts in studying real world problems. Prerequisite: A course in geography. 4 hours. (Counts for advanced hours in LAS.)
273. **Spring Field Course.** Field observation and mapping of human and physical phenomena using basic geographic field techniques; required ten-day field trip during spring semester break. Prerequisite: Geography majors, or nonmajors with consent of instructor. 4 hours.
277. **Interpretation of Aerial Photographs.** Same as Forestry 277. Principles and techniques in extraction and analysis of information derived from aerial photographs, including black and white, color, and color infrared; applications to problems in the natural and social sciences stressed in the laboratory. A beginning FORTRAN programming course is highly desirable but not required. Prerequisite: Knowledge of trigonometry (Mathematics 114 or equivalent). 3 hours.
284. **Population Geography.** Problems and issues surrounding the geographic distribution of populations at the world, regional, and local levels; emphasizes problems associated with population growth and decline, recent population redistribution, births and deaths, and elderly and minority populations. 3 hours.
290. **Individual Study.** Supervised independent study of special topics or regions; required for students graduating with departmental distinction. Prerequisite: Junior standing; at

least one formal course in the topic or region of interest; consent of instructor. 2 to 4 hours. May be repeated once. (Counts for advanced hours in LAS.)

- 291. Honors Individual Study.** Individual study and research projects for students who are working toward the degree with distinction in geography. Prerequisite: Junior standing; consent of honors adviser. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 294. Special Topics in Social Geography.** Introduction to current research in social geography; includes such topics as access to public facilities, geography of crime, innovation diffusion, geography of communications, spatial assimilation of minorities, and geography of social well-being. See *Timetable* for current topics. 4 hours. May be repeated.
- 303. Advanced Physical Geography: Methodology and Applications of Landform Studies.** Systematic analysis of the basic elements of physical geography and their interaction through time and surface expression, including the modifying effects of humans. Complementary to Geology 301. Prerequisite: Geography 103 or consent of instructor. 4 hours or 1 unit.
- 304. Soil Geomorphology.** Same as Geology 304. Analysis and review of the principles of soils as applied to geomorphology, archaeology, and geography. One weekend and several one-day field trips; student fees reflect actual field expenses. Prerequisite: Geography 103 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 305. Zoogeography.** Introduction to the principles of zoogeography; the central theme explains present distribution of animals, chiefly mammals. Prerequisite: Geography 102 and 103, Geology 102, Biology 104, or consent of instructor. 3 hours or 1 unit.
- 306. Fluvial Geomorphology.** Same as Geology 306. Systematic overview of the forms and processes associated with rivers and drainage basins; topics include basin hydrology, drainage networks, river hydraulics, sediment transport processes, channel morphology, channel change, and human impacts on fluvial systems. Prerequisite: Physics 101, and Geography 103 or Geology 107, or consent of instructor. 4 hours or 1 unit.
- 307. Periglacial Geomorphology.** Same as Geology 307. Examination of periglacial landscapes through analysis of the formative processes and their interaction with the resulting forms. Prerequisite: Geography 303, Geology 301, or consent of instructor. 4 hours or 1 unit.
- 308. Geomorphology of Coasts.** An analysis of the morphology of marine coasts including study of their distributions and of the physical factors that have influenced their development and distribution; analyzes effects of human-induced stress on modern beaches. Prerequisite: Geography 103 or equivalent. 4 hours or 1 unit.
- 310. The Geography of Development and Underdevelopment.** The patterns and processes of Third World development geography. Lectures and discussion draw upon theoretical and case study material by development geographers working in Asia, Africa, and Latin America. Prerequisite: Geography 101, 110, and Economics 101 are highly recommended. 4 hours or 1 unit.
- 315. Physical Climatology.** Surveys the basic concepts of energy balance climatology, with emphasis on the topoclimatic scale; lectures supplemented by calculations and field observations examining the effects of location and surface characteristics on determination of climate. Prerequisite: Mathematics 112, Physics 101, and Geography 102; and Computer Science 103 or equivalent; or consent of instructor. 3 hours or 1 unit.
- 325. Historical Geography of American Landscapes to 1880.** Same as Landscape Architecture 325. Changing patterns of spatial organization in the United States and Canada, circa 1400 A.D. to 1880; focuses on landscape patterns through time (especially the built environment), perception of relic landscapes in the present day, and contemporary preservation of historic areas as historic places. 4 hours or 1 unit.
- 326. Historical Geography of American Landscapes Since 1880.** Same as Landscape Architecture 326. Review of the values and technologies which underlie the structuring of the American built environment during the past century; emphasizes the changing meaning of urban, suburban, small town, rural, and wilderness places in American life and is concerned with the image of place as a basis for historic preservation. 4 hours or 1 unit.
- 327. American Vernacular: The Cultural Landscape.** Same as Landscape Architecture 327. Focuses on vernacular structures in the cultural landscape, especially common houses,

- barns, and commercial and industrial structures; examines origin and geographical diffusion of vernacular architecture in the United States. 4 hours or 1 unit.
331. **Geography of Caribbean America.** Surveys the physical environment and the sequent occupation processes that have shaped contemporary rural and urban population and land use patterns in Mexico, Central America, Panama, and the West Indies. 3 hours or $3/4$ unit.
332. **Geography of South America.** Surveys the physical environment and the sequent occupation processes that have shaped contemporary rural and urban population and land use patterns in South America. 3 hours or $3/4$ unit.
341. **Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Environmental Studies 341, and Urban and Regional Planning 375. See Civil Engineering 341.
353. **Geography of the U.S.S.R.** Physical and cultural regionalism; a survey of natural resources and patterns of human occupation including industry, agriculture, and transportation. 3 hours or $3/4$ unit.
355. **Geography of Central and South Africa.** Regional geography of Africa south of the Sahara. 3 hours or $3/4$ unit.
361. **Geography of Agricultural Land Utilization.** Geographic consideration of the nature of agricultural land utilization from the world, continental, and regional viewpoints; special emphasis on the geographical implications of various types of agricultural land use and upon the interrelationships between areas of different types of land utilization. 3 hours or $3/4$ unit.
365. **Transportation Systems and Spatial Development.** Descriptors of transportation systems; allocation models; transportation as an industrial activity and public good; and transportation and spatial development, including the role of transportation in developing countries and in urban and regional development and problems involved in measuring the impact of transport investment. 3 hours, or $1/2$ or 1 unit.
366. **Location of Industry and Other Economic Activities.** Industrial site selection in theory and practice; examines the effect of factors such as materials, markets, labor, transportation, and environmental constraints on industrial location; and evaluates urban commercial patterns and factors affecting the location of commercial activities. 3 hours or $3/4$ unit.
367. **The Origins and Impact of Energy Scarcity.** Examines the development of the physically based theories of scarcity and a comparison to the historical and most recent economic theories of scarcity of critical resources, especially energy, and their expected application in local, regional, national, and international situations. Prerequisite: Mathematics 130 or equivalent; or Economics 102 or 103, or equivalent. 3 hours, or $3/4$ or 1 unit.
368. **Biological Modeling.** Same as Agronomy 368 and Biology 368. An interdisciplinary modeling course for students interested in dynamic system modeling of living processes; each student will build a model by the end of the course. No special mathematical background required. Prerequisite: Ecology, Ethology, and Evolution 212, Plant Biology 381, Entomology 315, or equivalent, depending on curriculum. 3 hours or 1 unit.
370. **Introduction to Quantitative Methods in Geography.** Introduction to statistical, numerical, and mathematical techniques used in geographic research; introduction to computer usage in geographic research. Prerequisite: Geography 185, one year of college mathematics, or one course in statistics, or equivalent. 4 hours or 1 unit.
371. **Recent Trends in Geographic Thought.** Examines trends in geographic thought since 1950; gives attention to developments in positivism, phenomenology, and structuralism with regard to geographic research; introduces students to the research methodologies of the department's faculty. 2 hours or $1/2$ unit.
372. **Geographical Epidemiology.** Same as Health and Safety Studies 375. See Health and Safety Studies 375.
373. **Map Compilation and Construction.** Instruction and practice in the basic techniques of map making followed by a consideration of problems involved in the construction of maps for presentation in a reproduced form (i.e., printed, photographed); the selection of proper source materials for the base and body of the map, the compilation and correlation of these materials, and methods of mechanical and photographic reproduction. 4 hours or 1 unit.

375. **Computer Cartography.** Introduction to concepts and techniques for computer mapping with spatial or statistical data; universal computer mapping strategies, with applications in the laboratory; cartographic data capture, covering data structures, devices, manipulation, and display; and a synthesis of geographic information systems. Prerequisite: Geography 185 or equivalent. 4 hours or 1 unit.
377. **Introduction to Remote Sensing.** Same as Forestry 377. Fundamentals of energy-matter interaction mechanisms, and the manifestation of reflected and emitted radiation on photographs and images; introduces characteristics of aerial films and filters, electro-optical scanners, and digital processing are introduced; and emphasizes applications in environmental problems. Prerequisite: Geography 277 or equivalent, Geography 185 (beginning statistics) or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
378. **Techniques of Remote Sensing Image Analysis.** Optical and digital information processing of imagery acquired from aircraft and satellite remote sensing platforms; includes systems design, mensuration theory, photographic enhancement techniques, and automatic digital classification for all of the standard sensor systems; and laboratory focusing on the design and implementation of information processing techniques with application limited to a survey of uses. Prerequisite: Geography 370 and 377, or equivalent. 4 hours or 1 unit.
380. **Urban Form and Function in Pre-Industrial Western Society.** A review of urban landscapes and functions and of the development of city systems in the historical geography of western civilization prior to industrialization. Previous course work in history or historical geography is desirable. 3 hours or $\frac{3}{4}$ unit.
382. **Siberian Culture History and Ethnology.** Same as Anthropology 382. See Anthropology 382.
383. **Urban Geography.** Distribution, functions, and internal structures of cities; emphasizes contemporary metropolitan and central city problems. 3 hours or $\frac{3}{4}$ unit.
384. **Migration and Spatial Interaction.** Theories and models of migration; contemporary migration patterns; information flow and individual movement in geographic space; and individual level and aggregate models of spatial interaction. 3 hours or 1 unit.
391. **Research in Geography.** Detailed examination and discussion of the methods of initiating and executing research projects in human or physical geography (taught in separate sections); requires students to write a research proposal of a quality suitable for a graduate thesis. Prerequisite: Geography 371; either graduate standing in geography or senior standing as a geography major and consent of department. 2 hours or $\frac{1}{2}$ unit.
403. **Physical Systems in Landform Analysis.** Same as Geology 403. A study of the phenomena of the physical landscape in terms of the basic principles of systems theory. Prerequisite: Geography 303 or equivalent, or consent of instructor. 1 unit.
404. **Critical Analysis of Concepts and Models in Geomorphology.** The interpretation of a landscape and its evolution is dependent on which of the available models the geomorphologist accepts; the course focuses on the importance and ramifications of this choice. Prerequisite: Graduate standing and consent of instructor. 1 unit.
405. **Seminar in Physical Geography.** Advanced study of one of several topics that vary from semester to semester and include: (a) mathematical models/numerical analysis in physical geography; (b) problems in physical geography; and (c) professional seminar. Prerequisite: Advanced course work in physical geography and consent of instructor. $\frac{1}{2}$ to 1 unit.
406. **Urban and Regional Analysis.** Same as Urban and Regional Planning 406. See Urban and Regional Planning 406.
450. **Issues in Regional Development.** Same as Urban Planning 450. Establishment and articulation of regional development goals; includes trade-offs, the role of government in regional development, analytical problems in the evaluation of regional public policy, and comparison and evaluation of regional development programs in a number of countries. Prerequisite: Urban and Regional Planning 406. 1 unit.
456. **Regional Science Methods: Economic and Demographic.** Same as Urban and Regional Planning 456. Examines models of regional growth and development, including export base, input-output and econometric, cohort component and spatial interaction; empha-

- sizes socioeconomic impact analysis and forecasting subnational economic and demographic change. Prerequisite: Urban and Regional Planning 406 or consent of instructor. 1 unit.
457. **Seminar in Regional Science.** Same as Urban and Regional Planning 457. Discusses advanced topics in regional science; prepares students for dissertation and thesis research, applied study for public agency, or other student research. Prerequisite: Geography 456, Economics 461, or consent of instructor. 1 unit.
463. **Historical Geography.** History and philosophy of historical research in geography. Research strategies for the analysis of individual and aggregate spatial behavior in the past, derived geographical patterns, changing spatial behaviors and patterns through time, and historical values underlying contemporary geographical decision making. 1 unit.
464. **Problems in Historical Geography.** Research seminar focused on the interests of participating students and faculty; application of geographic theory to the study of past geography, geographic change in the past, spatial behavior in the past, and/or evidence of spatial behavior in the contemporary scene. Prerequisite: Geography 370 or equivalent; prior preparation in historical geography. 1 unit.
470. **Advanced Spatial Analysis.** Advanced techniques of spatial analysis, including spatial autocorrelation, trend surface analysis, grouping and regionalization procedures, and point pattern analysis. Prerequisite: Geography 370 or equivalent. 1 unit.
494. **Seminar in Social Geography.** Advanced study of a current research topic in social geography. Topic varies from semester to semester; prepares students for dissertation and thesis research through study of advanced literature and the completion of a research paper. Prerequisite: Geography 370 and 371, or equivalent; graduate course work in social geography or in one of the social sciences. 1 unit.
495. **Advanced Studies in Geography.** Seminar and directed individual investigation of selected problems or regions; designed to develop ability to conduct independent investigation. Scheduled seminars are detailed in each semester's *Timetable*. All students are required to register each semester in section Z (the departmental colloquium) for 0 units in addition to other 495 work which may be selected. 0 to 2 units.
497. **Development of Geographic Thought.** Historical survey of the discipline from the Graeco-Roman period to the present. 1/2 unit.
499. **Thesis Research.** 0 to 4 units.

GEOLOGY

Head of Department: R. J. Kirkpatrick

Department Office: 245 Natural History Building, 1301 West Green Street, Urbana

100. **Planet Earth.** Introduces nonscience majors to physical aspects (earthquakes, volcanoes, tsunamis, mountains, continental drift) and historical aspects (formation of the earth and life, dinosaurs, ice age, evolution of climate) in earth science. Presents information on earth resources, natural hazards, and development of natural landscapes. Focuses on humanistic issues; provides a context for understanding the concept of environmental change. Optional lab demonstrations and field trips with co-registration in Geology 110. 3 hours. Students may not receive credit for both Geology 100 and Geology 101 or 111. Credit is also not given to students who have received credit for Geology 107.
101. **Introduction to Physical Geology.** Focuses on the physical features of our planet and their origin. Topics include: plate tectonics, mountain building, glaciers, earthquakes, volcanoes, coastlines, rivers, deserts, geologic structures, weathering, minerals, and rocks. Introduces the fundamental methodology for observing and interpreting earth features. Optional field trips. Intended for nonphysical science majors. 4 hours. Credit may not be received for both Geology 101 and Geology 100, 107, or 111.
102. **History of the Earth.** Examines the birth and evolution of our planet including the oceans and atmosphere. Studies the geologic record, and measuring geologic time; the record of

the origin and evolution of life. Explores the influence of life on planetary physical and chemical processes and the impact of major events such as drifting continents, meteorite impacts, astronomical cycles, advance and retreat of the seas, and natural catastrophes on geology and life. Optional field trips. 3 hours. Students may not receive credit for both 102 and 108.

104. **Geology of the National Parks and Monuments.** Develops geologic background, concepts, and principles through study of selected national parks and monuments. Examines the geologic framework and history, modern geologic processes, and factors influencing the present day landscape for each park area. Optional field trips. 3 hours.
105. **Geology of Energy Resources.** Geology of fossil and nuclear fuels, geothermal energy, wind and water power, and exotic energy sources. History of energy production and use. Future supplies and predictions of availability. Politics and environmental effect on energy supply, extraction, and consumption. 3 hours.
107. **General Geology, I.** Introduces Earth phenomena and processes. Includes minerals and rocks, continental drift, plate tectonics, rock deformation, igneous and sedimentary processes, geologic time, landscape evolution, internal structure and composition of the earth, groundwater, seismology and earthquakes, and formation of natural resources. Emphasizes the chemical and physical aspects of the Earth, and the basis for geological inference. Field trip required for geology majors, optional for others. Intended for science and science-oriented students. 4 hours. Credit may not be received for both Geology 107 and Geology 101 or 111.
108. **General Geology, II.** Approaches to understanding the dynamic history of the Earth since its formation by analysis of sedimentary rock systems, evolution and life history, plate tectonic changes through time, and age determination methods. Laboratory work focuses on identification of sedimentary rocks, reconstructing sedimentary environments, fossil identification, and a field trip report. Field trip required. Primarily intended for science and science-oriented students. Prerequisite: Geology 107 or consent of instructor. 4 hours. Credit may not be received for both Geology 108 and 102.
110. **Planet Earth - Lab/Field.** Introduces practical techniques for identification of rocks and minerals, interpretation of geologic and topographic maps, recognition of fossils, appreciation of geologic features and landforms in the field. Two field trips are required. Prerequisite: Concurrent registration in Geology 100 or consent of instructor. 1 hour.
111. **The Dynamic Earth (Honors).** Study of the geological history and evolution of the earth, the formation of mountains and ocean basins, the making of continents and earth environments and resources. A four day field trip will be open to students. Course in the campus Honors Program. 4 hours. Credit may not be received for both Geology 111 and Geology 100, 101, or 107.
115. **Regional Field Study.** Field observations in a region of diverse geology. One- to two-week field trip. Credit is given only on completion of a satisfactory written report. Prerequisite: Any one of Geology 101, 102, 107, or 250; or consent of instructor. 2 hours.
143. **History of Life.** The evolution of life from its beginning, illustrating changing faunas and floras through time; the invasion of land and of the skies; the effects of a changing atmosphere, changing climates, and continental drift. Emphasis on dinosaur evolution, ecology, and extinction; also other vertebrates, including mammal-like reptiles, mammals, and the emergence of humans, as well as plants and invertebrates. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
250. **Geology for Engineers.** Physical geology with an emphasis on those aspects of the natural environment which are of importance to the engineer. Prerequisite: Theoretical and Applied Mechanics 150 or 152; sophomore standing in the College of Engineering. 3 hours.
290. **Individual Study.** Research and individual study in geology. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member. 1 to 4 hours. May be repeated. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.
291. **Individual Honors Study.** Research and individual study in geology for honors credit. Prerequisite: Geology 108 or equivalent; consent of supervising faculty member and of departmental honors adviser. 1 to 4 hours. May be repeated. A maximum of 8 hours of Geology 290 plus 291 may be counted toward graduation.

292. **Senior Thesis.** Research in geology, with thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member. 2 to 8 hours. May be repeated. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Research in geology with honors thesis; a thesis must be submitted for credit to be received. Prerequisite: Consent of supervising faculty member and of departmental honors adviser. 2 to 8 hours. May be repeated. A maximum of 10 hours of Geology 292 plus 293 may be counted toward graduation. (Counts for advanced hours in LAS.)
301. **Geomorphology.** History, origin, and characteristics of land forms produced by weathering, fluvial, glacial, wind, and wave processes or by a combination of these acting upon the major kinds of geologic materials and structures. Lectures, laboratory, and field trips. Prerequisite: Geology 108 or consent of instructor. 4 hours or 1 unit.
304. **Soil Geomorphology.** Same as Geography 304. See Geography 304.
306. **Fluvial Geomorphology.** Same as Geography 306. See Geography 306.
307. **Periglacial Geomorphology.** Same as Geography 307. See Geography 307.
311. **Structural Geology and Tectonics.** Introduction to principles of rock deformation, stress, and strain; description and interpretation of geologic structures; study of methods for structural analysis; outline of geotectonic processes; three hours of lecture and a three-hour lab per week. Required four day field trip. Prerequisite: Geology 107 or consent of instructor. 4 units or 1 hour.
315. **Field Geology.** Field mapping or study in a selected area of a specific geologic problem; involves preparation of a geologic map and/or report. Prerequisite: Geology 108 or equivalent; consent of instructor. 2 to 8 hours, or $1\frac{1}{2}$ to 2 units.
317. **Geologic Field Methods, Western U.S.** Field course based in the mountains of the western United States. Provides intensive practical experience in geologic mapping, as well as instruction in field structural, stratigraphic, geomorphologic, and petrologic analysis. Offered during summer session only. Prerequisite: 8 hours of 300-level credit in geology, including Geology 340 or 332, or consent of instructor; Geology 311 is recommended. 6 hours or $1\frac{1}{2}$ units.
320. **Introduction to Paleontology.** Surveys the major groups of fossil forming invertebrates, vertebrates and plants, their modes of preservation, and basics of taxonomy; also their use in the study of functional morphology, ecology, evolution, and biogeography. Prerequisite: Geology 108, or Ecology, Ethology, and Evolution 320, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
325. **Paleobotany.** Same as Plant Biology 325. See Plant Biology 325.
332. **Mineralogy and Mineral Optics.** Introduction to: crystallography; crystal optics; structures, compositions, properties, stabilities and geological occurrences of minerals; and mineral identification. Prerequisite: Geology 108 and Chemistry 102. 4 hours or 1 unit.
336. **Petrology and Petrography.** Study of the minerals, compositions, textures, structures, classifications, and origins of igneous, sedimentary, and metamorphic rocks; lectures emphasize rock forming processes (petrology), and laboratories emphasize description and classification (petrography). Prerequisite: Geology 332. 4 hours or 1 unit.
340. **Sedimentology and Stratigraphy.** Introduces dynamics of sedimentation, geology of sedimentary basins, the distribution of geologic processes through time, definition and correlation of stratigraphic units, principles of paleogeography, stratigraphy and tectonics. Prerequisites: Geology 102 or 108, or consent of instructor. 4 hours or 1 unit.
344. **Stratigraphic Geology.** Advanced practices in definition and correlation of stratigraphic units, paleogeography and stratigraphic tectonics; time criteria and their application in stratigraphy; advanced practice in subsurface stratigraphy; regional field exercises; usage in geologic mapping, mineral fuels exploration, hydrogeology, and engineering geology exemplified. Prerequisites: Geology 340 or consent of instructor. 4 hours or 1 unit.
346. **Advanced Sedimentary Systems.** Advanced survey of processes of sediment transport and bedform evolution in open channel, coastal and marine geological settings; fluvial, eolian, coastal, deltaic, shelf, turbidite, and submarine fan depositional systems; current status of basin systems focussing on basin formation, basin fills, basin maturation and

integrative basin analysis. Prerequisite: Senior or graduate standing; Geology 311 and 340; concurrent registration in Geology 350 and 360 desirable. 3 hours or $\frac{3}{4}$ unit.

- 350. Introduction to Geophysics.** Introduction to basic concepts related to the physics of the Earth's interior; includes formation and composition, gravity and shape, seismology, heat flow and internal temperatures, magnetism, rheology, and plate tectonics. Prerequisite: Mathematics 242 or 245 and Physics 107. 4 hours or 1 unit.
- 351. Geophysical Methods for Geology, Engineering and Environmental Sciences.** Examines nondestructive geophysical methods used to study the near surface structure of the Earth; includes basic procedures in data acquisition, processing, and interpretation; studies applications to hydrocarbon and mineral exploration and engineering and environmental investigations. Several weekends of field experiments are recommended; students participating in the experiments receive an additional hour or $\frac{1}{4}$ unit credit. Prerequisite: Mathematics 242 and Physics 107. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 352. Physics of the Earth.** Survey of the physical and chemical principles used to delineate the physical state and evolution of the Earth including its internal structure, composition, and mineralogy. Topics include seismology, gravity, magnetics, heat flow, geophysical exploration, high-pressure mineralogy, and composition of the mantle and core. Students in geophysics, engineering, or physics should enroll in 350. Prerequisites: Physics 102, Geology 332, credit or concurrent registration in Geology 311, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 355. Introductory Groundwater Hydrogeology.** An introduction to fluid flow and transport in the subsurface; topics include the geology of groundwater, regional groundwater flow, petroleum migration, formation of economic ores, and water-rock interaction. Prerequisite: Mathematics 120, 121 or 135. 4 hours or 1 unit.
- 356. Introduction to Plate Tectonics Analysis.** Introduction to the analytic methods employed in plate tectonics analysis; topics include methods of locating seismic events, construction of earthquake focal mechanisms, determination of paleomagnetic poles, calculation of plate kinematics, and of reconstruction plate motions; measurements of heat flow and in-situ stress, and calculation of basin subsidence curves. Prerequisites: Mathematics 242 or 245, Physics 106, and Geology 107 or consent of instructor. 4 hours or 1 unit.
- 357. Glacial Geology.** Consideration of glacial processes, materials and landscapes, stratigraphic analysis of glacial deposits and the mid-continent Pleistocene glacial succession; field trip and required field work. Prerequisite: Geology 107 or consent of instructor. 4 hours or 1 unit.
- 358. Seismology.** Quantitative treatment, at the advanced undergraduate level, of the theoretical and observational aspects of seismology, and application to: understanding the nature of planetary interiors, earthquakes, natural and man-made explosions, and tectonics; prospecting for natural resources; and earthquake engineering. Includes equations of motion, Helmholtz potentials, polarization, matching of boundary conditions, Thompson-Haskell formulation, Rayleigh and Love waves, dispersion and higher modes, travel time inversion, origin and mechanism of earthquakes, effects of earthquakes on ground motion, and synthetic seismograms. Prerequisite: Mathematics 346 or equivalent; or consent of instructor. 4 hours or 1 unit.
- 360. Geochemistry.** Fundamental chemical and physical concepts applied to geological processes; topics include: origin, distribution, and geochemical behavior of elements; chemical evolution of the Earth; geochemistry of natural waters and sedimentary rocks; isotope geochemistry, crystal chemistry, trace element geochemistry and organic geochemistry. Prerequisite: Geology 101 or 107; Chemistry 102; Mathematics 120, 121, or 135; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 370. Oceanography.** An investigation of the principal factors that control the origin and physiography of ocean basins; the composition and distribution of marine sediments; the composition, biological productivity, and dynamics of seawater. Prerequisite: Geology 101 or 107, and Chemistry 101, and Mathematics 120, 121, or 135; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 380. Current Problems in Environmental Geology.** Same as Environmental Studies 380. Survey of geomechanics, groundwater hydrology, aqueous geochemistry, and related

topics. Fundamental principles of each topic are introduced, and applications to currently important problems including natural hazards, well pumping, and waste disposal are discussed. Prerequisite: Chemistry 102; Physics 101 or 106; Mathematics 130, 131, or 245; Geology 107; and senior standing; or consent of instructor. 4 hours or 1 unit.

397. **Special Topics in Geology.** Seminar or lectures in subjects not covered by regular course offerings; for advanced undergraduates and graduate students. See *Timetable* for current offerings. Prerequisite: Consent of instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
401. **Physical Geochemistry, I.** Introduction to geochemistry providing the background needed for more advanced courses in geochemistry, petrology, and mineralogy; topics, with geochemical examples, include classical thermodynamics, statistical thermodynamics, reaction kinetics, aqueous geochemistry, solid-state chemistry, and the theory of phase transformations. Prerequisite: Chemistry 102 and Mathematics 242 or 245; or equivalent, or consent of instructor. 1 unit.
402. **Physical Geochemistry, II.** Introduction to geochemistry providing the background needed for more advanced courses in geochemistry, petrology, and mineralogy. Topics, with geochemical examples, includes classical thermodynamics, statistical thermodynamics, reaction kinetics, aqueous geochemistry, solid-state chemistry, and the theory of phase transformations. Prerequisite: Geology 401 or consent of instructor. 1 unit.
403. **Physical Systems in Landform Analysis.** Same as Geography 403. See Geography 403.
415. **Advanced Field Geology.** Field mapping or study in a selected region. Requires preparation of a geological map and/or report. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
420. **Paleoecology.** Interpretation of life habit of fossil organisms from skeletal morphology and associated depositional features; reconstruction of marine ecosystem relationships from the study of assemblages of fossils. Prerequisite: Geology 320 or equivalent. 1 unit.
421. **Topics in Paleontology.** Selected topics in macro- and micropaleontology. Intensive study of a selected invertebrate or algal group; special problems in the taxonomy, evolution, skeletal diagenesis, ecology, biogeography, and biostratigraphy of selected fossil organisms. Prerequisite: Geology 320, Ecology, Ethology, and Evolution 320, or consent of instructor. 1 unit. May be repeated.
422. **Advanced Stratigraphic Geology.** Application of stratigraphic principles and techniques to solution of a selected geologic problem or problems. Selected problem may be in the area of regional stratigraphy, historical inference, or applied geology. Prerequisite: Consent of instructor. 1 unit.
431. **Structural Mineralogy.** Crystal chemistry of minerals and survey of current knowledge about the structures and properties of selected minerals and mineral groups. Prerequisite: Consent of instructor. 1 unit.
432. **Sedimentary Geochemistry.** Equilibrium assemblages among the principal organic and inorganic sedimentary solids and their associated liquids during weathering, deposition, and diagenesis; kinetics and mechanism of phase changes; and transport processes during diagenesis. Prerequisite: Geology 360 or equivalent, or consent of instructor; some background in physical chemistry desirable. 1 unit.
433. **Isotope Geology.** Introduction to the theoretical basis for isotopic fractionation in nature; survey of isotopic variations in natural materials; and application of isotopic variations to problems of geological and environmental significance. Prerequisite: Consent of instructor. 1 unit.
434. **Theoretical Petrology.** Use of thermodynamic and kinetic arguments in the solution of basic petrological problems. Prerequisite: Consent of instructor. 1 unit.
435. **Igneous and Metamorphic Petrology.** Application of chemistry and physics to the study of crystalline rocks, with emphasis on the integration of theory with field and laboratory observations; topics selected on the basis of student interest and training. Prerequisite: Geology 336. 1 unit. May be repeated.
437. **Basin Analysis and Sedimentary Geology.** Examines contemporary aspects of tectonics and sedimentation, cratonic sequences, seismic stratigraphy, geologic history of sea level, isotope chronostratigraphy, anoxic sedimentation, pelagic deposition, transgressive-regressive sequences, rates of sediment accumulation, sediment yield, maturation of

organic sediments, global sedimentary cycles, basin classification, basin geodynamics, and examples of basin analysis. Prerequisite: Geology 311, 340, 352, and 360; or equivalent; or consent of instructor. Consent of instructor required for students from other departments. 1 unit.

439. **Carbonate Sedimentology.** Study of genesis and diagenesis of carbonate sediments covering: carbonate deposition, coordination of ultrastructural-petrographic properties and elemental-isotopic composition, nature and environments of diagenetic changes, and temporal trends in carbonates. Prerequisite: Geology 320 and 336, or equivalent; or consent of instructor. 1 unit.
450. **Principles of Engineering Geology.** Study of the effects that lithology, weathering, joints, faults, and ground water have upon engineering projects; the description and origin of geologic factors and their significance in the design, construction, and performance of civil engineering undertakings. Field trip or term paper required. Prerequisite: Geology 250 or equivalent, or consent of instructor. 1 unit.
451. **Practice of Engineering Geology.** Review of modern geotechnical exploration techniques (borings, downhole logging, surface geophysics, and remote sensing) and study of case histories illustrating the influence of significant geologic features on exploration design, construction, and performance of civil engineering projects. Field trip or term paper required. Prerequisite: Geology 450 and Civil Engineering 383, or consent of instructor. 1 unit.
452. **Geodynamics.** Dynamical characteristics of the solid earth; mathematical theories that describe large scale deformation, both on the surface and within the interior of the Earth; theoretical predictions compared with observations to delineate: the internal properties of the Earth, driving mechanism of plate tectonics, and the origin of various geological processes such as volcanism, mountain building, and basin formation. Prerequisite: Mathematics 285, Physics 107, Geology 350 or permission of instructor. 1 unit.
454. **Geophysical Inverse Problems.** Emphasizes implementations of geophysical inverse theory in complex systems of incomplete, noisy measurements. Includes solutions based on vector norms, generalized inverse, maximum likelihood solution, various travel time inversions, reflectivity, migration, tau-p inversion, moment tensors, and the inversion of geochemical data. Prerequisite: Mathematics 315 or equivalent and Geology 350 or Geology 358, or consent of instructor. 1 unit.
455. **Hydrogeology.** Geology of the occurrence, storage, movement, and quality of water in the rocks of the Earth's crust. Prerequisite: Consent of instructor. 1 unit.
457. **Quaternary Geology.** Consideration of the Quaternary Period, its definition, stratigraphic and fossil records, and correlations; introduces climatic considerations. Prerequisite: Geology 357 or consent of instructor. 1 unit.
458. **Groundwater Geochemistry.** Inorganic geochemistry of groundwaters, with emphasis on the geochemical processes occurring in systems open to groundwater flow, the chemical interaction of groundwaters with sediments and rocks, and the application of quantitative geochemical models. Prerequisite: Geology 355 or Civil Engineering 357 or equivalent; and Geology 360 or 401 or Civil Engineering 343; or consent of instructor. 1 unit.
461. **Mineralogy of Clays.** Same as Ceramic Engineering and Materials Science and Engineering 426. Composition of various types of clays; the structure and properties of the clay minerals; and the origin and mode of occurrence of the clay minerals and clay materials. Field trip required. Prerequisite: Geology 332 or equivalent; consent of instructor. 1 unit.
462. **Petrology of Clay Minerals.** Same as Ceramic Engineering and Materials Science and Engineering 427. Origin and occurrence of clay minerals in natural and synthetic systems such as the weathering, sedimentary, burial diagenetic, and hydrothermal environments; quantitative X-ray diffraction analysis of mineral assemblages from each environment; advanced analytical techniques such as nuclear magnetic resonance and transmission electron microscope analysis of clay minerals. Prerequisite: Geology 461. 1 unit.
468. **Microbeam Analysis.** Covers the theory and practice of scanning electron microscopy (SEM) and quantitative electron microprobe analysis with emphasis on geological applications; laboratory work utilizes both the SEM and an automated microprobe

equipped with wave-length dispersive and energy dispersive spectrometers, and also covers specimen preparation. Prerequisite: Consent of instructor and endorsement of research adviser. $\frac{1}{2}$ unit. May be repeated as topics vary; students may register for two different topics in the same semester. May be repeated to a maximum of 1 unit.

488. **Advanced Structural Geology.** Analysis of geologic deformation based upon the principles of mechanics and utilizing research data from laboratory and field investigations; methods in structural analysis. Prerequisite: Geology 311 or consent of instructor. 1 unit.
489. **Geotectonics.** Nature and distribution of major earth structures and geological and geophysical evidence bearing on their origin. Prerequisite: Geology 311 or consent of instructor. 1 unit.
493. **Advanced Studies in Geology.** Work may be taken in the following fields: (a) general geology; (b) engineering geology; (c) geomorphology and glacial geology; (d) clay mineralogy; (e) ground-water geology; (f) micropaleontology; (g) mineral deposits; (h) mineralogy and crystallography; (i) paleontology; (j) geochemistry; (k) geophysics; (l) petrography and petrology; (m) sedimentology; (n) stratigraphy; (o) oceanography; (p) submarine geology; (q) structural geology and geotectonics; (r) mathematical geology; (s) sedimentary petrography; (t) petroleum geology; (u) coal geology; (v) isotope geology and geochronology; (w) electron beam analysis; (x) vulcanology; (y) environmental geology; and (z) planetology. $\frac{1}{4}$ to 2 units.
499. **Thesis Research.** Individual research under supervision of members of the faculty in their respective fields. 0 to 4 units.

GERMANIC LANGUAGES AND LITERATURES

(Including German, Germanic, and Scandinavian)

Head of Department: James M. McGlathery

Department Office: 3072 Foreign Languages Building, 707 South Mathews Avenue, Urbana

German

Students in elementary and intermediate language courses may not ordinarily register for credit in more than one four-hour course at the same semester level (e.g., 104 or 114). Approval to do so must be obtained from the department.

101. **Elementary Course.** Oral practice, reading, and grammar for beginners. 4 hours.
102. **Elementary Course.** Continuation of German 101. Prerequisite: One semester of college German or equivalent. 4 hours.
103. **Intermediate Course.** Continuation of German 102. Prerequisite: Two semesters of college German or equivalent. 4 hours.
104. **Intermediate Course.** Continuation of German 103. Prerequisite: Three semesters of college German or equivalent. 4 hours.
113. **Intermediate Speaking.** Practice in speaking idiomatic German; emphasis on spontaneous expression. Prerequisite: Two semesters of college German or equivalent. 4 hours.
114. **Intermediate Speaking.** Continuation of German 113. Prerequisite: Three semesters of college German or equivalent. 4 hours.
153. **Practice in Conversation.** Emphasis on learning to converse in German in an everyday manner. Prerequisite: Two semesters of college German or equivalent. 2 hours.
161. **German Masterpieces in Translation I: The Middle Ages Through Classicism.** Introduces major works of German literature in English translation from the beginnings through the eighteenth century. Texts and lectures in English. 3 hours.
162. **German Masterpieces in Translation II: Romanticism to the Present.** Introduces major works of German literature in English translation from the nineteenth and twentieth centuries. Texts, discussions, and lectures in English. 3 hours.

189. **Living German—German Living.** Practice in speaking German for students living in the German House. Prerequisite: Elementary speaking knowledge of German. 1 hour. May be repeated to a maximum of 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **German Literature in Translation.** Same as Comparative Literature 224. Introduction to German literature for students with no knowledge of German. 3 hours. May be repeated as topics vary.
211. **Conversation and Writing.** Prerequisite: German 104 or equivalent, or consent of instructor. 3 hours.
212. **Conversation and Writing.** Continuation of German 211. Prerequisite: German 211 or equivalent, or consent of instructor. 3 hours.
220. **German for Business.** Introduces German business language as used in basic operations in retail/wholesale, export/import, banking transactions. Prerequisite: German 211 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
221. **German for Economics.** German language as used in professional contexts involving economic matters: texts and documents relating to forms of enterprises and their financing, to macroeconomic structures of domestic and foreign trade, and to reports on the economies of German-speaking countries. Prerequisite: German 220 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
225. **German-Speaking Europe Today.** Examines contemporary civilization and culture in the German-speaking countries of Europe, including reference to historical, political, and economic developments. 3 hours.
231. **Introduction to German Literature, I.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period. Prerequisite: Two years of college German or equivalent. 3 hours.
232. **Introduction to German Literature, II.** Introductory study of representative works (prose, drama, lyrics) by outstanding German, Austrian, and Swiss writers of the modern period. Prerequisite: German 231 or equivalent. 3 hours.
270. **Parateaching.** Same as French, Latin, Russian, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, Humanities, Latin, Russian, and Spanish 279. See Humanities 279.
280. **Teachers' Course.** Introduction into the problems of the teaching of German and a study of textbooks. Prerequisite: Senior standing or consent of instructor. 4 hours.
293. **Honors Senior Thesis.** Intended primarily for candidates for honors in German, but open to other seniors. Prerequisite: Senior standing; consent of instructor. 1 to 4 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
296. **Special Topics in German Literature.** Same as Comparative Literature 228. Introductory study in such topics as individual authors, selected literary movements or periods, modes of inquiry in literary study, minor genres, subgenres, extraliterary influences, etc. Prerequisite: Reading fluency in German beyond the fourth-semester college level. 3 hours. May be repeated as topic varies to a maximum of 6 hours.
299. **Study Abroad.** Lectures, seminars, and practical work in German language, literature, civilization, and in other academic areas appropriate to the student's course of study. Prerequisite: German 211 or equivalent; 3.75 overall average; 4.0 average in German courses. 0 to 17 hours. May be repeated to a maximum of 34 hours per academic year.
301. **Advanced Conversation, Composition, and Syntax.** Intensive study of advanced problems of grammar, syntax, and style. Prerequisite: German 211 and 212, or equivalent. 3 hours or $1\frac{1}{2}$ unit.
302. **Advanced Conversation.** Practice in free conversation. Prerequisite: German 301 or equivalent. 1 hour or 0 units.
303. **Translation in Theory and Practice.** Theory and practice of translating technical, commercial, scientific, and literary texts from German into English and vice versa. Prerequisite: German 301 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

311. **German Literature 750-1450.** Literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 750 to 1450. Prerequisite: German 232 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **German Literature 1450-1770.** A literary, thematic, cultural, and bibliographical analysis of the major authors, works, genres, and movements in German literature from 1450 to 1770. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
320. **History of German Civilization.** Selected topical, historical, and pictorial analysis of Germany's culture and civilization. Prerequisite: German 232 or equivalent. 4 hours or $\frac{3}{4}$ unit.
330. **Modern German Poetry.** Same as Comparative Literature 323. A poetical and metrical survey of modern German lyric verse. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
331. **The German NOVELLE.** A study of the development of the German NOVELLE as a genre, together with reading and discussion of *Novellen* from Goethe to Grass. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
332. **German Drama.** German drama from the classical to the modern period; selected works of representative playwrights, such as Lessing, Goethe, Schiller, Kleist, Grillparzer, Hebbel, Buechner, Hauptmann, Kaiser, Brecht, Frisch, Weiss, and Mueller. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
335. **Literature and Culture of the German Democratic Republic.** History, politics, and literature of the German Democratic Republic. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
341. **Martin Luther.** Same as Religious Studies 341. Special attention to Luther as an artist, and to his importance for the development of German language and literature; attention also paid to the historical and intellectual trends of the fifteenth and sixteenth centuries as well as to the significance of Luther in modern psychological and sociological thought. Prerequisite: A reading knowledge of German. 3 hours or $\frac{3}{4}$ unit.
342. **Goethe.** Introduction to Goethe's life and works. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
343. **Goethe's FAUST.** Intensive study of Goethe's *FAUST*, Parts I and II, with an examination of the theme's evolution in literature. Prerequisite: German 232 or equivalent. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, Italian, Portuguese, and Spanish 360. See English as an International Language 360.
365. **Structure of the German Language, I (Phonology and Morphology).** Introductory survey of the phonological and morphological structure of the German language. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit.
366. **Structure of the German Language, II (Syntax).** Introduction to German syntax; theory and practical applications. Prerequisite: German 365 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, Italian, Portuguese, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, Humanities, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
387. **Topics in Folklore.** Same as Comparative Literature, English, Slavic, and Speech Communication 387. See English 387.
390. **The German Cinema.** History and criticism of the German film from its beginnings through Expressionism and the New Objectivity of the 1920s, the Third Reich and the period of decline, to the young German film of the 1960s; weekly film screenings, lectures, and discussions. Knowledge of German useful but not required. 3 hours or $\frac{3}{4}$ unit.
396. **Special Topics in German Studies.** Intensive study of restricted topics in German language, literature and culture. Prerequisite: Three years of college German or equivalent. 3 hours or $\frac{3}{4}$ unit. May be repeated as topics vary to a maximum of 9 hours or $2\frac{1}{4}$ units.
400. **Beginning German for Graduate Students.** Introduction to the reading of German texts in the sciences and the humanities. 4 hours. No graduate credit.

401. **Readings in German for Graduate Students.** Designed for graduate students preparing for the German reading requirements for the Ph.D. Prerequisite: German 400 or equivalent. 4 hours. No graduate credit.
410. **Introduction to Graduate Study.** Bibliography and methodology of the study of the Germanic languages and literatures, with particular regard to German literature and Germanic linguistics; introduction to scholarship in general and the German profession in particular, including the modes and methods of scholarly endeavor. 1 unit.
415. **Middle High German.** Prerequisite: German 365. 1 unit.
420. **History of the German Language.** The internal and external history of German from prehistoric times to the present. Prerequisite: German 365 or equivalent. 1 unit.
430. **Old High German.** Grammar and interpretation of the oldest literary documents. Prerequisite: German 365. 1 unit.
440. **Middle High German Literature.** Prerequisite: German 415 or equivalent. 1 unit.
441. **German Romanticism.** Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
442. **Nineteenth-Century German Realism.** German realism as manifested in the literature between romanticism and naturalism, with emphasis on so-called poetic realism. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
444. **The Eighteenth Century before Goethe.** The Enlightenment and the development of the classical ideal; emphasizes the work of Gottsched, Lessing, Wieland, Klopstock, and Herder. Prerequisite: German 312 or equivalent. 1 unit.
451. **Naturalism, Symbolism, and Expressionism.** Same as Comparative Literature 441. Comparative analysis of German literature from the 1880s to the 1920s within the European context. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
452. **German Literature from the Twenties to the Present.** Trends, problems, and personalities in recent German literature, including exile literature and literature of the Third Reich. Prerequisite: Two 300-level courses in German literature, or equivalent. 1 unit.
460. **Seminar in Older German Literature.** Topics range from the earliest known literature to the Enlightenment. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
461. **Seminar in Modern German Literature.** Same as Comparative Literature 482. Topics range from the Enlightenment to the present. Prerequisite: German 410. 1 unit. May be repeated as topics vary.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, Italian, Portuguese, Russian and Spanish 463. See French 463.
480. **Teaching German in College.** Introduction to the problems of teaching German in college. $\frac{1}{2}$ unit.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, Italian, Portuguese, Russian and Spanish 481. See French 481.
482. **Seminar in Second Language Learning.** Same as Italian 480, Portuguese 480, and Spanish 480. See Spanish 480.
493. **Research in Special Topics.** $\frac{1}{4}$ to 2 units. May be repeated to a maximum of 2 units.
499. **Thesis Research.** 0 to 4 units.

Germanic

367. **Introduction to Germanic Linguistics.** Same as Linguistics 367. Comparative and historical survey of the Germanic languages. Prerequisite: Completion of the foreign language requirement in the College of Liberal Arts and Sciences, or equivalent; some knowledge of German desirable. 3 hours or $\frac{3}{4}$ unit.
426. **Gothic.** Synchronic and diachronic study of the Gothic language and its relationship to other Germanic and Indo-European languages; extensive reading of extant texts. Prerequisite: Germanic 367 or consent of instructor. 1 unit.

462. **Seminar in Germanic Linguistics.** Varying topics dealing with problems in diachronic and synchronic Germanic linguistics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated as topics vary.
465. **Comparative Germanic.** Reconstruction of the phonological and morphological systems of Proto-Germanic and their development into the Germanic languages and dialects. Prerequisite: Germanic 426 or consent of instructor. 1 unit.
467. **Runic Inscriptions.** Detailed analysis of inscriptions in the "older" Germanic futhark, the Anglo-Frisian futhorc, and the Scandinavian "younger" futharks; their relationships and the correlation between phonological and orthographic developments. Prerequisite: Germanic 465 or consent of instructor. 1 unit.

Scandinavian

101. **Elementary Scandinavian, I.** The first of four semesters leading to a reading knowledge of Danish, Norwegian, or Swedish, and to an oral command of one of these languages; linguistic structure, reading, and oral practice. 4 hours.
102. **Elementary Scandinavian, II.** Continuation of Scandinavian 101. Oral practice and reading of simple texts. Prerequisite: Scandinavian 101. 4 hours.
103. **Intermediate Scandinavian, I.** Readings in Danish and Norwegian, or in Swedish; structure of Swedish, or of Danish and Norwegian. Prerequisite: Scandinavian 102 or equivalent. 4 hours.
104. **Intermediate Scandinavian, II.** Continuation of Scandinavian 103. Readings in classical and modern Danish, Norwegian, or Swedish texts. Prerequisite: Scandinavian 103. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
215. **The Scandinavian Novel: Masterpieces in English Translation.** Same as Comparative Literature 215. Works by Jacobsen, Strindberg, Vesaas, Myrdal, and Nobel Prize winners Hamsun, Undset, Lagerkvist, and Johnson; readings and discussion in English. 3 hours.
251. **Germanic Mythology.** Same as Religious Studies 251. Studies pre-Christian beliefs of the Germanic peoples as reflected primarily in medieval Icelandic prose and poetry (in translation). 3 hours.
252. **Icelandic Sagas in Translation.** Same as Comparative Literature 252. Studies Old Norse-Icelandic literature: kings' sagas, family sagas, mythical-heroic sagas, and romances. Texts and lectures in English. 3 hours.
293. **Honors Senior Thesis.** Prerequisite: Senior standing; consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
361. **Ibsen in Translation.** Same as Comparative Literature 326. Dramas in English translation; selected works of Ibsen's Scandinavian contemporaries. 3 hours or 1 unit.
362. **Strindberg and the Later Scandinavian Dramatists in Translation.** Same as Comparative Literature 327. Major dramas and prose works of August Strindberg; selected plays by Kaj Munk, Kjeld Abell, Nordahl Grieg, and Par Lagerkvist. 3 hours or 1 unit.
390. **The Films of Ingmar Bergman.** Focuses on Bergman's major films of the late 1950s and 1960s; involves reading screenplays and extensive criticism in addition to viewing the films; and includes important artistic influences on Bergman as well as his own significance as a major twentieth-century artist. Knowledge of Swedish unnecessary. 3 hours or $3/4$ unit.
396. **Special Topics in Scandinavian Studies.** Individual study in selected topics, such as individual authors, literary movements, periods, genres, or themes, and Scandinavian culture. Prerequisite: Consent of instructor. 2 to 4 hours, or $1/2$ to 1 unit. May be repeated.
405. **Old Norse-Icelandic, I.** Grammar and selected readings. 1 unit. Offered in alternate years.
406. **Old Norse-Icelandic, II.** Readings; selections from the Elder Edda and the sagas. Prerequisite: Scandinavian 405. 1 unit. Offered in alternate years.

GRAPHIC DESIGN

(See Art and Design)

GRADUATE COLLEGE

Dean of College: Judith S. Liebman

College Office: 202 Coble Hall, Champaign

- 399. Graduate College Study Abroad.** Provides campus credit for study at accredited foreign institutions or approved overseas programs. Final determination of credit granted is made after the student's successful completion of work. Credit will not count toward residence requirements. Prerequisite: Full academic standing in the Graduate College and consent of major department, Graduate College, and Study Abroad office. 0 to 16 hours, or 0 to 4 units.

HEALTH AND SAFETY STUDIES

Head of Department: R. W. Armstrong

Department Office: 121 Huff Hall, 1206 South Fourth Street, Champaign

- 100. Contemporary Health.** Examines concepts of health and health promotion in contemporary society with emphasis on health and safety of individuals. Topics include: mental health and stress; exercise, nutrition and weight control; disease; sexuality; aging; environmental health; drugs, tobacco, and alcohol; and consumer health. 3 hours.
- 101. Introduction to Public Health.** Introduction to the nation's public health system; includes an overview of historical roots and organizational structure, basic research tools, concepts and scope of varied public health programs, topical treatment of major contemporary health and safety problems. 3 hours.
- 111. Professional Seminar.** Orientation to department; current views and issues in health and safety fields; career opportunities, and other related topics. 0 credit.
- 140. Health Advocate, I.** Provides an overview of current college student health issues and concerns, knowledge of the University of Illinois health care delivery system and an understanding of medical self care; develops skills in communication and referral techniques enabling students to be advocates for members of their living units. 2 hours.
- 141. Health Advocate, II.** Provides direct experiences in peer education and basic community health program planning including needs assessment and evaluation. Students plan and implement one campus-wide health promotion activity. Includes CPR certification. Prerequisite: Health and Safety Studies 140. 2 hours.
- 143. Drug Use and Abuse.** Introduction to the biological, psychological, pharmacological, and legal aspects of drug use and abuse; surveys community and university resources concerned with drug use and abuse; emphasizes personal and social actions for responsible drug use. 2 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Mental Health.** Introduction to the science of mental health and illness including personality development, the genesis and manifestations of mental illness, and the maintenance of mental health; taught by a psychiatrist with emphasis on the preventive and medical aspects of mental health. 2 hours.
- 204. Foundations of Health Behavior.** Examines the application of the social and behavioral sciences to health and health behavior; analyzes psychological, social psychological, and sociological approaches to health behavior. Topics include the development of health attitudes and behaviors, perceptions of health and illness, methods of changing health behavior and patient-provider interaction. Prerequisite: Health and Safety Studies 100. 3 hours.

- 206. Human Sexuality.** Emphasizes the behavioral aspects of human sexuality. Topics include: birth control; prenatal care, pregnancy and childbirth; sex roles; premarital sex; lifestyles; marriage and divorce. 2 hours.
- 210. Health Program Development.** Presents the elements of program development and planning as they pertain to various health settings including health care facilities, community agencies, and the school community; places special emphasis on student skills in developing example program plans pertinent to the student's area of interest. Prerequisite: Health and Safety Studies 100 and 101. 3 hours.
- 214. Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Leisure Studies, Psychology, and Rehabilitation 214. See Human Development and Family Studies 214.
- 225. Sexuality Program Development.** Examines theory and practice in the planning, implementation, and evaluation of sex education and sexuality programs in various settings; current topics and issues; students complete an individual planning project. Prerequisite: Health and Safety Studies 100 and 210. 2 hours.
- 240. Health Promotion Practicum.** Preparation and presentation of lifestyle workshops to campus community groups. Practica selected from one or more of the following topics: nutrition, fitness, chemical education, sexuality, or stress management. Prerequisite: Junior standing, or consent of instructor. 3 hours. May be repeated once for credit.
- 243. Drug Education Planning.** Development of curricula and education program strategies for management of drug use and abuse; evaluation of current school and community responses to drug use and abuse; pharmacological, psychosocial and legal aspects of drugs including tobacco, alcohol, medications, and illicit drugs. Prerequisite: Credit or concurrent registration in Health and Safety Studies 210. 2 hours.
- 250. Health Care Systems.** An overview of the major issues confronting health care systems from a macro perspective. Identification and analysis of the functions, major participants and trends in health care systems in the United States and abroad. Attention is directed at current and emerging issues having implications for health care systems in industrialized nations. 3 hours.
- 266. Tomorrow's Environment.** Same as Environmental Studies 236. See Environmental Studies 236.
- 274. Introduction to Epidemiology.** Provides an overview of the basic concepts, principles, and methods of epidemiology; emphasis on the application of epidemiology to health education, health services administration and planning, health policy, and environmental health. Prerequisite: Health and Safety Studies 100 and 101, or consent of instructor. 2 hours.
- 280. Orientation to Internship.** Provides students with information concerning placement in internship. Topics include internship requirements; student responsibilities; preparation of resumes and cover letters; selecting an organization or site; interviewing; issues of professional development. Prerequisite: Junior standing. 0 credit.
- 285. Health and Safety Studies Internship.** Supervised field experience in official, voluntary and professional health agencies; designed to provide students in Health and Safety Studies with work experience in actual field situations. Students work for 12 weeks in University-approved health agencies for a minimum of 480 hours. Prerequisite: Completion of Health and Safety Studies 300-level courses in field of concentration; Senior standing in Health and Safety Studies and consent of instructor. 8 hours.
- 290. Honors Seminar.** Same as Kinesiology 290 and Leisure Studies 260. See Kinesiology 290.
- 293. Special Projects.** Special projects in research and independent investigation in any phase of health, kinesiology, recreation, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser and instructor, and approval of the head of department. 2 or 3 hours. May be repeated for a total of 4 or 6 hours.
- 310. Public Health Practice.** Theory and practice of public health promotion as they relate to educational approaches in solving community health problems. Prerequisite: Health and Safety Studies 210, or consent of instructor. 4 hours or 1 unit.
- 312. Health and Safety Education in the Elementary School.** Overview of the school health program to acquaint the teacher with modern concepts of health and safety education in the elementary school; consideration of the role of the classroom teacher in understand-

- ing and meeting the health needs of children; and focus on the legal requirements for Illinois schools, major health and safety problems of elementary children, the teacher's role in the school health program, and methods and materials in teaching modern health and safety education. Prerequisite: Junior standing. 3 hours or $\frac{3}{4}$ unit.
- 313. Curriculum Development in Nutrition Education.** Same as Vocational and Technical Education 353. See Vocational and Technical Education 353.
- 317. Human Services in Industrial and Occupational Settings.** Same as Social Work and Labor and Industrial Relations 317. See Social Work 317.
- 321. Health Data Analysis.** Introduces health data analysis, sources and uses of health data, collection techniques and classification procedures, commonly used health indices, techniques of rate adjustment, graphic presentation of data as they relate to the planning, conducting, and evaluating of public and school health education programs. Prerequisite: Educational Psychology 390 or equivalent. 3 hours or 1 unit.
- 329. Research Techniques for the Health Sciences.** Study of the research literature, research designs, and evaluation models utilized in the public health sciences. Emphasizes developing skills in analyzing research and assessment of health behaviors, and problem identification and research design for individual student research projects. Prerequisite: Sociology 385 or Educational Psychology 390; or equivalent. 4 hours or 1 unit.
- 355. Health Services Financing.** Examines major topics and emerging trends in health financing, including sources of revenue, public and private financing organizations, reimbursement and sources of revenue to health providers, and capital financing in the health care industry. Prerequisite: Junior standing. 3 hours or $\frac{3}{4}$ unit.
- 356. The Organization of Health Care.** Same as Sociology 339. Examines types and performance of health care organizations (e.g., doctors' offices, clinics, hospitals, and nursing homes), networks of health services, evaluation of health care, and social policy issues relating to organizations in the U.S. health care system. Prerequisite: 6 hours of anthropology, sociology, health and safety studies, or psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 357. Health Planning.** Analysis of theory, principles and practices of health planning processes. Includes application of health planning as it relates to health systems agencies and the health care delivery system. Prerequisite: Health and Safety Studies 303, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 358. Health Administration.** Examines management principles relative to health care institutions; emphasizing goal setting, decision making, system analysis, organizational structure, conflict resolution, and leadership theories. Prerequisite: Senior or graduate standing, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 369. Environmental Health.** Same as Environmental Studies 369. Appreciation of the concepts and mechanisms used to reduce or prevent environmental problems that may lead to infectious or environmentally-induced diseases; presents topics from a public health perspective which include water supply management, waste water treatment and disposal, radiation protection, pest control, and solid waste management. Prerequisite: Health and Safety Studies 274 or equivalent. 2 hours or $\frac{1}{2}$ unit.
- 371. Epidemiology and the Media.** Same as Veterinary Pathobiology 371. See Veterinary Pathobiology 371.
- 374. Principles of Epidemiology.** Same as Environmental Studies, Medical Sciences, and Veterinary Pathobiology 374. The epidemiology and natural history of infectious and noninfectious diseases, including integrated vector control and host resistance; mental health and public health. Prerequisite: Microbiology 326, Veterinary Pathobiology 332, or equivalent; or consent of instructor. 4 hours or 1 unit.
- 375. Geographical Epidemiology.** Same as Geography 372. Patterns of health and disease in place and time; time-space analysis and mapping; interrelations between health and population, behavior, and environment; sociocultural aspects; investigative examples from mid-latitude continental, oceanic, and tropical settings. Prerequisite: Health and Safety Studies 374, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 385. Health and Safety Studies Advanced Internship.** Observation, study, and practical work in student's area of specialization under supervision in professional field situations; student works for a minimum of 12 weeks in a University-approved agency or site. Prerequisite: Health and Safety Studies 329, 374 and 410; or graduate standing in health and safety studies; or consent of the department. 4 hours or 1 unit.

394. **Special Topics.** Lecture-discussion course in topics of current interest; see *Timetable* for specific subjects. Prerequisite: Consent of instructor. 2 to 4 hours, or $1/2$ to 1 unit. May be repeated to a maximum of 8 hours or 2 units.
401. **Issues in Health Education.** Analyzes current developments, trends, and controversies in health education from an historical perspective, with emphasis on developing student competencies for issue analysis; assesses the effect of philosophical, scientific, political, and legislative initiatives on professional practice; and examines issues affecting the health educator in various work settings, including occupational health and safety, patient care, public health, school health, and higher education. 1 unit.
410. **Public Health Development.** Advanced study of the principles, practice and current issues of public health at the local, state, national and international levels, including the relationships between public health departments, voluntary health agencies, and other community organizations. 1 unit.
427. **Statistical Techniques in Epidemiological Research.** Same as Environmental Studies 427, Medical Sciences 463, and Veterinary Pathobiology 426. Description and application of quantitative issues and statistical techniques prominent in the analysis of classification data arising from epidemiologic cohort or case-control aetiologic studies; studies of preventive public health; and therapeutic clinical interventions. Confounding factors and methods of adjustment including standardization, stratified and matched analyses, and multiple logistic regression modelling are emphasized. Practice using available computing software for implementation is stressed. Prerequisites: Health and Safety Studies 374 and minimum of two statistics courses covering multiple regression and correlation. 1 unit.
440. **Health Behavior: Theoretical Perspectives.** Analysis of social science theories and perspectives that comprise the foundation of health education theory and practice. Includes development of a conceptual frame of reference for understanding, predicting, and facilitating change in health behaviors. Prerequisite: Graduate standing. 1 unit.
450. **Health Policy in the United States.** Comprehensive analysis of the policy process in health care in the United States; systematic and critical review of health policy development, implementation, and evaluation; impact of government at all levels and the role of providers, industry, labor, and consumer in health policy. Prerequisite: Admission to graduate program in health and safety studies or the MBA program; Health and Safety Studies 329; or consent of instructor. 1 unit.
451. **Public Health Policy.** Examines the historical mandates of public health and the formulation, substance, and implementation of public health policy at state and local levels of government; students select case studies to evaluate the performance of the public health sector in achieving its goals through health policy. Prerequisite: Health and Safety Studies 450 or consent of instructor. 1 unit.
476. **Epidemiology of Infectious Diseases.** Same as Veterinary Pathobiology 416. See Veterinary Pathobiology 416.
477. **Principles and Methods of Veterinary Epidemiology.** Same as Veterinary Pathobiology 417. See Veterinary Pathobiology 417.
479. **Seminar in Epidemiology.** Discussion of advanced topics in epidemiologic methods and research. Prepares students for thesis or dissertation research through study of selected literature and the completion of a research paper. Prerequisite: Health and Safety Studies 374 or equivalent. 1 unit.
490. **Seminar for Advanced Students.** Critical evaluation of research studies in health and safety studies, emphasizing research methods and experiment design and analysis; review of statistical techniques in factorial and correlational studies; and student reports of thesis literature reviews and research procedures. Prerequisite: Master's thesis. $1/2$ unit. May be repeated to a maximum of 1 unit.
493. **Special Projects. Independent research on special projects.** Prerequisite: Educational Psychology 390, Kinesiology 495, and Health and Safety Studies 440 or equivalent. $1/2$ to 2 units. May be repeated to a maximum of 2 units.
494. **Special Topics in Health and Safety Studies.** Lectures on topics of current interest. $1/2$ or 1 unit.
499. **Thesis Research.** Preparation of theses in health and safety studies. 0 to 4 units.

HISTORY

Chair of Department: Charles Stewart

Department Office: 309 Gregory Hall, 810 South Wright Street, Urbana

111. **Western Civilization from Antiquity to 1660.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society before 1660; includes the Greek and Roman world, the German migrations, the rise of cities and the commercial revolution, medieval art, universities, and heresies, the Renaissance and Reformation, the Puritan Revolution, and the beginnings of the modern world. 4 hours.
112. **Western Civilization from 1660 to the Present.** The fundamental developments—social, economic, cultural, intellectual, and political—in the history of mankind and Western society since 1660; includes the rise of modern science, the French and Industrial revolutions, the Romantic movement, the growth of nationalism and socialism, imperialism, urbanization, the Russian Revolution, Nazi Germany, the world wars, and the West and the underdeveloped world. 4 hours.
131. **History of England to 1688.** Survey of the political and constitutional, social and economic, religious and cultural, and imperial history of the British people from the beginning of English history through the revolution of 1688. 4 hours.
132. **History of England, 1688 to the Present.** Survey of the political and constitutional, social and economic, diplomatic and imperial, religious and cultural history of the British people from 1688 to the present. 4 hours.
151. **History of the United States to 1877.** Colonial foundations, movement for independence, and early years of the republic. 4 hours. Credit is not given for both History 151 and either History 260 or 261.
152. **History of the United States, 1877 to the Present.** The evolution of an industrial, urbanized, and pluralistic society, grappling with domestic and global problems. 4 hours. Students Credit is not given for both History 152 and 262.
168. **Indian Civilization and Society.** Same as Anthropology 168. An introductory survey course on an interdisciplinary basis dealing with the evolution of Indian religion, politics, culture, and social organization. 4 hours.
170. **East Asian Civilizations: China, Japan, Korea.** Same as East Asian Languages and Cultures 170. Surveys the three major East Asian civilizations from ancient and classical times, through the period of Western influence, political revolution, and modernization, to the contemporary age and the emergence of East Asian superpowers. 3 hours.
172. **Southeast Asian Civilizations.** Same as Anthropology and Asian Studies 186. See Anthropology 186.
173. **Islamic History and Civilization in the Near and Middle East to 1700.** Development of Islamic beliefs, institutions, and culture in the nuclear Islamic region (the present area of the Arab countries and Israel, Iran, and Turkey) from Mohammed to the age of European expansion. 4 hours.
174. **Islamic History and Civilization in the Near and Middle East Since 1700.** Islamic civilization since the age of European expansion; imperialism, Westernization, nationalism, and modernization. Arab countries, Israel, Iran, and Turkey are covered. 4 hours.
175. **Latin America from Conquest to Independence.** Survey of Latin American history from the discovery of America to 1824. 3 hours.
176. **Modern and Contemporary Latin America.** History of the Latin American republics from their independence to the present; emphasis on Argentina, Brazil, Chile, Colombia, Cuba, and Mexico. 3 hours.
181. **The Ancient World.** Ancient empires and Greece. 3 hours.
182. **The Ancient World.** Rome. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Through research, reports, and discussion in a selected field of

historical study, the seminar provides a thorough understanding of the problems of that field and of the methods of history as a discipline. Prerequisite: James Scholar standing or other designation as a superior student; consent of instructor. 3 to 4 hours. May be repeated to a maximum of 6 hours.

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
203. **The Age of Localism: The Early Middle Ages.** The failure of imperial Rome and the rise of the Church; the organization of European society on a local basis through manorialism and feudalism. 3 hours.
204. **The Revival of Europe: The High and Later Middle Ages.** The revival of the economy; the expansion of Europe; and the rise of national states. 3 hours.
211. **The Contemporary World: Political, Ideological, and International Forces.** Interpretation of the contemporary world covering the legacy of imperialism, militarism, and world politics, the revolt of the masses, the totalitarian state, nationalism, internationalism, and such related topics. 3 hours.
212. **The Contemporary World: Economic, Social, and Cultural Aspects.** Interpretation of the contemporary world covering the economics of global power, ideological and social forces, the individual and the modern mind, the collective society, the personality in history, and such related topics. 3 hours.
215. **History of North and West Africa.** Survey of major themes and events in the history of North and West Africa from prehistoric times and the peopling of Africa through the advent of Islam; North and West African empires and states in the medieval period; the arrival and departure of European colonial powers; and the re-emergence of independent African states. 3 hours.
216. **History of East and Southern Africa.** Survey of major themes and events from the Bantu migrations and the rise of Aksum through the development of states and empires, Islam, the expansion of trade, European colonial rule, nationalism, and the persistence of white domination in the south. 3 hours.
219. **Survey of Russian History from Early Times to the Present.** Main themes and problems of Russian history from earliest times to the present. 3 hours.
222. **Traditional China.** Same as East Asian Languages and Cultures 222. Historical background to the modern age, tracing the Chinese state and empire from the earliest times until 1644 A.D. Basic political, social, and economic patterns; cultural, intellectual, and technological achievements; and China's impact on Asia and the world. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as East Asian Languages and Cultures and Religious Studies 224. Examination of China's principal philosophical, religious, and political schools of thought—such as Confucianism, Taoism, Zen Buddhism, and Maoism—as ways of understanding one of the world's major civilizations; the period of the classical philosophers, the glory years of empire, and the troubled era of western contact receive approximately equal attention. 3 hours.
237. **Contemporary Western Europe.** Same as Economics 237. See Economics 237.
247. **Science in Western Civilization, I.** The intellectual and social history of science from antiquity through the Enlightenment; special emphasis on the scientific revolution of the seventeenth century. 3 hours.
248. **Science in Western Civilization, II.** Topics in the intellectual and social history of modern science, 1789 to the present. 3 hours.
249. **History of Medicine.** Rise and development of medicine in the West since the sixteenth century; interrelations of physiology, pathology, and social demands with the theory and practice of medicine; patterns of professionalization; social role of the physician; conflict among ideas of medicine as an art, a science, and a social service; and problems of mental illness, medical ethics, and nontraditional forms of practice. Prerequisite: One year of college biology or chemistry, one year of college history, or consent of instructor. 3 hours.
253. **Afro-American History to 1877.** Same as Afro-American Studies 253. History of Africans in the Americas, surveying the African slave trade, slavery in the European colonies of the Americas, early United States slavery, and the Afro-American in the Civil War and Reconstruction. 3 hours.
254. **Afro-American History Since 1877.** Same as Afro-American Studies 254. History of

- Afro-Americans in the age of white supremacy; the rise of modern protest organizations; the era of integration; and the black power movement. 3 hours.
255. **New England, 1620-1789.** The founding of the New England colonies and their development through the period of the American Revolution. 3 hours.
260. **Colonial Beginnings and Early United States History to 1815.** Social, economic, and political survey of the region and its relation to the evolving Atlantic community. Credit is not given for both History 260 and 151. 3 hours.
261. **The United States in the Nineteenth Century.** History of the United States from 1815 to 1900. 3 hours. Credit is not given for both History 261 and 151.
262. **The United States in the Twentieth Century.** One major emphasis on foreign policy, including the emergence of the United States as a great power after 1898; a second emphasis on the Progressive movement and recurrent attempts at the reform of American society; and racial and urban problems and the conservation of natural resources included. 3 hours. Credit is not given for both History 262 and 152.
265. **Europe and the Romantic Revolution, 1770-1850.** Examines Romanticism as a basic psychological orientation that received its first elaborate cultural development and historical definition in the period indicated; treats various aspects of human activity, such as love, heroism, nature worship, morbidity, social idealism, and nationalism from the standpoint of the Romantic Movement. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
267. **History of Korea.** Same as East Asian Languages and Cultures 267. See East Asian Languages and Cultures Studies 267.
268. **Religious Rebellions and Messianic Movements in History.** Same as Religious Studies 268. Comparative study of revolutionary religious movements from ancient times to the present. 3 hours.
273. **The History of American Women: Colonial Period to the Present.** Same as Women's Studies 273. Focuses on the changing legal, political, economic, and social status of women in the United States and the complex factors affecting change; includes a consideration of family life; and combines chronological and topical approaches. 3 hours.
274. **United States and World Crisis, 1917 to Present.** History of American foreign relations since World War I. 3 hours.
281. **War, Military Institutions, and Society to 1815.** Land and naval warfare from prehistory to Napoleon; discusses traditional topics such as technology, tactics, and strategy at length and demonstrates how military institutions are integrated with society as a whole. 3 hours.
282. **War, Military Institutions, and Society Since 1815.** Land and naval warfare since Napoleon; technology, tactics, strategy, administration, and military institutions in themselves and as they relate to western and nonwestern societies; and conventional nuclear warfare. 3 hours.
285. **Premodern Japanese History.** Same as East Asian Languages and Cultures 285. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the earliest times to the sixteenth century. 3 hours.
286. **Modern Japanese History.** Same as East Asian Languages and Cultures 286. An introduction to the history of the Japanese people, their social and cultural systems, politics, and economy, from the mid-sixteenth century to the mid-twentieth century. 3 hours.
289. **Comparative Muslim Societies.** Same as Anthropology 289 and Religious Studies 289. See Religious Studies 289.
290. **Individual Study.** Readings in selected fields in consultation with the instructor. Prerequisite: Junior or senior of high standing; written consent of the honors adviser. 2 to 4 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Two-semester research project. Prerequisite: History major with senior standing and 4.5 grade-point average; written consent of supervising professor and honors adviser. May be taken by honors students in partial fulfillment of department honors requirements. 3 hours. Must be repeated for a total of 6 hours. (Counts for advanced hours in LAS.)
296. **Special Topics.** Topics are given on an experimental one-time-only basis. 3 hours.

298. **Colloquium in History.** Prerequisite: Junior standing; 14 hours in history, or, with consent of instructor, 14 hours in the social sciences and/or humanities. 3 hours. May be repeated as topics vary to a maximum of 6 hours. (Counts for advanced hours in LAS.)
301. **European Working-Class History: 1750 to the Present.** Same as Labor and Industrial Relations 301 and Sociology 301. Comparative study of the rise of the working class in European countries; formation, culture, and daily life; stratification within the working class; workers in organized labor and revolutionary movements. Prerequisite: One year of college history, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
303. **The Middle East in the Twentieth Century.** Great power diplomacy, imperialism, nationalism, and problems of modernization studied through coverage of Arab states and Israel, Turkey, and Iran. Prerequisite: One year of college history or political science, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
304. **Medieval Civilization.** Same as Religious Studies 304. The architectural, artistic, philosophical, political, and religious components of medieval culture, thought, and patterns of behavior; includes monasticism and society and the individual. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $1/2$ or 1 unit.
305. **The Age of the Renaissance.** Same as Religious Studies 305. Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
306. **The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as Religious Studies 306. Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
307. **Islam and the Near and Middle East from Mohammed to 1258.** Same as Religious Studies 307. The Koran and the Prophet; rule from the Atlantic Ocean to India; Arab and Persian Muslims; caliphate and sultanate; law, theology, mysticism, and heresies; Crusades; trade and commerce; and intellectual and cultural achievements. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
308. **The Emergence of the Modern Middle East in the Eighteenth and Nineteenth Centuries.** Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
309. **Development of Modern Europe; Absolutism and Colonial Expansion, 1648-1789.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
310. **Europe in the Age of the French Revolution and Napoleon.** Comparative survey of Western countries in the age of democratic upheavals; America, England, and Prussia as well as France; the rise of Napoleon and the response of Europe; and the fate of innovation and reform in the immediate aftermath of the Napoleonic Wars. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
311. **European History from 1815 to 1871.** A synthesis of politics, economics, and culture; revolutions, reaction, liberalism, conservatism, socialism, nationalism, romanticism, and realism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
312. **European History from 1871 to 1918.** A synthesis of politics, economics, and culture; new state systems, long depression, imperialism, racism, nationalism, imperialism, symbolism, fin de siecle, socialism, and World War I. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
313. **European History from 1918 to 1939.** Survey of European society from 1918 to 1939, with emphasis on the impact of World War I, the Russian Revolution, fascism, and the intellectual trends of the twenties and thirties. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
314. **European History from 1939 to the Present.** Survey of European society since 1939, with emphasis on the impact of World War II, the cold war, the establishment of the welfare state, and social developments. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
316. **The Industrial Revolution in Europe, 1780-1900.** Comparative analytic study of industrial development in England, France, Germany, and Russia; social, cultural, and demographic consequences of rapid economic change. 3 hours, or $1/2$ or 1 unit.
318. **European International Affairs, 1815-1914.** The history of European international affairs from the Vienna Congress to the First World War, with the main focus on political developments, but with considerable attention also paid to the influence of domestic

- politics and social and economic changes on foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
319. **European International Affairs, 1914 to the Present.** The history of European international affairs from the First World War to the present day, concentrating on political developments, especially the two world wars, but including the impact of domestic politics, ideological struggle, and socio-economic change upon foreign policy. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
320. **Russia from the Earliest Times to Peter the Great.** Political, economic, cultural, and social development of Russia during the Kievan and Muscovite periods. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
321. **Early Imperial Russia.** From Peter the Great's 'service class state' to the 'disensermnt' of Russian society under Alexander II: The evolution of political institutions and social groups, including the relationship between autocracy and nobility, the role of serfdom, the growth of the bureaucratic state, and the origins of the Russian intelligentsia. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit. For higher credit, graduate students will be required to do more reading and to write an additional paper.
325. **Southern Africa: Race and Power.** Same as African Studies 325 and Political Science 333. See African Studies 325.
326. **Intellectual and Cultural History of Russia.** Survey of major themes in the development of Russian culture and thought, with emphasis on the nineteenth and twentieth centuries. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
327. **Late Imperial Russia.** Modernization and industrial revolution in Russia from the end of serfdom to the overthrow of autocracy in 1917: The transformation of an agrarian economy; the emergence of a working class; the revolutionary movement; the dilemma of Russian liberalism; war and revolution. Prerequisite: One year of college history, or consent of instructor. 3 hours, or $1/2$ or 1 unit. For higher credit, graduate students will be required to do more reading and to write an additional paper.
328. **History of the Soviet Union since 1917.** Political, social, and economic development of the USSR since the 1917 revolutions that brought the Bolsheviks to power; social change and social engineering; political struggles among Stalin and his rivals; the "Stalin revolution" from above and economic modernization; the USSR's emergence through World War II and the Cold War as a world power; "developed socialist" society. Prerequisite: One year of college history, or consent of instructor. 3 hours, or $1/2$ or 1 unit. Graduate students will write an additional substantial paper and engage in special discussion sections.
329. **Southeastern Europe, 1700-1918.** The political, economic, and cultural development of the Rumanians, South Slavs, Greeks, and Albanians; the impact of Ottoman rule; the rise of nationalism and the formation of national states; and the Orthodox Church. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
330. **Eastern Europe, 1919 to the Present.** The political, economic, and cultural history of Poland, Czechoslovakia, Hungary, Rumania, Yugoslavia, Bulgaria, Greece, and Albania; particular emphasis upon the post-World War II era. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
331. **Medieval Economic and Social History.** Includes the decline of Roman society, the age of localism, the revival of commerce and urbanism, medieval capitalism, and economic decline and social turmoil. Prerequisite: One year of college history or consent of instructor. 3 hours or 1 unit.
332. **Medieval England.** Economic, intellectual, religious, and social developments as reflected in the art and architecture of medieval England from the time of the German invasions to about the fifteenth century. Prerequisite: Sophomore standing or consent of instructor. 3 hours, or $1/2$ or 1 unit.
333. **England under the Tudors and Stuarts, 1485-1660.** Politics, religion, and society in the era of the Protestant Reformation and the Civil War. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
335. **History and Culture of Venice.** Examines Venice from its origins at the time of the Roman

Empire until the present. Includes economic, political, and social history; humanism; philosophy; art; architecture; literature; music; and popular culture. Fully illustrated with slides. 3 hours or 1 unit.

336. **France, 1815-1920.** The development of France, with special attention to questions of social history. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
337. **American Working Class History, 1780 to the Present.** Same as Labor and Industrial Relations 337. Focuses on working class formation, culture, ideas, and organization; examines daily experience of work and community life; special emphasis on race, ethnicity, and gender in the process of class formation; labor relations and the changing patterns of working class protest and accommodation. Prerequisite: One year of college level history, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
338. **History of Biology.** Same as Biology 338. Development of biological thought from antiquity to the present, emphasizing evolutionary theory and physiology in the nineteenth century and genetics in the twentieth century. Prerequisite: One year of college biology or history, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
339. **Scientific Thought, I.** Same as Philosophy 317 and Sociology 305. See Philosophy 317.
340. **Scientific Thought, II.** Same as Philosophy 318 and Sociology 306. See Philosophy 318.
341. **Modern Britain: the Victorian Era, 1815-1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
342. **Modern Britain Since 1900.** History of the political, constitutional, social, economic, and diplomatic developments of the United Kingdom, including Ireland. Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
343. **The Turks and the Ottoman Empire, 1100-1566.** Turkish migrations; the Crusades; Genghis Khan and the Mongols; Seljuks of Rum; Ottoman expansion; Islamic mysticism and law; society and economy; and international trade routes in the Black Sea and eastern Mediterranean. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
344. **The Ottoman Empire, 1566-1924.** Economy, society, law, and government; the Ottomans and Mediterranean society; Ottoman culture and Islamic tradition; minorities; trade, diplomacy, and capitulations; "decline" and dismemberment; and traditional and westernizing attempts at revival. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
346. **Thought and Society in Modern Europe, 1789-Present.** Same as Sociology 304. Examines the reciprocal relationship between thought and society in western Europe from the French Renaissance to the present. Prerequisite: Sociology 200, or one year of college history, or consent of instructor. 3 hours or 1 unit.
347. **History of Roman Law and Legal Tradition.** Examines Roman law and legal tradition in the context of historical, political, and social developments; origins of law in primitive and ancient classical societies; surveys development of precedent, codification, and preservation of Roman law, and the impact of Roman law on western legal traditions. Prerequisite: One year of college history, political science, or classical civilization; or consent of instructor. 3 hours, or $1/2$ or 1 unit.
349. **War and Society in Early Modern Europe, 1450-1815.** Technology, tactics, operations, and strategy of warfare from the Renaissance through the Napoleonic Era; the impact of war and military institutions upon economics, society, and government; topics vary. Prerequisite: History 281, 282, 306, 309, or 310, or consent of instructor. 3 hours or 1 unit.
352. **Colonial Beginnings of American Life and Institutions.** Study of the seventeenth- and eighteenth-century colonies to 1763. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
354. **The Era of the American Revolution, 1763-89.** Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
355. **Federalists, Jeffersonians, and the Era of Good Feeling.** United States history from 1789 to 1828, with emphasis on the conflict between nationalism and sectional interests. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.

356. **America in the Age of Jackson.** Political, social, and cultural study of the United States from the 1820s to the 1850s, including the humanitarian reform movements, manifest destiny, and the Mexican War. 3 hours, or $1/2$ or 1 unit.
359. **Civil War and Reconstruction.** The United States between 1850 and 1877, with emphasis on the causes of the war, wartime problems of the North and South, and efforts to create a new Union after the war. 3 hours, or $1/2$ or 1 unit.
360. **History of the United States, 1877-1909.** Prerequisite: One year of college history, political science, or economics. 3 hours, or $1/2$ or 1 unit.
361. **Immigrant America.** History of immigration and immigrant groups in the United States from 1830 to 1980. Covers major waves of immigration and focuses on the diverse cultural heritage, social structure, and political activism of immigrants from Europe, the Americas, and Asia. Prerequisite: One year of college American history or consent of instructor. 3 hours or 1 unit.
362. **History of the United States since 1932.** Discusses the New Deal, the Cold War, Franklin D. Roosevelt and subsequent presidents, the structure of American imperialism, and America's role in world politics. Prerequisite: One year of college history, political science, or economics. 3 hours, or $1/2$ or 1 unit.
363. **Social History of Industrial America to 1918.** The impact of industrialization, immigration, and urbanization on American society to the end of World War I. Prerequisite: One year of college history. 3 hours, or $1/2$ or 1 unit.
364. **Social History of Industrial America Since World War I.** Study of the impact of industrial technology, business enterprise, immigration, and urbanization on American society. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
366. **The History of Illinois in the Twentieth Century.** The development of a modern American state in the twentieth century with emphasis upon its political life, economic growth, social and intellectual problems, and contribution to the nation. Includes Chicago's expanding role in the history of Illinois. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
367. **The Trans-Mississippi West.** The West in American history since the Louisiana Purchase; western stereotypes, order and violence, racial minorities, the urban sector, natural resources, and environmental policy. 3 hours, or $1/2$ or 1 unit.
368. **The South in American History.** Same as Afro-American Studies 368. Exploration of the history of the American South identifying and explaining differences between the South and the rest of the nation; examines the correlates of economic change in the realms of politics, social structure, and cultural values. Race relations provides a central theme of the course. 3 hours, or $1/2$ or 1 unit.
369. **Constitutional Development of the United States to 1865.** Prerequisite: One year of college history or political science. 3 hours, or $1/2$ or 1 unit.
370. **Constitutional Development of the United States Since 1865.** Prerequisite: One year of college history or political science. 3 hours, or $1/2$ or 1 unit.
371. **American Intellectual and Cultural History to 1865.** Same as Religious Studies 381. Examines the role of religious, scientific, political, social, educational, and artistic thought and institutions in shaping a distinctive American culture, emphasizing Puritanism, the Enlightenment, and the Romantic movement. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
372. **American Intellectual and Cultural History since 1859.** Same as Religious Studies 382. Treats the leading intellectual and cultural influences in shaping modern and contemporary America, emphasizing the impact of Darwinism and naturalistic thought, science and technology, the American university, divisions in religious thought (Modernism, Fundamentalism, Neo-Orthodoxy), the Counterculture, and the New Conservatism. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
373. **History of American Foreign Relations to 1917.** 3 hours, or $1/2$ or 1 unit.
374. **Imperialism, 1870 to the Present.** Deals thematically with controversial issues concerning imperialism in the past century; includes various theories on the origins of imperialism, the diverse character of European empires before 1914, the impact of the world

- wars on empire, and American and Soviet "imperialism" since World War II. Prerequisite: One year of college history or political science. 3 hours, or $\frac{1}{2}$ or 1 unit.
375. **Andean Countries of South America, 1532 to the Present.** The history of Colombia, Ecuador, Peru, Bolivia, and Chile; emphasizes common problems and diverse responses, from the conquest in the sixteenth century to the struggles for development in the twentieth. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
377. **History of Modern Brazil, 1808 to the Present.** Problems of a neocolonial society; themes include family structure, slavery, imperialism, modernization, and the crisis of traditional institutions. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
378. **History of Mexico, 1519 to the Present.** The development of Mexico from the conquest to the postrevolutionary present. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
379. **Slavery and Race Relations in Latin America.** Same as Afro-American Studies 379. Selected topics on Indians and Spaniards, whites and blacks, emphasizing Mexico, the Caribbean, and Brazil. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
380. **Twentieth Century Africa: The Colonial Era.** The peoples, cultures, and societies of Africa under European colonial dominance. Although attention is paid to colonial policies and practices, the primary focus is on the continuing autonomy of African peoples. Special attention will be given to the cases of Ethiopia and South Africa. Prerequisite: History 215, 216, or African Studies 222, or junior standing. 3 hours or 1 unit.
381. **Ancient Greek States.** History of the Greek states from the earliest times to 334 B.C. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
382. **Alexander and His Successors.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
383. **History of the Roman Republic to 44 B.C.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **The Roman Empire.** Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **African Independence and Underdevelopment: 1945 to the Present.** Same as Political Science 332. Historical investigation of African political economies based on selected case studies; includes development of the colonial economy, economic bases of African nationalism, and postindependence underdevelopment and attempts to escape from it. Prerequisite: One year of college history or enrollment in the African Studies program. 3 hours, or $\frac{1}{2}$ or 1 unit.
386. **The Horn of Africa: Nationalism and Revolution.** A complete survey of the history of the Horn, from the origins of agriculture and pastoralism to the late twentieth century. Covers classical Aksum, medieval Ethiopia, and the coastal Islamic city states; concentrates on the twentieth century and the rise of conflicting nationalisms, the outbreak of revolution, and famine. Prerequisite: History 216 or African Studies 222 or junior standing. 3 hours or 1 unit.
387. **History of Central America.** Major themes of Central American history since conquest: the Colonial regime, ethnic diversity, the independence movement, fragmentation in the nineteenth century, export economies and imperialism, 1880-1932, social movements and populism in the twentieth century, revolution and intervention since the 1950s. Prerequisite: One year of college history or consent of the instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
388. **India from Colony to Nation.** Mughal Empire and British Raj, Indian national awakening, and struggle for independence under Ghandi and Nehru. 3 hours, or $\frac{1}{2}$ or 1 unit.
390. **China Under the Ch'ing Dynasty.** Same as East Asian Languages and Cultures 390. The period of Manchu domination in China (1644-1912); emphasis on Chinese reactions to Western influences during the nineteenth century. Prerequisite: One year of college history or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
393. **Social-Economic History of Modern China.** Same as East Asian Languages and Cultures 393. Disintegration of traditional social and economic systems during the nineteenth and

- twentieth centuries, and the political effects of that disintegration; examines changes in the agricultural economy, changing rural elites, urbanization, and emergence of new social classes. It is recommended that students take History 390 and 394 before registration in History 393. 3 hours, or $1/2$ or 1 unit.
394. **Twentieth-Century China.** Same as East Asian Languages and Cultures 394. Chinese state and society in revolutionary transition; emphasis on the Nationalist and Communist revolutions and their results. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
396. **Politics and Society in Twentieth-Century Germany.** Political upheavals of twentieth-century Germany; topics include the First World War's impact on German society, the war's revolutionary aftermath, the political struggles and cultural achievements of the Weimar Republic, the rise of Hitler, the Third Reich, the Holocaust, the Second World War, and the divided postwar Germanies; novels and films complement readings. Prerequisite: History 112. 3 hours or 1 unit.
397. **History of Spain and Portugal.** Iberian history from pre-Roman times to the present with emphasis on the modern period. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
398. **The Habsburg Monarchy, 1526-1792.** A history of the Habsburg Monarchy from the union of Austria, Bohemia, and Hungary to the end of the period of reform. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
399. **The Habsburg Monarchy, 1792-1918.** Social, cultural, economic, and political development; evolution of the central institutions of the monarchy and the monarchy's place in the European state system; and internal history of the constituent peoples of the monarchy: Germans, Magyars, Czechs, Slovaks, Poles, Slovenes, Croats, Serbs, Ruthenians, and Rumanians. Prerequisite: One year of college history or consent of instructor. 3 hours, or $1/2$ or 1 unit.
411. **Seminar in Ancient History: Greece.** 1 unit.
413. **Seminar in Ancient History: Rome.** 1 unit.
415. **Seminar in Medieval History.** 1 unit.
417. **Seminar in European History, 1350-1648.** 1 unit.
419. **Seminar in European History, 1648 to 1815.** 1 unit.
421. **Seminar in European History Since 1815.** 1 unit.
423. **Seminar in English History to 1688.** 1 unit.
425. **Seminar in English and British Empire History Since 1688.** 1 unit.
427. **Seminar in Russian History.** 1 unit.
434. **Research Seminar in Japanese History.** Same as East Asian Languages and Cultures 434. The period covered will alternate between the Early Modern (1550 - 1850) and Modern (1850 - present) eras. Prerequisite: Graduate standing in History, East Asian Studies, or other related discipline and reading knowledge of Japanese, or consent of instructor. 1 unit. May be repeated as topics vary to a maximum of 2 units.
441. **Seminar in Near and Middle Eastern History.** Investigates research topics in Near and Middle Eastern history in accordance with students' needs. Topics may vary from semester to semester. Students will prepare oral and written reports. Prerequisite: Graduate standing. 1 unit. May be repeated to a maximum of 2 units.
448. **Seminar in African History.** Prerequisite: History 215, 216, and one upper-level African history course. 1 unit.
451. **Seminar in Early American History to 1789.** 1 unit.
453. **Seminar in American History Since 1789.** 1 unit.
461. **Seminar in Latin American History.** 1 unit.
471. **Seminar in the History of Science.** 1 unit.
472. **Seminar in History of Medicine: Selected Topics from Antiquity to the Present.** 1 unit.
473. **Seminar in Military History.** Prerequisite: Consent of instructor. 1 unit.
474. **Problems in Japanese History.** Same as East Asian Languages and Cultures 474. The period covered will alternate between the Early Modern (1550-1850) and Modern (1850-present) eras. Prerequisite: Graduate standing. 1 unit. May be repeated to a maximum of 2 units.

475. **Problems in Ancient History.** 1 unit.
476. **Problems in Medieval History.** 1 unit.
477. **Problems in Early Modern European History.** 1 unit.
478. **Problems in European History since 1815.** 1 unit.
479. **Problems in English History before 1688.** 1 unit.
480. **Problems in English History since 1688.** 1 unit.
481. **Problems in Russian History.** 1 unit.
482. **Problems in Military History.** Prerequisite: Graduate standing. 1 unit.
483. **Problems in Chinese History.** Same as East Asian Languages and Cultures 483. 1 unit.
484. **Problems in European History, 1350-1648.** 1 unit.
485. **Problems in Near and Middle Eastern History.** Covers, in depth, major problems of specific periods and areas and the relevant literature of Near and Middle Eastern History, which will vary from semester to semester. Prerequisite: Graduate standing. 1 unit. May be repeated to a maximum of 2 units as topics vary.
486. **Problems in American History to 1830.** 1 unit.
487. **Problems in American History since 1815.** 1 unit.
488. **Problems in Latin American History.** 1 unit.
489. **Problems in African History.** 1 unit.
490. **History and Social Theory.** Introduces recent historical work drawing upon theories and concepts from the social sciences; considers fields of inquiry which include family history, demographic history, labor history, prosopographical and entrepreneurial studies, local and regional studies, and others. 1 unit.
491. **Quantitative Techniques for Historians.** Focuses on the use of quantitative techniques in historical research, exploring problems in research design, data management and computer techniques, and the evaluation of statistics used by historians. Prerequisite: Sociology 385 or consent of instructor. 1 unit.
492. **Problems in Comparative History.** Intensive comparative examinations of particular issues in the histories of multiple countries, cultures or periods; emphasizes methodology, the discipline of comparative history, and the nature of historiography in a cross-cultural and interdisciplinary context. Prerequisite: Consent of instructor. 1 unit.
495. **Individual Research Project.** Directed research in special fields; may be taken in lieu of seminars in fields in which seminars are seldom offered. 1 unit.
496. **History of Historiography.** Introduction to the great historians from early times to the present. Prerequisite: Graduate standing in history or consent of instructor. 1 unit.
497. **Reading Course.** Directed readings in special fields. Primarily, but not exclusively, for students with a master's degree or equivalent, who are preparing for the preliminary examination in history and who need instruction in areas not provided by current course offerings. Prerequisite: Consent of instructor. 1 unit.
498. **Problems in the Teaching of College History.** Prerequisite: Candidate for Ph.D. degree in history. $1\frac{1}{2}$ unit.
499. **Thesis Research.** Individual direction in research and guidance in writing theses for advanced degrees. 0 to 4 units.

HISTORY OF ART

(See Art and Design)

HORTICULTURE

Head of Department: Anton G. Endress

Department Office: 1005 Plant Sciences Laboratory, 1201 South Dornier Drive, Urbana

100. **Introduction to Horticulture.** Basic principles of plant growth and development as they apply to the production, marketing, and utilization of fruits, vegetables, and ornamental plants. 3 hours.
125. **Survey of Landscape Horticulture.** Consumer analysis of horticultural elements and nonplant items utilized in the development of residential, commercial, and community landscapes; includes analysis of objectives, site, plants, installation, and maintenance; and considers selection and development of specialty gardens and interior landscapes in order to develop analytical skills in evaluating needs, materials, and services available. Not open to students in ornamental horticulture curriculum. 3 hours.
131. **Introduction to Floral Design.** Introduces the art of arranging flowers, foliages, and accessories according to the principles of design. Lecture and lab; fee required. 2 hours. Credit not given for students in ornamental horticulture.
190. **Home Vegetable Gardening.** Principles and practices of producing vegetables in the home garden by traditional and organic methods; lecture and laboratory. 3 hours. Credit is not given to horticulture majors. All other students: may not receive credit for both Horticulture 190 or 242.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Identification and Use of Woody Ornamental Plants, I.** Systematic approach to the identification, ornamental characters, culture, propagation, production, and use of woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
202. **Identification and Use of Woody Ornamental Plants, II.** Systematic approach to the identification, ornamental characters, culture, propagation, production and use of woody ornamental conifers, broadleaf evergreens, vines, ground covers and woody ornamental deciduous trees and shrubs; special emphasis on the cultivated varieties. Prerequisite: Plant Biology 100 and Horticulture 201, or consent of instructor. 3 hours.
210. **Home Grounds Planning and Design.** Practice of developing home grounds emphasizing planting design; analysis of and practical solutions for typical site problems; and evaluating garden structures as elements in home grounds planning and design. Prerequisite: Horticulture 202; limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agriculture occupations for secondary teachers curriculum. 4 hours.
211. **Home Grounds Development and Construction.** Continuation of Horticulture 210, with emphasis on development of home grounds and construction methods and techniques. Prerequisite: Horticulture 210; limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agriculture occupations for secondary teachers curriculum. 3 hours.
212. **Landscape Contracting.** Interpretation of the landscape architect's plans and specifications; estimating quantities of materials; and computing costs and procedures for bidding and executing landscape construction. Prerequisite: Horticulture 211. Registration limited to horticulture majors, students in the ornamental horticulture curriculum, or students in the agricultural occupations for secondary teachers curriculum only. 3 hours.
220. **Plant and Animal Genetics.** Same as Agronomy 220 and Animal Science 220. See Agronomy 220.
221. **Plant Propagation.** Examines theory and methods employed in propagation of plants, emphasizing anatomical, physiological, and ecological principles involved in sexual propagation (seeds) and asexual propagation (division, cuttings, budding, grafting, tissue culture, etc.). Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
222. **Greenhouse Management.** Survey of topics relating to greenhouse structures (design, location, construction) and their operation (management, heating and cooling systems, cultural practices, and cost accounting). Several field trips to local greenhouses will be made. Prerequisite: Horticulture 100 or consent of instructor. 3 hours.

223. **Floricultural Crops Production, I.** Commercial production of major cut-flower crops in the greenhouse and field. Prerequisite: Horticulture 222. 3 hours.
224. **Floricultural Crops Production, II.** Commercial production of pot plants and minor greenhouse and field-grown cut flowers. Prerequisite: Horticulture 223. 3 hours.
226. **Bedding Plant Production, Use, and Identification.** Examines the commercial production, use, and identification of herbaceous, frost-tender ornamental plants, largely flowering annuals, grown for outdoor bedding purposes. Includes field trip. Prerequisite: Plant Biology 100. 3 hours.
227. **Indoor Plant Culture, Use and Identification.** Culture, use, and identification of indoor plants in relation to their application in interior situations; discusses the influence of water, fertilizer, soil type, light (natural and artificial), relative humidity, storage and shipping. Students design and maintain an interior plant area; lecture and lab. A field trip is required. Prerequisite: Plant Biology 100 or consent of instructor. 3 hours.
230. **Herbaceous Perennials: Identification and Use.** Identification of herbaceous perennials; cultural requirements and uses in the landscape; discussion of perennial border design for continuous flowering. Prerequisite: Plant Biology 100. 3 hours.
231. **Floral Design, I.** Applies principles of design to the composition and decorative use of flowers, foliages, and accessories. Registration open to students in Ornamental Horticulture, Horticulture, Agricultural Education, Interior Design, and Restaurant Management or with consent of instructor. 3 hours.
232. **Flower Shop Management and Floral Design, II.** Introduces flower shop management: includes the location, establishment, and financing of a new or existing shop and basic skills in management, pricing, buying, delivery, and display. Covers advanced floral design skills. Prerequisite: Horticulture 231. 3 hours.
233. **Floriculture for the Home.** Fundamentals of home gardening and the effective use of ornamentals as a part of the home environment; subjects include the selection, culture, and use of garden annuals, biennials, perennials, bulbs, and house plants; garden tools and equipment; soil preparation; plant propagation; principles of design and planting methods; garden maintenance; use of fertilizers; pest control; training and pruning; lawn care; hybridizing; growing structures; and care of cut flowers. Not open to students in the ornamental horticulture curriculum. 3 hours.
234. **Landscape Plants Production.** Emphasizes woody ornamental plant production, nursery operation, and nursery business management techniques; compares both traditional and computer-aided management tools; examines industry scope and diversity through nursery visits, presentations by nursery operators, and student-directed interviews/presentations throughout the state. Field trip required; see *Timetable* for approximate cost. 3 hours. Offered in alternate years.
236. **Turfgrass Management.** Examines the principles and practical knowledge necessary for the establishment and maintenance of high-quality turfgrass stands for use as home lawns, golf courses, athletic fields, parks, and other commercial uses; presents an integrated approach to management that considers conservation of resources and environmental impacts in relationship to turfgrass quality. Prerequisite: Plant Biology 100. 3 hours.
242. **Commercial Vegetable Production.** Commercial vegetable production with emphasis on cultural considerations and harvest and handling of selected vegetable crops; integrates principles of plant growth into vegetable production schemes; covers vegetable classification, growing practices and handling in the context of current commercial production systems. Prerequisite: Horticulture 100 and Soils 101. 3 hours.
250. **Horticulture Internship.** A supervised off-campus learning experience of at least 300 hours in a horticulture related enterprise. Prerequisite: Junior standing; good academic standing; major in ornamental horticulture, horticulture, or agricultural science with horticulture emphasis; completion of a 200- or 300-level course appropriate to the internship activities; and consent of instructor. 2 hours. May be repeated to a maximum of 4 hours.
251. **Arboriculture.** Evaluates criteria for ornamental woody plant selection, cultivation, valuation, and maintenance; links the technical skills and practices for commercial

- arborists to an understanding of woody plant physiology and anatomy; emphasizes marketing and promotion of horticultural expertise. 3 hours. Offered in alternate years.
261. **Small Fruit and Viticulture Science.** Technological application of biological principles to the culture of strawberry, grape, blueberry, raspberry, blackberry, currant, gooseberry, and miscellaneous small fruits. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours.
262. **Tree Fruit Science.** Examines biological principles, cultural methods and practices involved in the growth and production of the apple, pear, peach, cherry, plum, apricot, almond, and miscellaneous citrus and nut crops. Prerequisite: Horticulture 100 or Plant Biology 100. 3 hours. Offered in alternate years.
300. **Special Problems.** Supervised research on individual problems in any phase of horticulture; includes anatomy, breeding, physiology, ecology, or general culture of fruit, vegetable, or ornamental plants. Prerequisite: Not open to students on probation; written consent of the instructor and authorized departmental approval required prior to advanced enrollment and registration. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in the department subject to approval of the instructor. 1 to 5 hours, or $1/2$ to 2 units.
307. **International Food Crops.** Survey of the botany, physiology, breeding, production practices, and pest management of the major international food crops. Tropical and subtropical crops are emphasized and aspects of agriculture in developing countries are discussed. Prerequisite: Agronomy 121, Horticulture 100, or Plant Biology 100. 3 hours or $3/4$ unit. Offered in alternate years.
320. **Horticultural Plant Breeding.** Methodology, objectives, and constraints of breeding for improved cultivars of flowers, woody ornamentals, turfgrasses, fruits and vegetables. Emphasis on breeding objectives and methods unique to horticultural commodities such as color, appearance, flavor and shelf-life, nutritional value and other characteristics that determine product quality. Prerequisite: Horticulture 220. 3 hours or $3/4$ unit. Offered in alternate years.
321. **Floricultural Physiology.** Studies the physiology and metabolism of floricultural crops during their development from seeds through flowering. Lectures and discussion. Prerequisite: Agronomy 101, Plant Biology 100, or consent of instructor. 4 hours or 1 unit.
322. **Plant Nutrition.** Studies the mechanisms of and factors affecting the absorption, transport, distribution, and functions of the essential elements required by higher plants. Lectures and discussions. Prerequisite: Soils 101; Plant Biology 234 or 330. 4 hours or 1 unit. Offered in alternate years.
323. **Principles of Plant Breeding.** Same as Agronomy 323. See Agronomy 323.
333. **Plant Physiology Laboratory.** Same as Agronomy 333 and Plant Biology 333. See Plant Biology 333.
336. **Perennial Grass Ecosystems.** Same as Agronomy 336. Different levels of ecological organization in perennial grass ecosystems. Provides advanced study for students in turfgrass and forage management. Cultural programs are derived from an understanding of interrelationships between different components of the ecosystem, including man and animals. Term paper required. Field trips; see *Timetable* for approximate cost. Prerequisite: Horticulture 236 or Agronomy 322. 4 hours or 1 unit.
340. **Introduction to Applied Statistics.** Same as Agricultural Engineering, Agronomy, Animal Science, Food Science, and Forestry 340. See Agronomy 340.
345. **Growth and Development of Horticultural Crops.** Factors affecting growth, development, and quality of horticultural crops, such as photoperiodism, growth regulators, carbon dioxide levels, etc. Lecture and discussion. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 4 hours or 1 unit. Offered in alternate years.
398. **Postharvest Physiology of Horticultural Crops.** Physiology, biochemistry, and anatomy of fruits and vegetables during development, maturation, and ripening in situ and in storage. Prerequisite: Plant Biology 100 and Chemistry 102 or 103, or equivalent. 4 hours or 1 unit. Offered in alternate years.

- 424. Plant Biochemistry.** Same as Agronomy and Plant Biology 424. See Agronomy 424.
- 425. Membrane Transport and Mineral Nutrition in Plants.** Same as Agronomy and Plant Biology 425. See Agronomy 425.
- 436. Plant Gene Regulation.** Same as Agronomy and Forestry 446. See Agronomy 446.
- 437. Gene Expression During Seed Development.** Same as Agronomy and Forestry 447. See Agronomy 447.
- 447. Horticulture Seminar.** Discussion of current research and literature pertaining to problems of horticulture and related fields. Prerequisite: Graduate standing in horticulture or related fields. $\frac{1}{4}$ unit.
- 488. Plant Pigments.** Same as Plant Biology 488. A comprehensive presentation of the nature, function, distribution, biosynthesis, degradation, separation, and spectroscopic properties of pyrrole, carotenoid, quinone, and anthocyanin pigments. Prerequisite: Plant Biology 330 or consent of instructor. 1 unit. Offered in alternate years.
- 490. Research Methods in Horticulture.** Lectures, discussions, demonstrations, and laboratory exercises dealing with methods and apparatus used in horticultural research. Prerequisite: One year of general chemistry and one semester of general or plant physiology, or consent of instructor. 1 unit.
- 492. Special Topics in Horticulture.** Readings and discussion in selected phases of horticulture including such topics as genetics, physiology, anatomy, morphology, and ecology of horticultural crops. $\frac{1}{2}$ to 2 units.
- 494. Professional Orientation in Horticulture.** The philosophy and components of graduate education, with development of the principles useful in teaching, research, and extension in horticulture. Prerequisite: Graduate standing in horticulture. $\frac{1}{4}$ unit.
- 499. Thesis Research.** Research on problems in floriculture, ornamentals, plant breeding, pomology, turfgrass, or vegetable crops. Prerequisite: Graduate standing in horticulture. 0 to 4 units (summer session 0 to 2 units).

HUMAN DEVELOPMENT AND FAMILY STUDIES

Head of Division: Leann L. Birch

Department Office: 201 Child Development Laboratory, 1105 West Nevada Street, Urbana

- 105. Introduction to Human Development.** Systematic overview of the psychological, biological, familial, and cultural factors related to human growth and development throughout the life cycle. 3 hours.
- 106. Observation and Assessment of Human Development.** Studies human behavior in laboratory and natural settings, with emphasis on the developing child; includes observation and assessment of cognitive, social, affective, and motor development. Prerequisite: Human Development and Family Studies 105, or consent of instructor. 3 hours.
- 110. Introduction to Family Ecology.** Overview of family development, including courtship, marriage, parenting, the aging family, and family crisis; emphasizes the application of research findings to individual decision-making. 3 hours.
- 143. Biological Bases of Human Behavior.** Same as Anthropology 143. See Anthropology 143.
- 145. Introduction to Women's Studies in the Social Sciences.** Same as Sociology 145 and Women's Studies 112. See Women's Studies 112.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 202. Development of Curriculum for Infants and Preschoolers.** Introduces development of curriculum for children from birth to age five; integrates child development theory and principles with programming for young children in preschool and childcare settings. Prerequisite: Human Development and Family Studies 105, or consent of instructor. 4 hours.
- 203. Infancy and Early Development.** Reviews development during the first two years of life, including cognitive, social, and biological aspects of early development; lab involves first-hand observation of infants to supplement and extend lecture material. Prerequisite:

Human Development and Family Studies 105 or Psychology 216, or consent of instructor. 4 hours.

205. **Children with Special Needs.** Same as Sociology 205. See Sociology 205.
210. **Comparative Family Organization.** Same as Anthropology 210. A cross-cultural examination of the family in relation to its environment, the family as an environment, and the family structure as it changes over time; evaluates findings in anthropology, sociology, and psychology; examines current issues in American family life. Prerequisite: Junior standing or consent of instructor. 3 hours.
211. **Social Context of Human Sexuality.** Surveys current research on social aspects of human sexuality from cross-cultural, social, familial, and life-span development perspectives. 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Leisure Studies, Psychology, and Rehabilitation 214. A multi-disciplinary introduction to the study of aging; the social, psychological and physiological context of changing roles in later life; public and private policies that affect older people and their families. Prerequisite: Human Development and Family Studies 105, or 3 hours of social science. 3 hours.
215. **Courtship and Marriage.** Development of cross-sex and same-sex relationships that lead to marriage or intimate living over the life cycle; the dissolution of such relationships; emphasizes the effects of social and cultural environments on intimate relationships. 3 hours. Students may not receive credit for both Human Development and Family Studies 215 and Sociology 321.
220. **Organization and Administration of Child Development Programs.** Examines principles and practices of organization and administration of programs and community services for young children and their families with special focus on leadership; emphasizes daily planning and operation of programs and services, and internal and external factors influencing program management and effectiveness. Prerequisite: Human Development and Family Studies 202, or consent of instructor. 3 hours.
242. **Family Violence.** Same as Sociology 242. See Sociology 242.
262. **Motor Development, Growth, and Form.** Same as Kinesiology 262. See Kinesiology 262.
291. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
292. **Thesis.** Intended primarily for candidates for honors but open to other seniors. Prerequisite: Senior standing; approval of head of department. 3 to 5 hours.
301. **Issues in Socialization and Development.** Presents and uses theories of socialization to evaluate and analyze current issues and socialization practices; delineates historical and philosophical trends in socialization, and discusses the implications of these trends for generating social policy affecting the developing individual. Prerequisite: Human Development and Family Studies 202 and 203 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Sex Roles.** Same as Sociology 302 and Women's Studies 302. Examines social institutions that affect sex differences in power and prestige, especially market labor, household labor, and fertility; social, emotional, and cognitive developmental differences over the life span. Prerequisite: Sociology 100 or Human Development and Family Studies 105; or 6 hours of anthropology, geography, political science, or sociology. 3 hours or 1 unit.
303. **Hospitalized Children and Their Families.** Examines the developmental needs of children in hospitals and their families; delineates the role of the Child Life Specialist and familiarizes students with hospital procedures and personnel. Clinical placement includes direct experience with hospitalized children and their families. Prerequisite: Human Development and Family Studies 202, 205, and 319, and consent of instructor. 3 or 4 hours, or 1 unit.
304. **Gerontology.** An interdisciplinary approach to the study of aging and the aged from developmental, behavioral, and social perspectives. Prerequisite: Senior standing. 3 hours or 1 unit.
305. **Pediatrics and Nutrition.** Same as Foods and Nutrition 305 and Elementary and Early Childhood Education 305. See Foods and Nutrition 305.
310. **Contemporary American Family.** Examination of the variety of forms families assume in the United States; families are compared in the areas of kinship, family organization,

patterns of interpersonal relationships, socialization, values, and integration with the larger society. Prerequisite: Human Development and Family Studies 210 or consent of instructor, and 6 hours of social science. 3 hours, or $\frac{3}{4}$ or 1 unit.

315. **Critical Transitions in Families.** A life-span development approach to the study of normative changes and non-normative events and their impact on marriage and family relationships; gives attention to variations in the socio-economic contexts of family transitions, and to methods for reducing the negative effects of such transitions. Prerequisite: 6 hours of Human Development and Family Studies courses, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
316. **Adolescent Development.** Examines paths of experience and individual development within the family, the peer group, and other domains through this socially-defined stage of life. Prerequisite: 6 hours of Human Development and Family Studies courses, or equivalent social science courses. 3 hours, or $\frac{3}{4}$ or 1 unit.
319. **Day Care Practicum.** Same as Psychology 319. See Psychology 319.
330. **The Family in International Settings.** Examines the impact of technological change on the family in developing nations, compared with the Western World; includes coverage of the effects of various development approaches and projects on family roles, form, and resource access, and the effects of family characteristics on the success of development projects. Prerequisite: Human Development and Family Studies 210, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
349. **Music in Early Childhood.** Same as Music 349. See Music 349.
350. **Practicum in Human Development and Family Studies.** A supervised on or off-campus learning experience related to human development or family ecology, supervised in cooperation with an appropriate agency or institution. Prerequisite: Human Development and Family Studies major; junior standing. Not available to students on probation. 4 to 12 hours, or 1 to 3 units. (Only 1 unit of the course may be applied to the total required for a graduate degree in Human Resources and Family Studies, Option 2. At the undergraduate level, only 4 hours may be applied to the total HDFS courses required.)
354. **Growth and Physical Development of Children.** Same as Kinesiology 354. See Kinesiology 354.
370. **Family Conflict Management.** Examines processes of conflict management in family and community disputes; emphasizes negotiation and mediation as modes of dispute settlement. Prerequisite: Human Development and Family Studies 210 or 310; or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
388. **Special Topics in Human Development and Family Studies.** Prerequisite: Senior standing and consent of instructor. 3 hours or $\frac{3}{4}$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
390. **Human Development: Theory and Methodology.** Discussion and evaluation of theories of human development and critical examination of current research; examples from current literature illustrating research methods and the differing theoretical orientations shaping research directions in human development. 4 hours or 1 unit.
410. **Family Interaction.** Observation and qualitative analysis of the family as a system; how family organization emerges, is maintained, and changes through social interaction. Prerequisite: Human Development and Family Studies 310 or equivalent. 1 unit.
418. **Seminar in Human Development.** An overview of theories and research in human development; focuses on major issues regarding development, differing conceptualizations of those issues, and relevant research. Prerequisite: Consent of instructor. 1 unit.
419. **Seminar in Family Research and Theory.** Presents an advanced, multidisciplinary approach to current theories and research in the areas of marriage and the family. Prerequisite: Human Development and Family Studies 310, or consent of instructor. 1 unit.
420. **Contemporary Topics in Human Development.** An in-depth analysis of a current issue in human development with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Studies or a related area, and consent of instructor; courses in statistics and Human Development and Family Studies 390 or equivalent. 1 unit.

- 421. Contemporary Topics in Family Studies.** An in-depth analysis of a current issue in family studies with special emphasis on general methodological problems illustrated through examples from one area of research. Prerequisite: Second-year graduate standing in Human Development and Family Ecology or a related area, and consent of instructor; courses in statistics and Human Development and Family Studies 390 or equivalent. 1 unit.
- 457. Sensorimotor Development.** Same as Kinesiology 457. See Kinesiology 457.
- 470. Family Mediation: Theory and Techniques.** Applies mediation theory and techniques to decisions faced by families in conflict, e.g., divorce; emphasizes the development of professional conflict management skills to assist individuals and families in their ability to resolve disputes. Prerequisite: Human Development and Family Studies 370 or equivalent. 1 unit.
- 493. Advanced Studies in Human Development and Family Studies.** Library or experimental research on specific problems of limited scope. May be taken in addition to 8 units required for a master's degree by students who do not write a thesis. For nonthesis students only. $\frac{1}{2}$ or 1 unit.
- 495. Seminar in Human Development and Family Studies.** Discussion and evaluation of current literature on selected topics in human development and family studies. Prerequisite: Graduate standing in Human Development and Family Studies or consent of instructor. $\frac{1}{4}$ to 1 unit.
- 498. Special Problems in Human Development and Family Studies.** Research or independent study on a special problem that is not part of thesis work. Prerequisite: Consent of instructor. $\frac{1}{2}$ to 2 units.
- 499. Thesis Research.** Original research designed and conducted under faculty supervision. 0 to 4 units.

HUMAN RESOURCES AND FAMILY STUDIES

Director of School: Donald K. Layman

School Office: 260 Bevier Hall, 905 South Goodwin Avenue, Urbana

- 100. Contemporary Issues in Human Resources and Family Studies.** Introduces and analyzes contemporary issues and trends in human resources and family studies; examines the integrative nature of Human Resources and Family Studies and life planning theories, models and research; includes orientation to the School of Human Resources and Family Studies. Required of freshmen in the School of Human Resources and Family Studies. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 268. Cooperative Extension.** Same as Agriculture 268. See Agriculture 268.
- 269. Cooperative Extension: Summer Experience.** Same as Agriculture 269. See Agriculture 269.
- 280. Leadership Development.** Same as Agriculture Communications 280. See Agriculture Communications 280.
- 298. International Experience.** Same as Agriculture 298. See Agriculture 298.
- 369. Educational Programs in Cooperative Extension.** Same as Agriculture 369. See Agriculture 369.
- 390. Seminar in Human Resources and Family Studies.** Discussion of selected topics in human resources and family studies; review of related literature. Prerequisite: Completion of 12 hours in Human Resources and Family Studies, or consent of instructor. 0 to 4 hours, or 0 to 1 unit. May be repeated for credit to a maximum of 4 hours or 1 unit.

HUMANITIES

Dean of College: Larry R. Faulkner

College Office: 294 Lincoln Hall, 702 South Wright Street, Urbana

131. **Introduction to Renaissance Civilization.** A study of major historical, intellectual, and artistic achievements of the period; organized around a series of topics, each focusing on a society, movement, or historical event as reflected in literature, art, and the history of ideas. 3 hours.
141. **Introduction to American Civilization, I.** An introduction to the multidisciplinary study of major aspects, events, and periods of the American experience; includes a series of topics, each focusing on one society, movement, or historical event as reflected in literature, art, history, and politics. 3 hours.
142. **Introduction to American Civilization, II.** Continuation of Humanities 141. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
193. **Undergraduate Seminar in Cinema Studies.** Topics vary. Consult *Timetable* or Unit for Cinema Studies. 1 to 3 hours. May be repeated to a maximum of 6 hours as topics vary.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
261. **Survey of World Cinema, I: The Beginnings through the Coming of Sound.** Survey of the development of equipment, techniques, and themes of the cinema from its origins through the coming of sound; lectures, discussions, and showings of selected films. 3 hours.
262. **Survey of World Cinema, II: The Thirties to the Present.** Survey of the development of equipment, techniques, and themes of the cinema from the coming of sound to the present; lectures, discussions, and showings of selected films. 3 hours.
279. **Introduction to Foreign Language Education.** Same as French, German, Latin, Russian, and Spanish 279. Introduction to the theory and methodology of second language teaching, including the history of foreign language education, contemporary practices and perspectives, and current research in second language acquisition. Includes 16 hours of observation in local schools. Prerequisite: Sophomore standing and enrollment in a teacher education curriculum, or consent of instructor. 3 hours.
285. **The Jewish Experience in Film.** Selected topics focusing on various aspects of Judaism and Jewish culture as it has been portrayed in world cinema along with an examination of the contributions of selected Jewish artists to the cinema. Prerequisite: One college course in literature or cinema studies. 3 hours.
290. **Individual Study.** Supervised reading and research on interdisciplinary humanities topics chosen by the student in consultation with a faculty member. Prerequisite: Consent of humanities adviser (an approved Learning Agreement must be submitted to 294 Lincoln Hall not later than the second week of the semester or the first week of the summer session). 2 to 4 hours. May be repeated to a maximum of 8 hours.
292. **Senior Thesis.** Individual research for majors in humanities leading to the completion of a thesis. Prerequisite: Senior standing, a declared option in humanities major, and consent of adviser. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
295. **Special Topics: Interdisciplinary.** Interdisciplinary topics in the humanities; topics vary, but are normally related to one of the options in the humanities major. 3 hours. May be repeated as topics vary; students may register for two different topics in the same semester.
297. **Special Topics: Junior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities major. Prerequisite: Junior standing and consent of humanities adviser (tutorial students must submit an approved Learning Agreement to 294 Lincoln Hall not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)

298. **Special Topics: Senior Seminar and Tutorial.** Interdisciplinary seminar and tutorial in selected topics related to one of the options in the humanities major. Prerequisite: Senior standing and consent of humanities adviser (tutorial students must submit an approved Learning Agreement to 294 Lincoln Hall not later than the second week of the semester or the first week of the summer session). 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
361. **Film Theory and Criticism.** Study of major aesthetic and critical theories about film; study of theory and practice of film criticism. Prerequisite: One cinema studies course at the 200 or 300 level and one college course in literature, or consent of instructor. 3 hours or 1 unit.
366. **Japanese Cinema.** Same as East Asian Languages and Cultures 366. Examines the influence of Japan's traditional aesthetics on its cinema and surveys its major film movements, genres, and directors. Prerequisite: Two college level courses in cinema studies or East Asian Languages and Cultures, or graduate standing. 3 hours or 1 unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Italian, Portuguese, Slavic, and Spanish 382, and Linguistics 386. Theory and practice of computer-assisted instruction, with special emphasis on problems and techniques of foreign-language instruction. General principles; survey of existent and probable future CAI systems; and practical experience with lesson design and programming on the IBM and Macintosh personal computers. Linguistics majors are advised to complete Linguistics 306 before registering for this course. Prerequisite: Two years college language or equivalent, and consent of instructor. 4 hours or 1 unit.
388. **French and Comparative Cinema, I.** Same as Comparative Literature and French 388. See French 388.
389. **French and Comparative Cinema, II.** Same as Comparative Literature and French 389. See French 389.
395. **Special Advanced Topics: Interdisciplinary.** Offers interdisciplinary topics in the humanities; topics vary, but normally relate to the interdisciplinary areas of study within the humanities major or to the special humanities facilities (e.g., the Language Learning Laboratory). Prerequisite: Prerequisites will vary according to topic. See *Timetable*. 3 hours or 1 unit. May be repeated as topics vary to a maximum of 6 hours or 2 units.

INDUSTRIAL DESIGN

(See Art and Design)

INDUSTRIAL ENGINEERING

(See Mechanical and Industrial Engineering)

INTERIOR DESIGN

(See Consumer Sciences)

JOURNALISM

Head of Department: Steven J. Helle

Department Office: 120A Gregory Hall, 810 South Wright Street, Urbana

- 114. Agricultural Communications Media and Methods.** Same as Agricultural Communications 114. See Agricultural Communications 114.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 204. Typography.** Studies type lore and design; type dimensions; printer's arithmetic and copyfitting; platemaking; printing processes; shop organization; and terminology. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours. News-editorial majors do not receive credit for this course.
- 214. Educational Campaign Planning.** Same as Agricultural Communications 214. See Agricultural Communications 214.
- 217. History of Communications.** Same as Communications 217. Nature and development of communication systems; history of communication media; history of journalism, advertising, and broadcasting; and communications in the modern world. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 218. Communications and Public Opinion.** Same as Communications 218. Theory of public opinion and of communications; relation of communication systems to public opinion, social systems, and the political order. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 220. Communications and Popular Culture.** Same as Communications 220. See Communications 220.
- 223. Photojournalism.** A basic photography course designed to give students a proficiency in picture taking and processing and to acquaint them with picture editing and other illustrative problems. For current fees, see *Timetable*; cameras provided by the college. Prerequisite: Registration in the College of Communications or consent of instructor. 3 hours.
- 231. Mass Communication in a Democratic Society.** Same as Communications 231. Studies the philosophical bases of the functions and the responsibilities of mass communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 241. Law and Communications.** Same as Communications 241. Historical background of the nature and meaning of the law as it relates to journalism and contemporary problems of freedom of expression. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 251. Social Aspects of Mass Communications.** Same as Communications 251 and Sociology 251. Media structures related to cultural content and functions; problems of life and society as treated in mass-produced communications. Prerequisite: Registration in the College of Communications or consent of the college. 3 hours.
- 291. Special Problems.** Special projects, research, and independent reading in journalism for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of head of department. 1 to 3 hours.
- 293. Journalism Seminar.** Seminar based on summer internship experience; offered only in the fall for students who participated in a spring preinternship orientation class and then completed an approved summer internship. Prerequisite: Journalism 350; open only to undergraduate journalism majors who have taken a noncredit internship orientation. 0 to 2 hours.
- 326. Magazine Article Writing.** Preparation of feature stories and articles; techniques of marketing, market analysis, and publishing articles written in the course. Prerequisite: Journalism 350; registration in the College of Communications or consent of the college. 3 hours or $1\frac{1}{2}$ unit.
- 330. Magazine Editing.** Basic principles of editing for consumer, business, trade, and company magazines; communications theory, market analysis, editorial process, design process, production process, and distribution process as they relate to magazine publish-

- ing. Prerequisite: Credit or concurrent registration in Journalism 326 or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
340. **News Publication Management.** An introduction to the administration and management of print media news organizations. Prerequisite: Journalism 350 or Advertising 391; and consent of the department. 3 hours or $\frac{1}{2}$ unit.
350. **Reporting, I.** Fundamentals of journalistic writing; reporting news of public affairs. Prerequisite: Registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
360. **Graphic Arts.** Rational and aesthetic standards of visual communications; principles and techniques of making visual statements; and uses of visual technology in wedding verbal and nonverbal languages. For current fees, see *Timetable*. Prerequisite: Registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
362. **Broadcast News Production.** Introduces radio and TV news production designed to acquaint students with techniques, principles, and equipment used in the studio and in the field; emphasizes planning, producing, and directing individual news and public affairs programs and news stories, and serving on production teams. Prerequisite: Registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
370. **News Editing.** Newspaper editing and headline writing; the makeup and design of newspaper pages. Prerequisite: Journalism 350 and 360; registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
372. **Broadcast News Writing and Gathering.** Gathering, writing, and editing news for radio and television; critical analysis of broadcast news practices, past and present; ethics of broadcast journalism; audio and visual communication principles as applied to news dissemination; editing and writing to film, tape and graphics. Individual and team projects. Prerequisite: Journalism 350 and 362; registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
380. **Reporting, II.** The interviewing, analytical, and writing techniques of reporting complex news stories with clarity and depth. Prerequisite: Journalism 350 and 360; registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
382. **Broadcast News Editing.** Principles of editing audio tape, video tape, and scripts with audio-visual materials; editing story units for broadcast; assembling news and public affairs programs; broadcast news editing ethics, research, and criticism. Prerequisite: Journalism 372; registration as a major in the Department of Journalism or consent of department. 4 hours or 1 unit.
390. **Advanced Reporting.** Advanced reporting projects in specialized fields; recommended for news-editorial seniors. Prerequisite: Journalism 350 and 380. 3 hours or 1 unit.
392. **Broadcast Journalism Practicum.** Individual and team-produced advanced enterprise projects in specialized fields. Subject matter to be coordinated with Journalism 390. Prerequisite: Journalism 382; registration as a major in the Department of Journalism or consent of department. 3 hours or 1 unit.
400. **Issues in Journalism.** Seminar on issues of contemporary importance in journalism. Prerequisite: Consent of department. $\frac{1}{2}$ unit.
468. **The Political Economy of Communications.** Same as Communications 468. Analyzes the structure, policy, and behavior of such media of communication as newspapers, magazines, books, postal service, telegraph, telephone, broadcasting, and film; special emphasis on their relationships to political order and the economy. Prerequisite: Consent of College of Communications. 1 unit.
470. **Communications and Popular Culture.** Same as Communications 470. Problems of cultural analysis related to the media of communications; social implications of communications research. Prerequisite: Consent of College of Communications. 1 unit.
471. **Proseminar in Communications, I.** Same as Communications 471. General discussion of the mass media of communications, their role as social institutions, and their control and support; content, audience, and effect of the mass media. Prerequisite: Consent of College of Communications. 1 unit.
472. **Proseminar in Communications, II.** Same as Communications 472. General discussion

of the problem of communications, including the individual as a communicating system, symbolic processes, analysis of messages, psycholinguistics, and language as social behavior. Prerequisite: Consent of College of Communications. 1 unit.

- 473. History and Theory of Freedom of the Press.** Same as Communications 473. Development of the Anglo-American press system and the idea of freedom of the press; contemporary mass media and their implications for freedom and democracy. Prerequisite: Consent of College of Communications. 1 unit.
- 474. Communications Systems.** Same as Communications 474. Analyzes the structure and development of communications systems; examination of the role of communication in social change, political movements, and formal organizations. Prerequisite: Consent of College of Communications. 1 unit.
- 480. Journalism Masters' Proseminar.** Introduction to scholarship and research in journalism and mass communication examining theoretical approaches to the meanings, uses, and effects of mass media in society; discussion of media freedom and accountability; humanistic and social scientific contributions to understanding mass communication. Prerequisite: Graduate standing in journalism or consent of instructor. 1 unit.
- 490. Special Topics in Journalism.** Prerequisite: Consent of head of department. ¹/₂ or 1 unit.
- 492. Research Methods in Communications.** Same as Communications 492. See Communications 492.
- 499. Thesis Research.** Prerequisite: Graduate standing in journalism. 1 to 2 units.

KINESIOLOGY

Head of Department: Karl M. Newell

Department Office: 117 Freer Hall, 906 South Goodwin Avenue, Urbana

- 100. Developmental Activities.** Skills and knowledge essential for leisure-time activities which are classified as developmental activities. Prerequisites for each developmental activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 to 2 hours.

Section A: Conditioning and Weight Control. Activities and understanding which contribute to the development and/or maintenance of physical fitness and a well-proportioned body. 1 to 2 hours. May be repeated once for credit if taken in successive semesters; credit not to exceed a total of 2 hours.

Section B: Personal Defense. Skills and understanding essential for defense against an aggressor, with emphasis on avoiding attack. 1 hour.

Section C: Weight Training. Skills and knowledge essential for use of weights for conditioning the body. 1 hour. May be repeated once for credit if taken in successive semesters.

Section D: Physical Fitness. Activities and understanding which contribute to the development and maintenance of physical fitness according to social and hygienic standards. 1 hour. May be repeated once for credit if taken in successive semesters.

Section H: Hatha Yoga. Introduction to Hatha Yoga, which is concerned with the physical well-being of the entire organism; includes a graduated program of postures (asanas), stretching movements, and muscular relaxation and breathing exercises. 1 hour.

Section I: Outdoor Adventures. Introductory skills and knowledge for development of life time activities in basic backpacking, basic river canoeing, and mountaineering techniques (balance climbing and rappelling). Includes participation in one field trip during the semester. Prerequisite: Kinesiology 106A and 107A; or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 101. Dance Activities.** Skills and knowledge essential for leisure-time activities which are classified as dance activities. Prerequisites for each dance activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.
- Section A: Ballroom Dance, I.** Introductory skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, cha-cha, and selected fad dances. 1 hour.
- Section B: Ballroom Dance, II.** Intermediate skills and understanding essential for ballroom dance, with emphasis on fox-trot, rhumba, lindy, waltz, and cha-cha as well as tango, samba, and paso doble. Prerequisite: Kinesiology 101A or consent of instructor. 1 hour.
- Section C: International Ballroom Dance.** Skills and understanding essential for international ballroom dance steps; emphasis on tango, cha-cha, Viennese waltz, samba, rhumba, quickstep, paso doble, mambo, and merengue. Prerequisite: Kinesiology 101B or consent of instructor. 1 hour.
- Section D: American Square Dance.** Introductory skills and understanding essential for square dancing; opportunities for conducting and calling dances. 1 hour.
- Section E: International Folk Dance.** Introductory skills, knowledge, and conditioning essential for exploring cultural characteristics via the folk dance idiom. 1 hour.
- Section F: Modern Dance, I.** Introductory skills, knowledge, and conditioning essential for free and creative dance. 1 hour.
- Section G: Modern Dance, II.** Intermediate level technique, improvisation, and composition for both men and women; multimedia approaches to dance and dance criticism. Prerequisite: Kinesiology 101F or consent of instructor. 1 hour.
- Section H: Afro-American Dance Forms.** Beginning skills and knowledge and, under the repeat option, refined and more complex skills and heightened kinesthetic awareness essential for development of cultural characteristics via dance of West African, West Indian, Latin American, and contemporary Black American sources. 1 hour. May be repeated to a maximum of 3 hours.
- Section Z: Special Topics.** Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.
- 102. Individual and Dual Activities.** Skills and knowledge essential for leisure-time activities which are classified as individual and dual activities. Prerequisites for each individual or dual activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.
- Section A: Tennis, I.** Introductory skills, knowledge, and conditioning essential for court play. 1 hour.
- Section B: Tennis, II.** Intermediate skills, knowledge, and attitudes for effective court play. Prerequisite: Kinesiology 102A or consent of instructor. 1 hour.
- Section C: Golf, I.** Introductory skills and understanding essential for course play, with emphasis on irons. For current fees, see *Timetable*. 1 hour.
- Section D: Golf, II.** Intermediate skills and understanding essential for use of irons and woods; analysis of course play. For current fees, see *Timetable*. Prerequisite: Kinesiology 102C or consent of instructor. 1 hour.
- Section E: Bowling, I.** Introductory skills and understanding essential for bowling. For current fees, see *Timetable*. 1 hour.
- Section F: Bowling, II.** Intermediate skills and understanding essential for bowling. For current fees, see *Timetable*. Prerequisite: Kinesiology 102E or consent of instructor. 1 hour.
- Section I: Foil Fencing.** Introductory skills, knowledge, and conditioning essential for foil fencing. 1 hour.
- Section J: Target Archery.** Introductory skills, knowledge, and conditioning essential for target shooting. 1 hour.
- Section K: Track and Field.** Introductory skills, knowledge, and conditioning essential for various track and field events. 1 hour. May be repeated once for credit.
- Section M: Pocket Billiards.** An introduction to the fundamentals of pocket billiards play; grip, stance, bridge, strategy, variation of shots, how to impart English on the cue ball, basic position play, and an 8-ball tournament; and rules of various billiard games. For current fees, see *Timetable*. 1 hour.

Section N: Basic Marksmanship. Introductory skills, knowledge, and safety measures for basic marksmanship techniques with small bore weapons. 1 hour.

Section O: Competitive Marksmanship. Development of advanced competitive shooting skills; includes match weapons, description use, match procedures and match techniques. Prerequisite: Kinesiology 102N. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 103. Indoor Court Activities.** Skills and knowledge essential for leisure-time activities which are classified as indoor court activities. Prerequisites for each indoor court activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.

Section A: Racquetball, I. Introductory skills, knowledge, and strategies essential for racquetball. 1 hour.

Section B: Racquetball, II. Intermediate skills, knowledge, and strategies essential for racquetball. Prerequisite: Kinesiology 103A or consent of instructor. 1 hour.

Section C: Badminton. Introductory skills, knowledge, and conditioning essential for badminton. 1 hour.

Section D: Handball. Introductory skills, knowledge, and conditioning essential for four-wall handball. 1 hour.

Section E: Squash Racquets. Introductory skills, knowledge, and conditioning essential for squash racquets. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 104. Skating Activities.** Skills and knowledge essential for leisure-time activities which are classified as skating activities. Prerequisites for each skating activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.

Section A: Figure Skating, I. Introductory skills, knowledge, and conditioning essential for figure skating. For current fees, see *Timetable*. 1 hour.

Section B: Figure Skating, II. Intermediate skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the United States Figure Skating Association's preliminary tests. For current fees, see *Timetable*. Prerequisite: Kinesiology 104A or consent of instructor. 1 hour.

Section C: Figure Skating, III. Advanced skills, knowledge, and conditioning essential for figure skating, with emphasis on skills to pass the first eight tests of the United States Figure Skating Association. For current fees, see *Timetable*. Prerequisite: Kinesiology 104B or consent of instructor. 1 hour.

Section E: Ice Dance. Introduction to set patterns of ice dance; emphasizes ice dance skills designed to build control in footwork and balance when skating with a partner. For current fees, see *Timetable*. Prerequisite: Kinesiology 104B or consent of instructor. 1 hour. May be repeated to a maximum of 2 hours.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 106. Swimming Activities.** Skills and knowledge essential for leisure-time activities which are classified as swimming activities. Prerequisites for each swimming activity are given below. More than one activity (Sections A, B) may be taken in the same term if these activities are offered on an 8-week basis. 1 hour.

Section A: Swimming, I. Introductory skills, knowledge, and conditioning essential for swimming. Open only to nonswimmers and those with no deep water experience. 1 hour. May be repeated once for credit.

Section B: Swimming, II. Intermediate skills, knowledge, and conditioning essential for swimming. Open only to swimmers who can execute a minimum of one of the five basic strokes in deep water, perform a standing dive, and tread in deep water. Prerequisite: Kinesiology 106A or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 107. Aquatic Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as aquatic sport activities. Prerequisites for each aquatic sport activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.

Section A: Canoeing. Introductory skills and knowledge essential for handling a canoe with safety. Prerequisite: Kinesiology 106B or consent of instructor; the ability to jump or dive into deep water while clothed and maintain a survival position for 10 minutes. 1 hour.

Section B: Competitive Swimming. Skills, knowledge, and conditioning essential for strokes, starts, and turns; emphasis on training for competitive participation as well as meet organization. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour.

Section C: Springboard Diving. Introductory skills, knowledge, and conditioning essential for springboard diving. Prerequisite: Kinesiology 106B or consent of instructor. 1 unit. May be repeated once for credit.

Section D: Synchronized Swimming. Introductory skills, knowledge, and conditioning essential for creating aquatic compositions. Prerequisite: Kinesiology 106B or consent of instructor. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 109. Team Sport Activities.** Skills and knowledge essential for leisure-time activities which are classified as team sport activities. Prerequisites for each team sport activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.

Section A: Volleyball, I. Introductory skills, knowledge, and conditioning essential for power volleyball. 1 hour.

Section B: Volleyball, II. Intermediate skills, knowledge, and conditioning essential for power volleyball. Prerequisite: Kinesiology 109A or consent of instructor. 1 hour.

Section C: Basketball. Introductory skills, knowledge, and conditioning essential for basketball. 1 hour.

Section F: Baseball. Introductory skills, knowledge, and conditioning for baseball. 1 hour.

Section H: Soccer. Introductory skills, knowledge, and conditioning essential for soccer. 1 hour.

Section I: Rugby Football. Introductory skills, knowledge, and conditioning essential for offensive and defensive strategies of the game. 1 hour.

Section J: Field Hockey. Introductory skills, knowledge, and conditioning essential for field hockey. 1 hour.

Section K: Lacrosse. Introductory skills, knowledge, and conditioning essential for lacrosse. 1 hour.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*. Prerequisite: Consent of instructor. 1 hour.

- 110. Gymnastic Activities.** Skills and knowledge essential for leisure-time activities which are classified as gymnastic activities. Prerequisites for each gymnastic activity are given below. More than one activity (Sections A through Z) may be taken in the same term. 1 hour.

Section A: Apparatus, I. Introductory skills, knowledge, and conditioning relative to participation on heavy apparatus. 1 hour.

Section B: Apparatus, II. Intermediate skills, knowledge, and conditioning relative to participation on heavy apparatus. Prerequisite: Kinesiology 110A or consent of instructor. 1 hour.

Section C: Tumbling. Introductory skills, knowledge, and conditioning for tumbling and free exercise. 1 hour. May be repeated once for credit.

Section Z: Special Topics. Specific subject matter varies and is indicated in the *Timetable*.
Prerequisite: Consent of instructor. 1 hour.

120. **Injuries in Sport.** Emphasizes injury mechanisms, means of injury prevention, and emergency care applied to various types of sport injuries; laboratory sessions emphasize preventive and therapeutic taping and emergency first aid. 2 hours.
121. **Survey of Sports Medicine.** Introduction to sports medicine for non-kinesiology majors; includes discussion of training, conditioning, and preparation for sports, injury aspects of sports, and rehabilitation. 3 hours.
122. **Physical Activity, Physical Fitness and Health.** Gives students the most current information for a basic understanding and appreciation of the contribution of physical activity, physical fitness and nutrition in the development and maintenance of a strong, healthy body throughout life. Designed primarily for non-kinesiology majors. 3 hours.
130. **Fundamental Analysis and Performance of Basic Movement Skills.** Introduction to human movement through development of skills and knowledges relative to structure and function of the human body in selected physical activities including: basic postural and locomotion patterns and fundamental throwing patterns; also studies developmental aspects of typical and atypical movement skills. Emphasizes performance and qualitative analysis of movement skills. 1 hour.
131. **Movement Skills: Fitness.** Development of and participation in a physical fitness program including physical fitness assessment. 1 hour.
132. **Movement Skills: Swimming.** Development of an understanding of basic swimming skills; emphasizes performance and qualitative analysis of personal aquatic skills, developmental aspects of aquatic skills, and analysis of atypical movement patterns in an aquatic environment. Prerequisite: Kinesiology 130, and ability to execute a minimum of one of five basic strokes in deep water, perform a standing dive, and tread in deep water. 1 hour.
133. **Movement Skills: Dance.** Development of an understanding of basic dance steps, positions and sequences; emphasizes performance and qualitative analysis of personal dance skills, developmental aspects of dance and rhythm, and analysis of atypical movement patterns in a dance setting. Prerequisite: Kinesiology 130. 1 hour.
134. **Movement Skills: Gymnastics.** Development of an understanding of basic gymnastic movements and sequences; emphasizes performance and qualitative analysis of personal gymnastic skills, developmental aspects of gymnastic skills, and analysis of atypical movement patterns in a gymnastic setting. Prerequisite: Kinesiology 130. 1 hour.
135. **Movement Skills: Field Activities.** Development of an understanding of basic field activity skills; emphasizes performance, as well as an appreciation of commonalities, in specific activities including soccer, speedball, speedaway, field hockey and flag football. Prerequisite: Kinesiology 130. 1 hour.
136. **Movement Skills: Racquet Activities.** Development of an understanding of basic racquet activity skills; emphasizes performance, as well as appreciation of commonalities in specific racquet activities such as tennis, badminton, squash or racquetball. Prerequisite: Kinesiology 130. 1 hour.
140. **Social Scientific Bases of Sport.** Introduction to the social scientific aspects of human movement including sport; particular emphasis on concepts derived from the social sciences (including psychology) that are appropriate to human movement. 3 hours.
141. **Sports in Greece and Rome.** Same as Classical Civilization 150. See Classical Civilization 150.
142. **Contemporary Issues in Sport.** Examines current issues in sport relative to competition, economics, race, sex, youth, educational institutions, deviant behavior, religion, psychology, and the media. 3 hours.
150. **Bioscientific Foundations of Human Movement.** Integrates anatomical and physiological aspects of human movement; emphasizes how the body moves, physiological responses to exercise stress, physical conditioning and physical fitness. 3 hours.
160. **Physical Education as a Profession.** The nature and scope of physical education as a profession; emphasis on orientation to the profession as well as understanding necessary for selecting an area of specialization within physical education. 2 hours.

- 168. Lifeguard Instructor Training and Aquatic Risk Management.** Examines the development of aquatic risk management and advanced rescue techniques as well as a system of lifeguard selection and training. Intended primarily for skilled aquatic personnel with the common goal of creating and maintaining a safe aquatic environment. Prerequisite: The ability to swim 500 yards continuously, swim 15 yards underwater, and recover a 10 lb. brick from a depth of 12 feet. 2 hours.
- 169. Water Safety Instructor Training.** American Red Cross Instructor training for the teaching of swimming and emergency water safety. Prerequisite: Current certification in American Red Cross Lifeguard Training or Emergency Water Safety. 2 hours.
- 171. Introduction to Sports Officiating.** Introduction to the fundamentals of sports officiating; a lecture course designed to foster the development of a sound knowledge of rules and an understanding of the mechanics involved in officiating selected sports. Content focuses upon those sports in season according to student demand and available faculty expertise; specific sports are announced in the *Timetable*. Each section is offered for eight weeks. 1 hour. May be repeated as specific activity varies.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 220. Fundamentals of Athletic Training.** Discusses the role of the athletic trainer: legalities, facilities, advanced emergency procedures, and injury prevention; emphasizes the understanding of the process of injury and healing as a basis for prevention and treatment of injuries. Laboratory sessions stress special taping, emergency procedures and equipment. Prerequisite: Physiology 103, Cell and Structural Biology 234, and Kinesiology 120, or consent of instructor. 2 hours.
- 222. Bases for Prescription of Therapeutic Exercises.** Functional anatomy and injury constraints as a bases for prescription of therapeutic exercises for musculoskeletal conditions; laboratory sessions stress clinical evaluation of muscle and joint function and familiarization with therapeutic exercises. Prerequisite: Physiology 103 and Cell and Structural Biology 234. 3 hours.
- 230. Coaching Strategies: Basketball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching basketball. 2 hours.
- 231. Coaching Strategies: Tackle Football.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tackle football. 2 hours.
- 232. Coaching Strategies: Baseball/Softball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching baseball/softball. 2 hours.
- 233. Coaching Strategies: Track and Field/Cross Country.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching track and field/cross country. 2 hours.
- 234. Coaching Strategies: Volleyball.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching volleyball. 2 hours.
- 235. Coaching Strategies: Gymnastics.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching gymnastics. 2 hours.
- 236. Coaching Strategies: Swimming/Diving.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching swimming/diving. 2 hours.
- 237. Coaching Strategies: Tennis/Badminton.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching tennis/badminton. 2 hours.

238. **Coaching Strategies: Soccer.** Examines strategies, motivational techniques, conditioning methods, program organization, contest administration, equipment and facility management, and performance analysis related to coaching soccer. 2 hours.
240. **Social Psychological Aspects of Physical Activity.** Discusses how psychological and social processes and constraints affect human action in physical activity environments. Attention is given to socialization; personal and interpersonal dynamics and group relations; stratification; and ideological and economic constraints upon the manifestations of sport and physical activity. Prerequisite: Kinesiology 140 or consent of instructor. 3 hours.
244. **Anthropology of Play.** Same as Anthropology 244. The study of human play with emphasis on origin, diffusion, spontaneity, emergence, and diversity; includes functions of play in selected culture groups. Prerequisite: A course in anthropology. 3 hours.
247. **Introduction to Sport Psychology.** An analysis of the competitive sport process, with study of how personality and situational variables affect motivation, anxiety, and aggression in sport. Attention is given to the psychological skills needed by coaches and athletes for successful and enjoyable sports participation. 3 hours.
249. **Sport and Modern Society.** Same as Sociology 249. The sociological analysis of sport in modern societies with regard to social class, politics, community, education, and collective behavior. 3 hours.
251. **Analysis of Physical Fitness Programs.** Introduction to the physiological adaptations of the body during physical conditioning; analysis and development of physical fitness programs for individuals and groups. Prerequisite: Kinesiology 150 or consent of instructor. 2 hours.
252. **Bioenergetics of Human Movement.** Study of the nature of energy transfer during physical activity; mechanisms of metabolic control, force production, cardiorespiratory support and adaptation relative to physical activity. Laboratory and lecture. Prerequisite: Kinesiology 150, Physiology 103, and Cell and Structural Biology 234 or equivalent. 3 hours.
255. **Biomechanical Analysis of Human Movement.** Studies the biological and mechanical principles of human motor performance; analyzes selected movement skills in depth. Prerequisite: Physiology 103, Cell and Structural Biology 234, and Mathematics 112, or consent of instructor. 3 hours.
257. **Coordination, Control and Skill.** Introduction to the concepts and principles of the coordination and control of movement and the development of skilled action. The course will focus on such topics as fundamental movement activities; movement control processes; acquisition, retention and transfer of skill; and the role of constraints to action. These topics have implications for understanding skilled performance, motor development and human performance in general. Prerequisite: Kinesiology 140 and 150 or consent of instructor. 3 hours.
262. **Motor Development, Growth, and Form.** Same as Human Development and Family Studies 262. Examination of the concepts of motor development, physical growth, and body form throughout the lifespan. Major emphasis is on the period of birth through adolescence. Prerequisite: Kinesiology 140 and 150. 3 hours.
263. **Physical Education Curriculum.** The identification, selection, and organization of movement knowledges and experiences into curricula for children and youth; emphasizes the decision-making process in curriculum development. Prerequisite: Junior standing. 3 hours.
267. **Adapted Physical Education.** Organization, administration, and conduct of physical education programs for the most prevalent types of medical conditions found in school settings; emphasis on analyzing motoric needs and prescribing programs of motor activity for special populations, including individuals with mental retardation and learning disabilities. Prerequisite: Kinesiology 150 and 257, or consent of instructor. 3 hours.
269. **Physical Education for Children.** Theory and practice of physical education in pre-elementary and elementary schools; for non-kinesiology majors. 3 hours.
273. **Instructional Strategies in Physical Education.** Analyzes the teaching-learning process, emphasizing the identification of instructional strategies specific to the development of skilled performance in movement activities. Prerequisite: Kinesiology 257. 3 hours.

- 285. Supervised Experiences in Kinesiological Research.** Supervised laboratory experiences in physical education research; individual work under the supervision of members of the faculty in their respective fields. The student assists with data collection, processing, and analysis for research in progress. Prerequisite: Kinesiology 160 or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours.
- 286. Supervised Experience in the Common School.** Supervised practice in observing, assisting, and teaching children in elementary, junior high school, and senior high school. Emphasis is on understanding motor behavior, teacher-learner behavior, and interrelatedness with other aspects of the learning environment. Prerequisite: Kinesiology 257 or equivalent. 2 or 3 hours. May be repeated for a total of 4 to 6 hours.
- 287. Supervised Experiences in the Agency Setting.** Supervised practical experience in leadership roles in nonschool agency settings; emphasis on observing, planning, and conducting physical activity programs for children and/or adults in preschool, recreation, or other social agencies. 3 hours. May be repeated for a maximum of 6 hours.
- 288. Supervised Experiences in Athletic Training.** Supervised practicum in the athletic training setting; places emphasis on evaluation of student progress in clinical experiences. Prerequisite: Sophomore standing, and selection into the National Athletic Trainers Association approved athletic training certification program. 1 hour. May be repeated for a maximum of 6 hours.
- 290. Honors Seminar.** Same as Health and Safety Studies 290 and Leisure Studies 260. Lectures and discussion dealing with issues in kinesiology, dance, health education, recreation education, and related fields. Prerequisite: James Scholar standing or grade-point average of 4.0. 2 hours. May be repeated for a maximum of 6 hours.
- 291. Special Problems.** Special projects in research and independent investigation in any phase of health, kinesiology, physical education, and related areas selected by the students. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser, instructor, and head of department. 2 or 3 hours. May be repeated for a maximum of 6 hours.
- 293. Honors Senior Thesis.** Planning, researching and writing of an honors thesis, under supervision of a faculty member, on a problem of appropriate scope and character. Paper will be presented at a suitable meeting and/or seminar. Prerequisite: Senior standing when enrolling; minimum grade-point average (total, University and Kinesiology prefix courses) of 4.25; a minimum of one full year (2 semesters) remaining at the University of Illinois, Urbana-Champaign campus; and submission of a written proposal for approval at least 4 weeks prior to on-campus registration. 3 hours. May be repeated to a maximum of 6 hours.
- 300. Seminar in Kinesiology.** Critical assessment and integration of knowledge pertaining to Kinesiology. Prerequisite: Senior standing in Kinesiology and completion of a majority of Kinesiology core courses; or consent of instructor. 3 hours or 1 unit.
- 301. Observation and Evaluation in Kinesiology.** Examines the concepts of observation, measurement, and evaluation of human motor performance and functioning in physical activity contexts. Prerequisites: Kinesiology 140 and 150, or consent of instructor. 3 hours or 1 unit.
- 305. Principles of Ergonomics.** Same as Industrial Engineering and Physiology 305. See Industrial Engineering 305.
- 320. Advanced Assessment of Athletic Injuries.** Analyzes injury patterns and mechanisms for the various joints and body segments; emphasizes the nature of the injuries, clinical evaluation and therapeutic principles, the physiology of the healing process, and functional anatomy. Prerequisite: Kinesiology 220, or consent of instructor. 3 hours or 1 unit.
- 321. Therapeutic Modalities in Athletic Training.** Emphasizes instrumentation and application of therapeutic modalities in laboratory settings: therapeutic heat, electrotherapy, traction, massage, and hydrotherapy. Prerequisite: Credit or concurrent registration in Kinesiology 320, or consent of instructor; Physics 140 is recommended. 2 hours or $1\frac{1}{2}$ unit.
- 322. Neurophysiological Bases of Therapeutic Exercise.** Examines neurological mechanisms underlying exercise performance with application to therapeutic programs. Prerequisite: Physiology 103 or Cell and Structural Biology 234, or equivalent. 4 hours or 1 unit.

- 341. Games in Culture.** Examines game phenomena as cultural action systems with special emphasis on the biosocial behavior expressed in varying societies; topics include game components, cultural contexts, ecological strategies, enculturation, acculturation, symbolism, change process, and maladaptive behavior. Prerequisite: Kinesiology 244 or consent of instructor. 3 hours or 1 unit.
- 342. Body, Culture, and Society.** An analysis of the significant social aspects of the human body including anthropological, historical, psychological and sociological perspectives. Places emphasis on cross-culture and cross-national studies of bodily behavior with particular stress on exercise, health and sport practices. Prerequisite: Kinesiology 140; Kinesiology 249 or equivalent; or consent of instructor. 3 hours or 1 unit.
- 346. Gender and Physical Activity.** An examination of the gendered nature of physical activity in such contexts as physical education, sport, play, games, and leisure. Analyzes theoretical and methodological assumptions pertaining to gender and physical activity/sport contexts with particular attention on concepts of masculinity, femininity, role conflict, socialization influences and media representations of gender. The feminist critique of socio-cultural sport studies is also considered. Prerequisite: Kinesiology 240 or consent of instructor. 3 hours or 1 unit.
- 347. Social Psychology of Sport.** Same as Psychology 349. Outlines the social psychological parameters which influence behavior and performance in sport; emphasizes the impact of social influences upon the individual within the sport context, including such factors as achievement motivation, competition, anxiety, aggression, and personality. Prerequisite: Kinesiology 140; Kinesiology 247 or equivalent; Psychology 100, 103, or 105; Psychology 201; or consent of instructor. 4 hours or 1 unit.
- 349. Sociology of Sport.** Same as Sociology 346. Sociological analysis of sport as a socio-cultural system which progresses from the micro to the macro level; focuses on theoretical and conceptual issues in sociology of sport. Prerequisite: Kinesiology 249 and 3 additional hours of sociology, or consent of instructor. 3 hours or 1 unit.
- 353. Body Composition, Evaluation, and Regulation.** Examines the theoretical and technical aspects of measuring human body composition; introduces relevant techniques and instrumentation currently in use; reviews research methodology and findings pertaining to the effects of exercise conditioning and nutritional modification on body composition. Prerequisite: Kinesiology 252 or equivalent; consent of instructor. 3 hours or 1 unit.
- 354. Growth and Physical Development of Children.** Same as Human Development and Family Ecology 354. A study of the growth and physical development of children through adolescence with emphasis on those systems and body composition changes related to motor performance and exercise stress. Prerequisite: Physiology 103 and Cell and Structural Biology 234; Kinesiology 301; or equivalent. 3 hours or 1 unit.
- 355. Cinematography in Kinesiology.** Designed to develop an understanding of the mechanics of human motion as related to performance in sport activities through the mode of cinematography. Prerequisite: Kinesiology 255, or consent of instructor. 3 hours or 1 unit.
- 356. Electromyographic Kinesiology.** Focuses upon the biological components of volitional and reflexive movement in humans; theory and technology of electromyography are utilized to describe and quantify the neuromuscular input to the mechanical output. Prerequisite: Physiology 103 and Cell and Structural Biology 234. 3 hours or 1 unit.
- 357. Motor Learning.** Discussion and analysis of scientific principles related to the learning and performance of motor skills; review of related literature and research in motor learning. Prerequisite: Psychology 100 or consent of instructor. 4 hours or 1 unit.
- 359. Physical Activity and Aging.** Examines aging and age-related changes in the cells, tissues, organs, and systems of the human body; emphasizes the role of physical activity and other lifestyle choices in modifying the aging process and in influencing the onset and progression of the chronic diseases which accompany aging. Prerequisite: Kinesiology 252 or consent of instructor. 3 hours or 1 unit.
- 385. Clinical Experiences in Sports Medicine.** Clinical experiences in medical supervision of sports programs, in the areas of therapeutic exercises, fitness programming, and cardiac rehabilitation. Prerequisite: Consent of instructor. Prerequisites are determined on an individual basis in accordance with the clinical experiences to be undertaken. 2 to 8 hours, or $1/2$ to 2 units. May be repeated to a maximum of 8 hours or 2 units.

394. **Special Topics in Kinesiology.** Lecture course on topics of current interest; specific topics announced in the *Timetable*. Prerequisite: To be determined for each subject and indicated in the *Timetable*. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated.
420. **Issues in Sports Medicine.** Addresses current issues in the medical aspects of sports; examples of these issues are epidemiology of injuries and treatment forms, use of sports equipment, questionable sports practices, and preventive techniques. Prerequisite: An exercise physiology course and Kinesiology 320, or equivalent; or consent of instructor. 1 unit.
422. **Kinesiotherapy.** Analyzes pathomechanics underlying injury and orthopedic problems; also analyzes rehabilitation methods for orthopedic and neurological dysfunctions. Prerequisite: Kinesiology 322 or consent of instructor. 1 unit.
447. **Sport Psychology.** Analysis of psychological factors and principles with special reference to motor performance, learning motor skills, perception, and emotion in sports situations; review of literature; and independent projects. Prerequisite: Kinesiology 347 or consent of instructor. 1 unit.
449. **Seminar: Sociology of Sport.** Same as Sociology 449. Sociological analysis of sport with emphasis on sociological theory; places stress on problems of comparative analysis, concept formation, and theory construction within the area of the sociology of sport. Prerequisite: Kinesiology 346 and 9 hours of sociology or anthropology; or consent of instructor. 1 unit.
451. **Scientific Basis of Physical Performance.** Contemporary trends in the study of human performance and exercise stress; analysis of the research literature, experimental strategies, and research instrumentation. Lecture-discussion and laboratory. Prerequisite: An exercise physiology course or Kinesiology 354, or equivalent. 1 unit.
452. **Neuromuscular Aspects of Human Performance.** In-depth study of the neuromuscular aspects of human activity; focus on selected topics related to growth, physical development, exercise prescriptions, athletic conditioning, and fitness. Prerequisite: Kinesiology 451. 1 unit.
453. **Circulorespiratory Aspects of Physical Activity.** Aerobic performance responses to short-term, intermittent, and prolonged physical activity; special consideration given to endurance training methods and assessment techniques, ergogenic aids, and problems associated with growth, environmental influences, and competitive sport. Prerequisite: Kinesiology 451 or consent of instructor. 1 unit.
455. **Experimental Kinesiology.** Mechanical and neuromuscular approach to human movement; analysis and experimental research. Prerequisite: Kinesiology 355 and 356, or consent of instructor. 1 unit.
457. **Sensorimotor Development.** Same as Human Development and Family Ecology 457. Studies the development of spatially adapted movement behavior in man; emphasis on the nature of sensorimotor systems and development of perception; the role of proprioceptive feedback mechanisms and associated reflexes; and the neurogeometric principles basic to the study of man interpreting and acting on the environment. Prerequisite: Kinesiology 357 or equivalent. 1 unit.
461. **Administration of Physical Education and Sport.** Analysis of completed research relating to theory and practice of administration in physical education and sport; the development of policy statements and procedures manuals for the various educational levels; and experience in the use of the case plan of instruction as a teaching technique for the development of competence and knowledge relating to human relations and administration in this specialized field. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar.** Lectures, discussions, and critiques on kinesiology and related subjects by faculty members and visiting professional leaders; presentation and criticism of student theses. 0 credit.
493. **Independent Study.** Independent research on special projects; offered summers as a special group practicum. $\frac{1}{2}$ or 1 unit.
494. **Special Topics in Kinesiology.** Lecture course in topics of current interest; specific subject matter announced in the *Timetable*. $\frac{1}{2}$ or 1 unit. May be repeated.

495. **Research Methods in Kinesiology.** Review and appraisal of common research procedures; application of statistical procedures, library methods, evaluation procedures, and experimental methods. 1 unit.
499. **Thesis Research.** Preparation of theses in kinesiology. 0 to 4 units.

LABOR AND INDUSTRIAL RELATIONS

Director of Institute: Professor W. Franke

Institute Office: 247 Labor and Industrial Relations Building, 504 East Armory Avenue, Champaign

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
301. **European Working-Class History: 1750 to the Present.** Same as History 301 and Sociology 301. See History 301.
315. **The Economics of Poverty and Income Maintenance.** Same as Economics 315. See Economics 315.
317. **Human Services in Industrial and Occupational Settings.** Same as Social Work 317 and Labor and Industrial Relations 317. See Social Work 317.
318. **Industry and Society.** Same as Sociology 318. See Sociology 318.
337. **American Working Class History, 1780 to the Present.** Same as History 337. See History 337.
341. **Economics of Labor Markets.** Same as Economics 341. See Economics 341.
345. **Economics of Human Resources.** Same as Economics 345. See Economics 345.
347. **Labor Law, I.** Same as Law 357. See Law 357.
355. **Industrial Social Psychology.** Same as Psychology 355. See Psychology 355.
357. **Psychology of Industrial Relations.** Same as Psychology 357. See Psychology 357.
360. **Employee Benefit Plans.** Same as Finance 360. See Finance 360.
409. **Organizational Behavior.** Same as Business Administration 409. See Business Administration 409.
418. **Seminar in Industrial and Economic Sociology.** Same as Sociology 418. Industrialization, labor-management relations as group relations, the interrelations of industry and community, technology and controls in industry, problem of social economics and stratification in industry. 1 unit.
420. **Formation of Public Policy.** Same as Political Science 461. See Political Science 461.
422. **Government Regulation.** Focuses on government policies affecting collective bargaining and personnel practices; includes an introduction to theories of political science and public policy for an understanding of government regulation in the employment area. Prerequisite: Labor and Industrial Relations 347 or 491, or consent of instructor. 1 unit.
430. **Foundations of Industrial-Organizational Psychology.** Same as Psychology 430. See Psychology 430.
435. **Motivation and Morale in Industry.** Same as Psychology 435. See Psychology 435.
440. **Labor Economics.** Same as Economics 440. See Economics 440.
441. **Labor Economics.** Same as Economics 441. See Economics 441.
442. **Collective Bargaining.** Same as Economics 442. Examination of: social values and social science concepts to develop a framework for explaining the basis and shape of collective bargaining as it has been practiced in the United States; government and law, unions, and employers as part of the development of this framework; the environment of collective bargaining with respect to the role of economics and bargaining structure; the negotiating process as the interactive basis for union-management relations; conflict and conflict resolution as part of the negotiating process; wage and other effects of collective bargaining as bargaining outcomes; contemporary changes in union management relations. Case materials and exercises may be used to supplement course materials. Prerequisite: Consent of instructor. 1 unit. Graduate credit is not given for both Economics 343 and Labor and Industrial Relations 442.

- 443. Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Law 361. Examination of the use of procedures to resolve employment disputes in both union and nonunion workplaces; comparative analysis of grievance arbitration, interest arbitration, mediation, fact-finding, and combinations of these procedures; special emphasis given to the role of third party intervention. 3 hours or 1 unit. Hourly credit only applicable to Law 361.
- 444. Problems and Policies in Human Resources.** Same as Economics 444. See Economics 444.
- 445. Investment in Human Resources.** Same as Vocational and Technical Education 445. Activities that influence future monetary and psychic income by improving the resources in people; coverage of investments, including schooling, on-the-job and other training, migration, and the search for information on jobs and incomes; emphasis on human capital concepts, public human resources policy, and equal employment opportunity policy. Prerequisite: An introductory course in economics and in quantitative methods, as specified by the department. 1 unit.
- 447. Labor Union Organization and Administration.** Same as Economics 447. Analysis of the structure, history, and government of the modern American trade union movement; survey of the environmental factors, objectives, and action programs with considerable emphasis on economic and internal institutional factors, including the roles of leaders, policy determination and execution, and governmental regulations; considerable emphasis also on the processes of union organizing and employer opposition. Prerequisite: Major in social science or consent of instructor. 1 unit.
- 448. Problems of Personnel Management.** Same as Business Administration 411. See Business Administration 411.
- 451. Labor Law and Public Policy.** Same as Law 360. Analyzes current major policy issues in labor relations and employment law through the concepts and techniques of the lawyer and the labor relations specialist. Prerequisite: For law students, Law 357 or consent of instructor; for Institute of Labor and Industrial Relations and other graduate students, one semester of labor and industrial relations course work or consent of instructor. 3 hours or 1 unit. Hourly credit only applicable to Law 360.
- 454. Comparative Industrial Relations Systems.** Same as Law 356. Examines the history and structure of industrial relations systems in industrialized market economies; the organization and policies of unions and employers and of their international organizations; the role of national governments and international organizations in establishing industrial relations policies; comparative analysis of such topics as industrial conflict, industrial and economic democracy, and the relations between industrial relations and national economic policy. 3 hours or 1 unit. Hourly credit only applicable to Law 356.
- 455. Labor in Less Developed Countries.** The role and place of LDCs in the world; colonialism, independence, and nation-building; economics, power, and stratification; development of labor markets and labor movements; economic, political, and social consequences of international trade, finance, and investment; international diffusion of technology and ideology; nation-states, multi-national corporations and world community; and international and regional organizations and their impact on labor in LDCs. Prerequisite: Economics 101 or 109, or equivalent. 1 unit.
- 456. Industrial Relations Theory, I.** An integrated analysis of the principles of labor relations through the study of the works of the major theorists and their critics. Prerequisite: Consent of instructor. 1 unit.
- 457. Industrial Relations Theory, II.** Continuation of Labor and Industrial Relations 456. Focuses on contemporary research in industrial relations and related fields. Prerequisite: Labor and Industrial Relations 456. 1 unit.
- 458. Faculty-Student Workshop.** Training and experience for Ph.D. students in the application of social science and industrial relations theory and research methodology to contemporary industrial relations problems through presentation and discussion of faculty and student research. Ph.D. students are required to make presentations and to participate in workshop discussions during the entire period of their campus residency. Prerequisite: Labor and Industrial Relations 456 and 457. 0 to 1 unit.

- 461. Compensation Systems.** Compensation theory and practice. This course addresses the theoretical and practical issues associated with the design of effective compensation systems. The design phases include establishing internal equity, external equity, and individual equity. Budgeting and administration are also addressed. Case analyses and computer simulations may be used to supplement course materials. 1 unit.
- 462. Human Resources Planning and Staffing.** Examines conceptual issues, policies, and practices relating to the attraction, selection, development, and planning for the most effective utilization of human resources. 1 unit.
- 463. Human Resource Information Systems and Computer Applications in Industrial Relations.** Design, implementation, and evaluation of human resource information systems (HRIS). Topics to be covered include fundamental database characteristics, information systems and management processes, systems analysis and needs assessment in Human Resources and Industrial Relations departments, implementing HRI systems, the use of HRI systems to solve organizational problems, information systems and labor relations. A series of cases and computer exercises which will play a major role in determining the course grade will be used. Regular seminars and some laboratory sessions will be scheduled throughout the semester. Prerequisite: Labor and Industrial Relations 491 and 493, or equivalent. 1 unit.
- 464. Human Resource Training and Development.** Examination of: theories of behavioral change; application of these theories to training and human resource development; assessing training needs, especially with reference to the internationalization of business, changes in labor demand, demographic trends in the United States, and increasing work force diversification; advantages and disadvantages of the various training and development techniques; relation of training to organizational strategies; methods of training evaluation. Special attention is given to the need for and methods of cross-cultural training. Students develop training exercises for class presentation and participation. 1 unit.
- 465. Human Resources Management and Strategy.** Same as Business Administration 414. Designed to provide integration across the specific functional areas of the human resources management (HRM) field, while at the same time demonstrating the linkages horizontally within HRM and vertically with strategic management of the firm. This case-focused course places emphasis on human resources issues of strategic importance to the organization. Prerequisite: One prior course from the Organizational Behavior and Personnel Management distribution subject area list (in the AM degree requirements for the graduate degree in LIR). 1 unit.
- 490. Individual Topics.** A student in labor and industrial relations may register for this unit with the consent of the curriculum adviser and the adviser under whom the student will perform individual study or research. Such individual work may include special study in a subject matter for which no course is available or an individual research project, including on-the-job research in industry, which is not being undertaken for a thesis. 0 to 2 units.
- 491. Industrial Relations Systems.** A general framework for the analysis of employment relationships. Topics include industrial relations theory, the American system of collective bargaining, intercountry system differences, and human resource management strategies and practices. Prerequisite: Graduate standing. 1 unit.
- 492. Research Methods in Labor and Industrial Relations.** Systematic analysis of theories and procedures of the various social and physical sciences bearing on research in labor and industrial relations; primary emphasis on the process of integrating the approaches and techniques of the various social sciences with respect to the study of problems in labor and industrial relations as met in practice in management, the union, and government service, as well as in teaching and research in the field. Prerequisite: Major in social sciences or consent of instructor. 1 unit.
- 493. Quantitative Methods in Labor and Industrial Relations.** Introduction to statistical concepts and methods in the social sciences and their application to industrial relations problems; familiarizes the student with modern methods of probability sampling, statistical inference, and multivariate analysis, and their application to current research

problems in labor and industrial relations. Prerequisite: Any elementary statistics course. 1 unit.

494. **Tutorial Seminar.** Research experience for Master's students in carrying out a problem solving project from formulation to written report in a chosen area of labor and industrial relations. Each student selects an individual topic with the approval and guidance of a faculty member and participates in a Tutorial Workshop. Prerequisite: Completion of no fewer than 6 units of Labor and Industrial Relations course work. 0 or 1 unit.
496. **Workers, Managers, and Unions in Historical Perspective.** A social and political history of North American workers and their relations with employers and government from the 1860s to the present. Focuses especially on the impact which the changing labor force had on the formation of labor organizations and on labor management relations throughout the last century. Prerequisite: Graduate standing in labor and industrial relations or consent of instructor. 1 unit.
497. **Collective Bargaining in Public Employment.** Same as Social Work 497, Administration, Higher, and Continuing Education 497, and Political Science 469. Development of employee organization, collective bargaining, and public policies in the public sector: federal, state, and local; analysis of contemporary bargaining relations, procedures, problems, and consequences; special emphasis on dispute resolution and on union impacts. 1 unit.
498. **Analysis of Organizations in Industrial Relations.** Intensive analysis of organizational behavior, with the main focus upon the theory of organizations as social institutions; concepts drawn from the various social sciences and applied to the principal organizations concerned with industrial relations; and examination of the internal dynamics of unions, managements, and government agencies, with special reference to decision-making processes, and their individual relations to the interactions among them. Prerequisite: Consent of instructor. 1 unit.
499. **Thesis Seminar.** For all students writing theses in labor and industrial relations at the A.M. and Ph.D. levels. 0 to 4 units.

LANDSCAPE ARCHITECTURE

Head of Department: Vincent J. Bellafiore

Department Office: 214 Mumford Hall, 1301 West Gregory Drive, Urbana

101. **Introduction to Landscape Architecture.** A survey of the practice, profession, and philosophy of landscape architecture. 2 hours.
133. **Basic Landscape Design.** Introduction to the fundamentals of design, including studies in two- and three-dimensional abstract and applied problems, basic elements and procedures of design, and principles of landscape composition. Prerequisite: Credit or concurrent registration in Landscape Architecture 180, or consent of instructor. 5 hours.
134. **Site Design.** Principles and practices of site planning; orientation, circulation, and land use definitions and relationships applied to site scale problems; and application of site design process. Field trip required; see *Timetable* for current fees. Prerequisite: Landscape Architecture 133 or consent of instructor. 5 hours.
142. **Landform Design and Construction.** Introduction to the fundamentals of the earth's surface as a design element; limitations and uses of landforms; and methods of grading, surface drainage, and land surveying. Prerequisite: Mathematics 114 or 116. 3 hours.
150. **Introduction to Environmental Factors in Design.** Principles and practices of identifying, analyzing, and recording landscape resources. Field trip required; see *Timetable* for current fees. Prerequisite: Geography 103 or consent of instructor. 3 hours.
170. **Introduction to Social Factors in Design.** To provide an understanding of how outdoor settings affect human behavior and how socially responsible design can result. Short exercises, field trips, and evaluation of open spaces will enable students to apply the above concepts. 3 hours.

180. **Design Communications, I.** Basic principles and techniques of visual communication in landscape architectural rendering, including computer-based techniques. Prerequisite: Concurrent registration in Landscape Architecture 133. Open to Landscape Architecture majors only. 3 hours.
181. **Design Communications, II.** Advanced principles and techniques of visual communication in landscape architectural rendering, including computer-based techniques. Prerequisite: Concurrent registration in Landscape Architecture 134; and Landscape Architecture 180 or consent of instructor. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Senior Honors Course.** Independent guided study and research in a selected area of landscape architecture; for candidates for honors in landscape architecture. Prerequisite: Senior standing in landscape architecture, a university grade-point average of 4.0, and consent of head of department. 1 to 6 hours. May be repeated to a maximum of 9 hours.
214. **History of Landscape Architecture.** Analysis of the development of landscape architecture as a result of environmental and cultural influences. 3 hours.
226. **Principles of Park Design.** Introduces theories, principles, and applications of park site and system master planning and design; examines relationships between aesthetic and functional considerations, site features, park users, and administrators. 2 hours.
235. **Recreation and Community Design.** Development of design solutions at site and master plan scale relative to community urban and recreational problems; emphasizes development of analysis and design techniques. Field trip required; see *Timetable* for current fees. Prerequisite: Landscape Architecture 134 or consent of instructor. 5 hours.
236. **Design Workshops, I.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. Students select from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours.
243. **Site Engineering.** Principles of surveying and design of drainage, circulation, and utility systems. Prerequisite: Landscape Architecture 142 and Mathematics 114 or 116; or consent of instructor. 4 hours.
244. **Landscape Construction.** Construction methods, materials, and procedures related to the design of landscape structures; development of design details and cost estimating. Prerequisite: Landscape Architecture 243 or consent of instructor. 4 hours.
246. **Professional Practice.** The landscape architect as a professional practitioner; includes orientation to the concept of professionalism, forms of professional activity, and the skills needed to manage a practice. 1 hour.
252. **Planting Design I.** Biogeography; identification of native species, evergreens, and exotics; uses of plants in the landscape; and planting design projects. Field trips required. Prerequisite: Horticulture 201 and 202. 3 hours.
253. **Planting Design II.** Planting design philosophies; detailed and comprehensive design projects; management practices; technical documents; and plant identification. Field trips required. Prerequisite: Landscape Architecture 252. 3 hours.
290. **Special Problems.** Supervised independent study, research, or special project in a selected area related to landscape architecture. Prerequisite: Junior or senior standing; consent of instructor and head of department prior to advance enrollment and registration. 1 to 6 hours. May be repeated to a maximum of 9 hours.
299. **Off-Campus Study.** Provides campus credit for off-campus study. Prerequisite: Junior standing; prior review and approval of the student's written proposal by a faculty committee and the department head. 0 to 15 hours (summer session, 0 to 6 hours). Final determination of appropriate credit is made by a faculty review committee upon completion of the student's work. Maximum credit, 15 hours (summer session, 6 hours), all of which must be earned within one semester.
325. **Historical Geography of American Landscapes to 1880.** Same as Geography 325. See Geography 325.
326. **Historical Geography of American Landscapes Since 1880.** Same as Geography 326. See Geography 326.

327. **American Vernacular: The Cultural Landscape.** Same as Geography 327. See Geography 327.
337. **Regional Landscape Design.** Introduction to the process of physical planning, emphasizing land use policy and plan formulation; a regional case study is undertaken to develop analytical skills, to introduce the relationship between cultural and natural processes, and to explore the need for responsible political action. Prerequisite: Landscape Architecture 236 or consent of instructor. 5 hours or 1¹/₂ unit.
338. **Design Workshops, II.** Project design at various scales utilizing problems of a wide range of complexity and subject matter; concerns rural, community, and urban problems, housing, recreation, and open space; and emphasizes problem analysis and generation of innovative design alternatives. The student selects from several sections depending on specific interests. Prerequisite: Landscape Architecture 235 or consent of instructor. 5 hours, or 3³/₄ to 1¹/₂ units.
341. **Land Resource Evaluation.** Same as Urban Planning 341. Examines concepts for the value of land, land resource problems and policy responses, methods for evaluating land resource development and policy alternatives, and case studies of land resource evaluation. Prerequisite: Graduate standing or consent of instructor. 4 hours or 1 unit.
344. **Social Impact Assessment.** Same as Environmental Studies, Forestry, Leisure Studies, Rural Sociology, and Urban and Regional Planning 344. See Environmental Studies 344.
350. **Land Use Ecology.** Ecological implications of alternative land use patterns; equipment, field techniques, and nomenclature in current use by environmental consultants; and elements of a baseline ecosystem study. Prerequisite: Consent of instructor. 3 or 4 hours, or 3³/₄ or 1 unit.
370. **Design-Behavior Interaction.** Critical discussion of notions and theories pertaining to the reciprocal effects of landscape architectural design and human behavior. 3 hours or 3³/₄ unit.
417. **Land and Society: History, Theories, and Problems.** Historical and cross-cultural investigation of the use, shaping, and perception of the land-based environment; case studies, critical problems and issues, and theories of social-environmental interaction. Prerequisite: Consent of instructor. 1 unit.
437. **Landscape Planning.** Small group design and planning studio emphasizing actual problems and clients; projects require fieldwork, analysis, problem-solving, design, and presentation to client. Prerequisite: Landscape Architecture 341 and 350, or consent of instructor. 1¹/₂ units.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Leisure Studies, Rural Sociology, and Urban and Regional Planning 440. See Environmental Studies 440.
442. **Spatial Design Methods.** Same as Urban Planning 442. Representations and solution procedures for problems involving the arrangement of land use activities in space; optimizing, approximate, and graphic methods, their applications, effectiveness, and efficiency; and experiments with computerized procedures. Prerequisite: Landscape Architecture 341 or consent of instructor. 1 unit.
450. **Environmental Impact Statements.** Requirements of the National Environmental Policy Act and Guidelines from the Council on Environmental Quality for preparing and writing environmental impact statements; includes interdisciplinary team efforts and impact assessment techniques. Prerequisite: Graduate or law school standing, or consent of instructor. 1 unit.
463. **Methods of Social and Behavioral Research in Designed Environments.** Same as Architecture 463. See Architecture 463.
464. **Conducting Social and Behavioral Research in Designed Environments.** Same as Architecture 464. Each student prepares and conducts research to obtain information about specific relationships between people and the designed environment. Prerequisite: Landscape Architecture 370 or Architecture 323, and Architecture 463, or equivalent; and a course in introductory statistics. 1 unit.
465. **Design/Behavior Studio.** Same as Architecture 465. Development of site or project scale

design emphasizing the integration of user needs and behavioral factors. Prerequisite: Landscape Architecture 464, or consent of instructor. 1½ units. May be repeated to a maximum of 3 units.

- 481. **Urban Design Studio, I.** Same as Architecture 481. See Architecture 481.
- 482. **Urban Design Studio, II.** Same as Architecture 482. See Architecture 482.
- 483. **Environmental Science and Planning Research.** Same as Urban and Regional Planning 483. See Urban and Regional Planning 483.
- 487. **Seminar.** Preparation, presentation, and discussion of research papers on current and future areas of landscape architectural application. Prerequisite: Consent of instructor. 1½ to 1 unit.
- 490. **Special Problems.** Nature and scope of projects to be determined by consultation between student and faculty adviser; open to landscape architecture majors as well as those from other disciplines who wish to engage in interdisciplinary work. Prerequisite: Consent of instructor. 1½ to 2 units.
- 498. **Master's Project.** Major independent or small-group project synthesizing knowledge from previous course work. Prerequisite: Consent of instructor and program adviser. 0 to 2 units.
- 499. **Thesis Research.** Prerequisite: Graduate standing in landscape architecture. 0 to 2 units.

LANGUAGES

(For a list of the languages regularly offered, together with the units responsible for offering them, see APPENDIX A.)

LATIN AMERICAN AND CARIBBEAN STUDIES

Director of Center: Enrique Mayer

Center Office: 201 International Studies Building, 910 South Fifth Street, Champaign

- 170. **Introduction to Latin America.** An interdisciplinary introduction to the ways of life of Latin American peoples, their origins and current expressions; discusses social, economic, and political problems, and domestic and international policies related to them in the context of other Third World societies. 3 hours.
- 199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. **Individual Study.** A major tutorial normally taken in the senior year. Students read the works on a reading list devised in consultation with a faculty tutor and write a term paper. Prerequisite: Latin American and Caribbean Studies 170; a declared major in Latin American and Caribbean Studies; consent of instructor. 1 to 5 hours. May be repeated as topics vary to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 295. **Special Topics.** A topical survey of social, economic, and political factors in Latin American life. Each semester a particular topic is considered. Prerequisite: A basic course in a social science discipline. 2 to 4 hours.
- 345. **Tutorials in Native Latin American Languages.** Upon the consent of the Director of the Center for Latin American and Caribbean Studies, tutorials are available in special native Latin American languages not regularly offered by the University. Tutorials at the elementary, intermediate, and advanced levels may be arranged. Students registering for unit credit for the first two semesters must first present satisfactory evidence of knowledge of the language at the elementary level, either in the form of credit earned at another institution or by passing a proficiency examination. Prerequisite: Consent of instructor. 2 to 4 hours, or 1½ to 1 unit. May be repeated up to six semesters successively to a maximum of 16 hours or 4 units. Graduate credit is given only for work beyond the elementary level.

LAW

Dean of College: Richard L. Schmalbeck

College Office: 209 Law Building, 504 East Pennsylvania Avenue, Champaign

- 301. Contracts-Sales, I.** Enforceability of promises including unjust enrichment and reliance, offer and acceptance, mistake, unfairness and overreaching, unconscionability, Statute of Frauds, interpretation of contract language, conditions, and third party beneficiaries. 4 hours or 1 unit.
- 302. Contracts-Sales, II.** Introduction to the Uniform Commercial Code, its interpretation and application; performance of contracts including warranty obligations, breach, remedies for breach, impossibility and frustration of purpose, assignment and delegation, and third party rights in sold goods. Prerequisite: Law 301. 3 hours or 1 unit.
- 303. Torts.** A basic course in civil wrongs, including intentional torts (such as assault and battery), negligence (duty, unreasonable risk analysis, actual and proximate cause), and strict liability. 3 hours or 1 unit.
- 305. Property, I.** With Law 306, the basic first-year course in property law, required of all students. Provides an overview of the law of land, with incidental coverage of personal property; includes the concept of property, acquisition of private property, recognized property interests, gratuitous transfer of property interests, commercial transfers (sale, lease), the use of property, and an introduction to environmental law. 3 hours or 1 unit.
- 306. Property, II.** Continuation of Law 305. 3 hours or 1 unit.
- 307. Criminal Law.** The sources and purposes of the criminal law; the meaning of criminal responsibility; and the characteristics of particular crimes. 3 hours or 1 unit.
- 308. Criminal Procedure.** Problems in the administration of criminal justice with emphasis on right to counsel, arrest, search, interrogation, lineups, and the scope and administration of exclusionary rules. Prerequisite: Law 307. 3 hours or 1 unit.
- 309. Civil Litigation, I.** The role and importance of procedure in litigation, including jurisdiction, pleadings and parties, pretrial motions and discovery, trial practice (except evidence), relationship between judge and jury, the effect of a decision in one case on subsequent litigation between the same or different parties (*res judicata*), verdicts and judgments, and appellate review. 3 hours or 1 unit.
- 310. Civil Litigation, II.** Continuation of Law 309. Prerequisite: Law 309. 3 hours or 1 unit.
- 311. Legal Writing and Research.** Emphasis on development and improvement of skills in legal writing, and training in legal bibliography. Assignments may include brief writing and preparation of legal memoranda and opinions. 3 hours or 1/2 unit.
- 312. Moot Court.** Following Law 311, moot court is required in the second semester of the first year for further development of skills in legal research, analysis, and writing. Each student works in a team on the preparation of an appellate brief on a moot court case and then argues the case in appellate argument fashion before a panel of senior students and faculty. 2 hours. No graduate credit.
- 313. Constitutional Law, I.** Basic principles of American constitutionalism, including the judicial function in constitutional cases; the implementation of the doctrines of federalism and separation of powers; the development and exercise of the powers of Congress and the states in the federal union; and the protection of civil rights and liberties. 4 hours or 1 unit (summer session, 3 hours or 1 unit).
- 314. Administrative Law.** The functions of administrative tribunals in federal, state, and municipal government; the procedure before such administrative tribunals; and judicial relief from administrative decisions. 3 hours or 1 unit.
- 315. Constitutional Law, II.** A detailed study of the history and application of the First Amendment to the Constitution of the United States; focuses on the decisions of the Supreme Court concerning the freedoms of assembly, press, speech, and religion as well as the implied right of association. Prerequisite: Law 313. 3 hours or 1 unit.
- 316. Constitutional Litigation.** A study of the federal statutes that authorize civil suits against public officials and governmental entities responsible for the deprivation of constitutional rights; immunities and defenses; potential remedies; federalism issues. 2 to 3 hours, or 1/2 to 1 unit.

317. **Advanced Criminal Procedure.** Problems in the administration of criminal justice, with emphasis upon the commencement of formal proceedings (bail, decision to prosecute, grand jury, preliminary hearing, location of prosecution, scope of prosecution, speedy trial); the adversary system (pleas, discovery, jury trials, prejudicial publicity, ethical problems, double jeopardy); and postconviction review (post-trial motions, appeals, habeas corpus, related postconviction remedies). Prerequisite: Law 307, 308 and 313. 3 hours or 1 unit.
318. **Legislation.** Constitutional and statutory issues in legislative procedure, including issues relating to separation of power between Congress and the President; particular legislative-executive issues raised by the Illinois Constitution; and techniques of legislative drafting and the interpretation of statutes. 2 to 3 hours, or $1/2$ to 1 unit.
319. **Environmental Law.** The regulatory aspects of environmental law. Environmental impact assessments; control of air pollution, water pollution, noise, and toxic substances; the roles of federal and state governments; and citizen participation in and judicial review of public decision-making and enforcement procedures. 3 hours or 1 unit.
320. **Natural Resources.** Legal problems associated with the use of certain land, water, and mineral resources, including energy sources; emphasizes public management and regulation. 2 or 3 hours, or $1/2$ or 1 unit.
321. **Urban Government.** The law governing the structure, powers, and operation of local governments in urban and suburban areas with analysis of political, economic, and social implications. 3 hours or 1 unit.
322. **Land Use Planning.** Examination of the legal and administrative aspects of land development and regulation in an urban society, including the techniques and problems of planning; the tools of plan effectuation, such as zoning, subdivision regulation, renewal and redevelopment, and housing programs; and the allocation of decision-making among various levels of government. 2 to 3 hours, or $1/2$ to 1 unit.
323. **American Indian Law.** A historical survey of congressional policy toward Indian affairs; studies relevant legislation delineating the relationship between tribes and the federal government; considers the unique jurisdictional problems that arise with conflicting claims of state, federal, and tribal sovereignty and regulatory authority; focus on individual rights and benefits conferred by federal law to American Indians, including Indian welfare laws, employment preference systems, and religious freedom legislation. 3 hours or 1 unit.
324. **Law and Medicine.** Examines legal, ethical, and social policy issues of selected recent revolutionary developments in health care provision; appropriate legal responses will be discussed and developed in the light of existing federal and state legislation, common law, and judicial intervention, constitutional mandates, economic/cost considerations, as well as analytical and evaluative commentary by physical and social scientists, lawyers, and politicians. 3 hours or 1 unit.
325. **Law, Science, and Medicine.** Explores the legal system's response to challenges of modern science and medicine; topics include regulation of genetic engineering and nuclear power, experimentation on humans and animals, control of communicable diseases, allocation of transplant organs, and the right to die. 2 or 3 hours, or $1/2$ or 1 unit.
327. **Advanced Bankruptcy and Creditors' Rights.** Selected issues in bankruptcy and creditors' rights not covered in Law 339, with emphasis depending on current significance; examination of business reorganizations under Chapter 11 of the Bankruptcy Code, generally including jurisdictional issues and problems related to the filing of the case, the participants in the Chapter 11 process, operating a business under Chapter 11, and formulating and confirming a reorganization plan. Prerequisite: Law 339. 3 hours or 1 unit.
328. **Organizations, I.** Examines the basic state and federal legal consequences for individuals, organizations, and society of the formation, control, and financing of organizations; includes the agency and employment relationship, unincorporated associations, general partnerships, limited partnerships, close corporations, public corporations, and nonbusiness organizations. 3 hours or 1 unit.
329. **Organizations, II.** Examines the impact of state and federal regulation and financial theory on the continuing financial policy decisions of business organizations, including distributions (by dividends and share purchases); going concern rights of debt and equity

- holders; insolvency and reorganization; tender offers; merger; and acquisitions. Prerequisite: Law 328. 2 hours or $\frac{1}{2}$ unit (summer session 3 hours or 1 unit).
330. **Antitrust Law.** The limitations imposed by the Sherman Act, Clayton Act, and Federal Trade Commission Act on anticompetitive practices by business firms; emphasizes price fixing, monopolization, mergers, exclusive dealing, tying arrangements. 3 hours or 1 unit.
331. **Business Planning.** Examination of planning situations wherein tax, corporations, corporate finance, securities regulation, and accounting materials are interrelated; organization of close corporations and public companies, corporate distributions and recapitalizations, sale of corporate businesses, corporate acquisitions and mergers, and corporate separations; and problems requiring written opinions and solutions. Prerequisite: Law 348 and 351. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
332. **Securities Regulation.** Problems arising under federal securities laws administered by the Securities and Exchange Commission, as well as "blue sky" or state securities laws; emphasis upon statutory and regulatory requirements imposed in connection with corporate financing. Prerequisite: Law 328 and 329. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
333. **Advanced Corporate and Securities Law.** A problem method analysis of advanced substantive and procedural aspects of corporate and securities litigation, including advanced aspects and recent developments of SEC Rule 10b-5; problems involving takeovers, litigation possibilities; procedural and other aspects of shareholders' derivative suits; extra-territorial application of the federal securities laws. Prerequisite: Law 328 and 329. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
334. **Government Regulation.** The legal and policy implications of government regulation. Course content varies from a survey of laws regulating various industries to a detailed focus on a specific industry. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
335. **International Business Transactions.** Doing business abroad: export-import regulations, use of foreign commission merchants, licensing of patents and know-how, investment and exchange problems, establishing a foreign operation (including forms of business organization available abroad), and application of United States and foreign antitrust law to the business operation. 3 hours or 1 unit.
336. **Regulation of Financial Institutions.** The framework of federal and state regulation of the structure and activities of financial institutions, with emphasis on banks and other depository institutions. Topics include relevant provisions of the National Bank Act, Federal Reserve Act, and Bank Holding Company Act as well as the regulatory policies of the Comptroller of the Currency and Federal Reserve Board. Consideration is given to the issues presented by "deregulation", including developments relating to branch banking, interstate banking, and brokerage and underwriting activities as well as regulation of international banking activities. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
337. **Article 9 (Personal Property Security).** Study of secured transactions under Article 9 of the Uniform Commercial Code. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
338. **Real Estate Finance.** Methods of financing land acquisition and residential and commercial development, including publicly owned and subsidized housing. 3 hours or 1 unit.
339. **Creditors' Rights.** The legal regulation of the relationship among debtors and their creditors and among creditors of a particular debtor; pre- and postjudgment remedies of unsecured creditors; debtors' attempts to defeat creditors, including fraudulent conveyances; study of Bankruptcy Code chapters 7 (liquidation) and 13 (adjustment of debts by individuals), and an introduction to chapter 11 (reorganization). 3 hours or 1 unit.
340. **Commercial Paper.** A study of problems involved in the use of checks and promissory notes with special emphasis on Articles 3 and 4 of the Uniform Commercial Code, including electronic funds transfers and letters of credit. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
341. **Consumer Credit.** Existing patterns and proposed changes in consumer credit law; finance charge regulations, special licensing for merchandisers of consumer credit, disclosure of finance charges, door to door selling, home improvement financing, cutting off defenses, creditor remedies problems including garnishment, wage assignments, and deficiency judgments, and administrative control of creditor practices. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).

- 342. Copyright, Trademark, and Unfair Competition.** The regulation of competitive business behavior at common law and under federal and state statutes; trademarks, copyrights, trade secrets, protection of ideas, commercial disparagement, false advertising, and price discrimination. 2 to 3 hours, or $\frac{1}{2}$ to 1 unit.
- 344. Sports Law.** Examines specialized aspects of the sports industry; emphasis given to antitrust, labor, and tax issues as applied to professional sports, and antitrust and constitutional issues that have allowed courts to intervene in intercollegiate athletics. Does not consider recurring legal problems for which general principles of law are applicable. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Patent Law.** Historical development of protection of ideas, inventions, and discoveries; patentability; securing the patent; amendment and correction of patents; and infringement remedies, defenses, and procedures. 2 hours or $\frac{1}{2}$ unit (summer session, 3 hours or 1 unit).
- 346. Advanced Antitrust Law.** Issues in antitrust law of particular current significance. The precise content varies, but typical areas of inquiry include federal regulatory antitrust exemptions, state action doctrine, patent licensing, extra-territorial application of domestic antitrust laws, and procedural issues in private enforcement. Prerequisite: Law 330. 3 hours or 1 unit.
- 347. International Trade Policy.** An analysis of the regulation of trade between nations by international agreement (e.g., the GATT), by multinational organizations (e.g., the European Communities), and by individual countries; emphasizes U. S. import restraints, export controls, and related laws. 3 hours or 1 unit.
- 348. Income Taxation.** The fundamental course in federal income taxation. Includes materials relating to income taxation of individuals and an introduction to taxation of corporations and shareholders. 3 hours or 1 unit.
- 349. Corporate Taxation.** An in-depth study of federal income tax law related to taxation of corporations, shareholders, partnerships, and partners. Prerequisite: Law 348. 3 hours or 1 unit.
- 350. Partnership Taxation.** Involves the study of Subchapter K of the Internal Revenue Code, including partnership formation, allocations, distributions, and liquidations. Also examines the tax treatment of Subchapter S corporations. Prerequisite: Law 348. 3 hours or 1 unit.
- 351. Estate and Gift Taxation.** A comprehensive treatment of federal transfer (estate and gift) taxes. Prerequisite: Law 348. 3 hours or 1 unit.
- 353. State and Local Taxation.** A survey which stresses the constitutional and statutory bases of state and local tax systems; considers the fiscal and economic policy aspects of the tax structure; and includes the power and purposes of taxation, the operation and administration of the general property tax, jurisdiction of the states to impose various types of taxes, and special problems relating to the operation of income, sales, and business excise taxes. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 354. Taxation of International Transactions.** Survey of the problems in U.S. taxation of foreign persons and foreign income, with special emphasis upon foreign business transactions of U.S. corporations. Prerequisite: Law 351. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.
- 356. Comparative Industrial Relations Systems.** Same as Labor and Industrial Relations 454. See Labor and Industrial Relations 454.
- 357. Labor Law, I.** Same as Labor and Industrial Relations 347. A study of the National Labor Relations Act as amended, the preact history of the labor movement, and the judiciary's response thereto, with emphasis on understanding the problems, experiments, and forces leading to the enactment; includes the negotiation and administration of the collective bargaining agreement, especially the grievance arbitration procedure, its operation and place in national labor policy; and explores the relationship of the individual and the union. Prerequisite: Graduate standing or completion of first year of law curriculum. 3 or 4 hours, or 1 unit.
- 358. Employment Discrimination.** Problems arising under federal statutory prohibitions of discrimination in employment, with particular emphasis on evidentiary problems and the use of statistical proofs; defining relevant labor pools, using statistical analyses of data, and establishing proof of test validation. Prerequisite: All first year law courses. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 3 hours or 1 unit.)

359. **Collective Bargaining and Labor Arbitration.** Enforcement and administration of the collective bargaining agreement, including enforcement of labor contracts under Section 301 of the National Labor Relations Act and enforcement of the labor contract pursuant to its own grievance and arbitration procedure. 2 hours or $1/2$ unit (summer session, 3 hours or 1 unit).
360. **Labor Law and Public Policy.** Same as Labor and Industrial Relations 451. See Labor and Industrial Relations 451.
361. **Problems and Practices of Labor Dispute Settlement.** Same as Economics 443 and Labor and Industrial Relations 443. See Labor and Industrial Relations 443.
362. **Public Sector Labor Law.** Treats the law of collective bargaining in public, largely state and municipal employment. Explores particular needs of public employment, in contrast with private employment, regarding approaches to: bargaining structure; scope of bargaining and enforceability of agreements; impasse and the resolution of disputes over terms and conditions of employment; and exclusivity of representation. Prerequisite: Law 357. 2 hours or $1/2$ unit.
363. **Family Law.** The creation and dissolution of the family, and legal relationships established by marriage, cohabitation and procreation. Covers the law of marriage, divorce, annulment, separation, unmarried cohabitation, illegitimacy, adoption and rights of child custody, parental property on divorce, inheritance, and related rights. Legal rules are placed into the social setting in which they operate, and emphasis is given to family policy as reflected in current developments in family law reform, including constitutional law. 3 hours or 1 unit.
364. **Decedent's Estates and Trusts.** Studies the means of transferring wealth, with primary emphasis on gratuitous transfers; the means available for making gratuitous transfers, including the validity and effect of testamentary instruments and trust deeds; and problems concerning the dispositive provisions of any type of instrument which transfers wealth. 3 hours or 1 unit.
365. **Future Interests.** Studies the validity and effect of gratuitous dispositions of assets in which enjoyment is postponed, restrained, or long continued; classification of future interests; construction; powers of appointment; rule against perpetuities and related restrictions. Prerequisite: Law 364. 2 hours or $1/2$ unit (summer session, 3 hours or 1 unit).
366. **Problems in Estate Planning.** Selected problems in the planning of estates which will serve to integrate the basic materials in property, trusts, wills, and income, estate, and gift taxation. Prerequisite: Law 348, 351, and 364. 2 to 3 hours, or $1/2$ to 1 unit.
367. **Alternative Dispute Resolution.** An examination of the limitations, consequences, and costs, as well as the indispensability of some aspects of modern litigation; the possibilities, requirements, and legal problems of consensual and of court-annexed dispute resolution processes alternative to final judicial adjudication, including legal counseling, negotiation, mediation, arbitration, mini-trials, summary trials, summary jury trials, early neutral evaluation, private resolution providers, and settlement processes; current disputes used for illustration. 2 to 3 hours, or $1/2$ to 1 unit.
368. **Mental Health Law.** Exploration of contemporary psychiatric theory, including diagnostic procedures, the etiology of psychopathology, and problems of treatment and prediction; legal issues and standards at the interface between mentally ill or incapacitated individuals and the institutional systems and processes designed to deal with such persons. 3 hours or 1 unit.
369. **American Legal History.** Studies selected topics in the development of law and legal institutions in the United States with particular emphasis on the history of the legal profession, legal education, and the role of lawyers and courts in U.S. society. Prerequisite: Some prior study of U.S. history, particularly social and intellectual, is helpful but not required. 3 hours or 1 unit.
370. **International Human Rights Law.** Studies established and developing legal rules and procedures governing the protection of international human rights, including Marxist and Third World, as well as Western, conceptions of those rights. 3 hours or 1 unit.
371. **Jurisprudence.** The place of law in society; the nature, goals, and methods of law; and the relation of law and social science. 3 hours or 1 unit.

- 372. Development of Western Legal Institutions.** Explores the development of both public and private law institutions in Western Europe and Great Britain from the period of late Antiquity (the Roman Codifications) to the high Middle Ages. 3 hours or 1 unit.
- 373. Current Legal Problems.** Intensive study of selected current legal problems; based upon recent court decisions, recent legislation, pending law reform proposals, or empirical studies; subject matter varies with each section; multiple sections and topics may be offered in a semester. Prerequisite: First year curriculum. 1 to 4 hours, or $1/4$ to 1 unit.
- 374. International Law.** The nature, sources, and subjects of international law and its place in the control of international society; includes an examination of the law of jurisdiction, territory, recognition and succession of states, rights and immunities of states in foreign courts, diplomatic immunities, treaties, protection of citizens abroad, settlement of international disputes, war and neutrality, the United Nations, and the International Court of Justice. 3 hours or 1 unit.
- 375. Comparative Law.** An introduction to legal systems that differ significantly from ours through discussion of specific subjects, including legal education, legal professionals and fees, public law, commercial law, highlights of civil procedure, bases of jurisdiction, the relative roles of cases, statutes, and codes, and international business practices. The two major civil law code systems (French and German) are principal sources with contrasts between English and American common law also noted. 2 hours or $1/2$ unit.
- 376. International Organizations of the United Nations.** Examines the legal and political problems arising from the establishment and operations of international organizations, covering the nature and implications of their legal personality, membership, decision-making processes and powers; emphasizes primarily the United Nations, related specialized agencies, and affiliated regional organizations in regard to the peaceful settlement of international disputes. 3 hours or 1 unit.
- 377. Soviet Law.** Soviet conceptions of the role of law in theory and in practice; highlights of Soviet law, with comparison to the common law and civil law traditions; and study of Soviet court and legislative materials. 2 to 3 hours, or $1/2$ to 1 unit.
- 378. Common Market Law.** An intensive study of the European Common Market, particularly of its laws relating to trade barriers, establishment of companies, and antitrust; and United States legislation in the field of international trade. 2 or 3 hours, or $1/2$ or 1 unit.
- 379. Economic Analysis of Law.** An introduction to the systematic economic analysis of law, including property, contracts, torts, criminal law, and related topics. 3 hours or 1 unit.
- 380. Advanced Torts.** Examines a variety of advanced tort topics, such as defamation, privacy, misrepresentation, special duties, prima facie tort, alternative compensation schemes, and proposals for tort reform. Prerequisite: First year of law school, or permission of the instructor and Associate Dean. 3 hours or 1 unit. Students may not receive credit for both Law 304 and 380.
- 381. Evidence.** The law governing the proof of disputed issues of fact; function of the court and jury; competence and examination of witnesses; standards of relevancy; privileged communications; illegal evidence; hearsay rule; best evidence rule; presumptions; and judicial notice. 3 or 4 hours, or 1 unit.
- 382. Trial Advocacy.** Examination of the problems of advocacy and tactics at the trial level. Students engage in all aspects of actual trial work, including witness preparation, opening and closing statements, direct and cross examination, and jury instructions; culminates in student conduct of a full jury trial in late spring; demonstrations are conducted by staff and visiting judges and practitioners. Prerequisite: Law 381. 2 hours or $1/2$ unit. Full year course; is repeated to a total of 4 hours or 1 unit.
- 383. Fundamentals of Trial Practice.** Explores the theory and reality of trial practice, from developing a theory of the case through submission of jury instructions; topics include fact gathering, jury selection, opening statements, direct and cross-examination, exhibits, expert witnesses, and closing arguments. Prerequisite: Law 381 and concurrent registration in Law 382. 1 hour or $1/2$ unit.
- 384. Insurance Law.** Covers principles generally applicable to insurance law and includes distinctive rules governing certain types of insurance coverage; objectives are to examine the nature of the insurance contract, marketing of insurance, principles of indemnity,

individuals and entities protected by insurance rules, and risks that are shifted by insurance coverage. Prerequisite: First-year curriculum. 3 hours or 1 unit.

- 385. Conflict of Laws.** The study of problems having relationship with two or more states or nations involving individual litigants or potential litigants; includes such matters as jurisdiction of courts, judgments, torts, workers' compensation, contracts, property, family relationships, trusts and estates, business organizations, and governmental activities. 3 hours or 1 unit.
- 386. Federal Courts.** Examination of the relationship of federal courts to other organs of federal government and to the states, including an analysis of cases dealing with congressional control over jurisdiction, federal review of state court decisions (including the relationship between state and federal substantive and procedural law), and application of law to fact; the scope of the federal question of jurisdiction in federal courts; abstention; federal injunctions of state criminal proceedings; and problems of justiciability, advisory opinions, and mootness. 3 hours or 1 unit.
- 387. Products Liability.** Substantive theories of products liability: negligence, breach of warranty, strict liability, and tortious misrepresentation; procedural and remedial problems with, and defenses to, each substantive theory. 2 to 3 hours, or $1/2$ to 1 unit.
- 388. Complex Litigation.** Legal and practical issues in "complex" cases: problems of joinder in multi-party cases, consolidation of cases brought independently (including the activities of the Judicial Panel of Multidistrict Litigation), class actions, discovery issues including the assertion and waiver of evidentiary privileges and use of computers, consequences of active judicial "management" of litigation at the pretrial stage, settlement of complex cases, and res judicata problems. 3 hours or 1 unit.
- 389. Computer Applications in the Law.** Provides the basic background necessary to make informed decisions on the use of computers in legal work; introduces the theoretical and practical aspects of document preparation, information retrieval, and communications. Prerequisite: Successful completion of first year of law school. 2 to 3 hours or $1/2$ to 1 unit (summer session 3 hours or 1 unit).
- 390. Law of Professional Responsibility.** A problem course analyzing ethical issues that arise in the practice of law and considering the approaches to such issues taken by the American Bar Association's Code of Professional Responsibility, Model Rules of Professional Conduct, and Code of Judicial Conduct. 1 to 3 hours, or $1/2$ to 1 unit.
- 391. Accounting Issues for Lawyers.** Examination of accounting principles as they affect the work of practicing lawyers, focusing particularly on accounting issues in corporate and securities law; includes an introduction to the mechanics of bookkeeping and proceeds to the interpretation of financial statements and the understanding of accounting conventions on income determination, inflation adjustments, and business acquisitions. Students with more than six hours of college accounting credit may not elect this course. 2 to 3 hours, or $1/2$ to 1 unit.
- 392. Lawyer as Negotiator.** Examines the negotiation process generally engaged in by legal practitioners; discusses specific negotiation situations of concern to lawyers, and considers the impact of social psychology upon the negotiation process. Reading materials include topics such as labor bargaining, personal injury settlements, nonverbal communication, visible manifestation of anxiety, and stress reaction; students engage in mock negotiations and write a paper on a related topic. 2 hours or $1/2$ unit (summer session, 3 hours or 1 unit).
- 393. Legal Drafting and Law Office Practice.** A practical course on the drafting of legal documents; a study of the organization and management of a law office. 2 hours. No graduate credit.
- 394. Legal Problems.** Preparation of comments on current legal developments for publication in the University of Illinois Law Review or the Illinois Bar Journal. 1 to 2 hours. May be repeated for a maximum of four semesters. No graduate credit.
- 395. Moot Court Board.** Preparation of an appellate brief; presentation of an appellate oral argument; participation in intramural, state, national, or international moot court competition. 1 hour. No graduate credit. May be repeated to a maximum of 4 hours.
- 396. Remedies.** A survey of legal and equitable remedies for the protection of personal and property rights. Procedural and substantive aspects of injunctions; restitution of unjust

enrichment in the context of the receipt of unsolicited benefits, benefits derived from the commission of tortious acts, and the mistaken acquisition of benefits; alternative remedies arising from bargain transactions; and remedies for violations of civil rights. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit.

- 397. Clinical Training.** Student field work in the offices of the Land of Lincoln Legal Assistance Foundation in Champaign and Danville, Champaign Human Relations Commission, local City Attorneys, State of Illinois Department of Mental Health, Champaign County State's Attorney, Champaign County Public Defender, Student Legal Service, and other public agencies. Students engage in legal and investigative work under the supervision of agency attorneys or other administrative personnel; this work may include conducting client interviews, doing legal research, preparing legal documents, and in some cases engaging in the trial of actual cases. 1 to 4 hours. May be repeated to a maximum of 4 hours. No graduate credit.
- 398. Seminar.** Subjects vary from year to year; specific subject matter will be announced in the *Timetable*. 2 hours or $\frac{1}{2}$ unit. May be repeated.
- 399. Research in Special Topics.** Individual research on a special problem selected in consultation with the instructor. 0 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 402. Introduction to United States Law.** An intensive introduction to the American legal system for graduate law students with prior professional training in non-common law legal systems; stresses the functioning of basic U.S. legal institutions and the techniques of American legal research. 1 unit.
- 499. Thesis Research.** 0 to 3 units.

LEISURE STUDIES

Head of Department: William McKinney

Department Office: 104 Huff Hall, 1206 South Fourth Street, Champaign

- 100. Introduction to Leisure Studies.** Central issues in defining leisure; historical, philosophical, sociological, psychological, and economic approaches to understanding leisure behavior, its meanings, social contexts, and personal and social resources. 3 hours.
- 110. Foundations for Delivery of Leisure Services.** Introduces the leisure studies major to the concepts, principles, and practices related to the provision of leisure services; description of the various field of professional practices and basic elements of leisure service systems such as budgeting, planning, staffing, and characteristics of client populations. 2 hours.
- 130. Introduction to Therapeutic Recreation.** A survey of the history, philosophy, concepts, and trends in therapeutic recreation; overviews types of populations served; describes settings and services; examines role of the therapeutic recreator in clinical and community settings. 2 hours.
- 140. Principles of Outdoor Education and Camping.** Introduces various aspects of outdoor education and organized camping; theoretical perspectives, basic skills, and practice in developing program objectives and evaluations. 3 hours.
- 141. Introduction to Outdoor Recreation.** Philosophy, policy, history, laws, regulations, and trends in the provision of all types of outdoor recreation opportunities; management and planning principles for the various organizational structures involved. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Leadership in Leisure Delivery Systems.** Introduces the student to the various theories of leadership and group dynamics applicable to situations that exist in the field of leisure service; provides practice in various leadership settings and techniques for the evaluation of leadership performance. 3 hours.
- 210. Theories and Methods of Supervision.** Concepts, principles, and objectives of supervision; the nature of the supervisory relationship; supervisory functions and processes; identification and application of methods and techniques; and organizational and

operational patterns of supervision in leisure service settings. Prerequisite: Leisure Studies 100 and 110, or consent of instructor. 3 hours.

- 212. Dynamics of Tourism.** Survey of travel and tourism with emphasis upon tourist behavior, motivations, preferences, decision-making, attractions, transportation services, facilities and information sources. Examines travel and tourism as an element of leisure service delivery from an interdisciplinary perspective. Prerequisite: Leisure Studies 100 or consent of instructor. 3 hours.
- 214. Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Psychology, and Rehabilitation 214. See Human Development and Family Studies 214.
- 215. Recreation Program Development.** Theory and practice in recreation program development in the various recreation settings, including public, private, and commercial operations; core programming and programming dictated by the needs of the field, setting, or clientele; and program evaluation. Prerequisite: Leisure Studies 100 and 200, or consent of instructor. 3 hours.
- 218. Recreation Business.** In-depth study of the delivery of leisure services in the for-profit sector. Covers the scope and administrative functions of recreation enterprises, including an analysis of planning, controlling, and developing recreation enterprises. Prerequisite: Leisure Studies 100 or consent of instructor. 3 hours.
- 230. Clinical Aspects of Therapeutic Recreation.** A survey of basic concepts associated with the clinical application of therapeutic recreation services, including an investigation of illness and disabilities, basic medical and psychiatric terminology, adaptive devices and appliances, assistive techniques and record keeping and behavior, observation and recording. Prerequisite: Credit or concurrent registration in Leisure Studies 130. 4 hours.
- 231. Leisure and Aging.** In-depth study of concepts and theories of aging as related to recreation services; characteristics of the elderly, service delivery systems; activity adaptation; legislation; and issues and trends. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
- 232. Principles of Therapeutic Recreation.** Practices and principles utilized in therapeutic recreation; includes professionalism, legislation, team approaches, activity analysis, client assessment and treatment plans. Prerequisite: Leisure Studies 230. 3 hours.
- 233. Recreation for the Physically Disabled.** In-depth study of aspects of physical disability as related to therapeutic recreation services; includes characteristics and implications of disability, self-help skills, wheelchair activities, techniques, services, accessibility, and legislation. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
- 234. Recreation for the Mentally Ill and Emotionally Disturbed.** In-depth study of mental illness and emotional disturbance as related to therapeutic recreation services; characteristics and classification of mental illness, treatment standards, legislation, treatment approaches, and issues and trends. Prerequisite: Psychology 238 and Leisure Studies 230, or consent of instructor. 3 hours.
- 235. Recreation for the Developmentally Disabled.** In-depth study of developmental disabilities as related to therapeutic recreation services; characteristics of various developmental disabilities, mainstreaming, normalization, activity selection and adaptation, instructional strategies, and behavioral management techniques. Prerequisite: Leisure Studies 230 or consent of instructor. 3 hours.
- 239. Seminar in Therapeutic Recreation.** A seminar for senior therapeutic recreation majors to discuss and explore current issues, trends, and professional concerns in the field of therapeutic recreation. Prerequisite: Senior standing. 1 hour.
- 240. Operation and Maintenance of Parks.** Basic understanding of park operations, facility design, construction, and maintenance practices; organizational structures, staff allocations, job descriptions, and contract administration. Prerequisite: Leisure Studies 100, 110, and 141. 3 hours.
- 241. Outdoor Recreation Consortium.** Intensive on-site study of programs and management of large multiple-use recreation areas; includes lectures, problem solving, and interaction with personnel from various responsible agencies. Prerequisite: Leisure Studies 141 and 240; Landscape Architecture 226, or consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.

- 250. Special Problems.** Special projects in research and independent investigation in any phase of health, physical education, recreation, or related areas selected by the student. Prerequisite: Junior or senior standing; grade-point average of 3.5; consent of faculty adviser, instructor, and head of department. 2 to 3 hours. May be repeated to a maximum of 4 or 6 hours.
- 260. Honors Seminar.** Same as Health and Safety Studies 290 and Kinesiology 290. See Kinesiology 290.
- 280. Orientation to Practicum.** Prepares and places students in the Leisure Studies Practicum. Students must document completion of 320 hours of field work. Topics include placement requirements and policies, vitas, interviewing, letters of application, and the role and issues of professional practice. Prerequisite: Junior standing; Leisure Studies 100, 110, 130, and either 200 or 230. 0 hours.
- 284. Leisure Studies Practicum.** Students are assigned to University-approved field training stations in an internship capacity for a minimum of forty hours per week for sixteen weeks. Both the agency and the University provide supervision. Prerequisite: Senior standing; Leisure Studies 280 and 310. 6 or 12 hours. Must be repeated to a maximum of 12 hours credit.
- 290. Research in Leisure Studies.** First of a two-course sequence examining elementary principles of research methods, design, processing and analysis; use of completed leisure research; development of an ability to conduct, evaluate, and utilize research on leisure behavior. Prerequisite: Junior standing; Leisure Studies 100, or consent of instructor. 3 hours.
- 291. Research Applications in Leisure Studies.** Second of a two-course sequence introducing students to the principles of research methods and their application to leisure systems. Focuses on techniques of data collection, instrument design, measurement, and data analysis and interpretation applied to leisure service delivery systems. Prerequisite: Leisure Studies 290 or equivalent, or consent of instructor. 3 hours.
- 299. Off-Campus Study.** Provides campus credit for foreign or domestic study completed off-campus. A student's proposal for study must have prior approval of the major department and the college office. Final determination of appropriate credit is made on the student's completion of the work. Prerequisite: Advanced standing and approval of major department and college. 0 to 16 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 32 hours.
- 310. Introduction to Administration.** Management of commercial, not-for-profit, or public leisure service agencies including organizational principles, budget planning and administration, problem solving and decision making. Prerequisite: Leisure Studies 210 and senior standing, or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 315. Play Theories and Their Implications.** Classical and modern theories of play; critical analysis of definitions, concepts, and assumptions and of extant research and research strategies; implications for programming and planning for play. Prerequisite: Leisure Studies 100 and Psychology 100, 103, or 105; or consent of instructor. 2 to 4 hours, or $1\frac{1}{2}$ to 1 unit.
- 316. Leisure and Human Development.** Examines changes in expressive style and behavior over the life course, and the interaction of leisure with developmental processes. Prerequisite: Leisure Studies 100 and one introductory psychology or human development course; or consent of instructor. 3 hours or 1 unit.
- 331. Facilitation Techniques and Leisure Education.** Examines knowledge, concepts, and models of leisure education in therapeutic recreation; applies specific instructional and counseling theories and techniques to the development and implementation of leisure education programs with different populations. Prerequisite: Leisure Studies 232 and junior standing, or consent of instructor. 3 hours or 1 unit.
- 332. Program Design and Evaluation in Recreation.** Examines theory and techniques of leisure services program design and evaluation utilizing systems approaches; includes needs assessment, agency accountability, and comprehensive programming strategies. Prerequisite: Leisure Studies 130 and senior standing, or consent of instructor. 3 hours or 1 unit.

- 340. Outdoor Recreation Management.** Principles, practices, and problems involved in managing outdoor recreation areas; emphasizes management of both natural and cultural resources and visitor use patterns. Prerequisite: Landscape Architecture 226 and Leisure Studies 141; or consent of instructor. Leisure Studies 290 or another research methods course recommended. 3 hours, or $1/2$ or 1 unit.
- 341. Outdoor Recreation Resource Planning.** Studies the outdoor recreational use of lands in the public domain and their planning, concepts, and processes related to planning resource based systems; multiple-use in planning; planning criteria for outdoor recreation facilities. Prerequisite: Leisure Studies 141, Landscape Architecture 226, and junior standing; or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies, Forestry, Landscape Architecture, Rural Sociology, and Urban and Regional Planning 344. See Environmental Studies 344.
- 381. Management Internship.** Work-study experience in the management aspects of leisure service delivery systems. Students are assigned to agencies in their special fields of study and are closely supervised by University faculty. Prerequisite: Leisure Studies 284 or graduate standing. 2 to 4 hours, or $1/2$ to 1 unit.
- 401. Foundations of Leisure Studies.** Basic philosophical, historical, and scientific foundations and developments in leisure and recreation; analyses of the significance of leisure in modern societies; critical review of major writings in the field with attention to particular special problem areas and current issues. Prerequisite: Leisure Studies 100 or equivalent. 1 unit.
- 402. Leisure Systems Administration.** In-depth study of the public administrative functions in large complex organizational structures; development of an understanding of change and evolution in leisure service agencies as related to the internal and external environments; study of various management styles and situations in leisure service agencies. Prerequisite: Basic course in administration or organization of leisure service agencies. 1 unit.
- 403. Advanced Research Methods in Leisure.** Examines methods and techniques of conducting and evaluating leisure research; experimental and survey designs and procedures; data collection, reduction and analysis. Prerequisite: Leisure Studies 100 or equivalent; Leisure Studies 290 or equivalent; a course in introductory statistics. 1 unit.
- 404. Seminar in Outdoor Recreation.** Philosophy, principles, and methods employed in outdoor recreation research today; also emphasizes pure versus applied research, utilization, and dissemination of research results. Prerequisite: Leisure Studies 141, 340 and 341, or equivalent; or consent of instructor. 1 unit.
- 412. Personnel Administration for the Delivery of Leisure Services.** Examines theoretical and technical principles of personnel managers in leisure service agencies; recruitment, training, selection, and evaluation of personnel with special emphasis on applied measurement concepts and legislation related to personnel administration in leisure services. Prerequisite: Leisure Studies 310 or consent of instructor. 1 unit.
- 430. Advanced Seminar in Therapeutic Recreation.** In-depth investigation of contemporary professional issues related to the practice of therapeutic recreation in treatment and community agencies serving special populations. Prerequisite: Leisure Studies 332 or consent of instructor. 1 unit.
- 440. Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies, Forestry, Landscape Architecture, Rural Sociology, and Urban and Regional Planning 440. See Environmental Studies 440.
- 445. Sociology of Leisure.** Same as Sociology 445. Sociological theory and research methods as applied to the study of leisure; institutional and community contexts of leisure, leisure roles and socialization, built and natural environments, and the relationships of leisure to family, work, subcultures, and resources. Prerequisite: Leisure Studies 401 or Sociology 386 or 415, or consent of instructor. 1 unit.
- 465. Psychology of Leisure.** Applies psychological theory and research methods to the study of leisure behavior and experience including a consideration of basic motivation, individual differences, and social interaction and implications for developmental intervention and human services. Prerequisite: Graduate standing or consent of instructor. 1 unit.

- 490. Seminar.** Student presentation of thesis studies, informal discussions, and critical analysis of problems; informal lectures by invited speakers. 0 credit.
- 493. Special Problems.** Independent research on special projects. Open only to students majoring in leisure studies. $\frac{1}{2}$ to 2 units.
- 494. Special Topics in Leisure Studies.** Lecture courses in topics of current interest; specific subject matter will be announced in the *Timetable*. Prerequisite: Will be determined for each course offered and will be indicated in the *Timetable*. $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** Preparation of thesis in leisure studies. 0 to 4 units.

LIBERAL ARTS AND SCIENCES

Dean of College: Larry R. Faulkner

College Office: 294 Lincoln Hall, 702 South Wright Street, Urbana

- 110. Workshop-Tutorial.** Independent study and experimental seminars open to Unit One students and to others; specific offerings vary each semester. Prerequisite: Allen Hall residency or consent of Unit One director. 1 to 4 hours. At the end of the semester, the instructor may increase or decrease credit up to 2 hours, i.e., to a maximum credit of 6 hours. Credit toward college or departmental requirements is contingent upon approval by the appropriate unit. A combined total of 12 hours of Liberal Arts and Sciences 110 credit may be applied toward graduation in the College of Liberal Arts and Sciences.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 294. Senior Project.** For students seeking graduation with distinction in IPS. Prerequisite: Consent of instructor and IPS Advisory Committee; open only to students whose major is IPS and who have a cumulative grade-point average of at least 4.25. 2 or 4 hours. May be repeated to a maximum of 4 hours.
- 295. Interdisciplinary Honors Seminar.** Seminar on interdisciplinary topics in the natural sciences, social sciences, humanities, and arts. Open to Chancellor's Scholars and other Honors students. Prerequisite: Junior standing in the Campus Honors Program. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 299. LAS Study Abroad.** Provides credit toward the undergraduate degree for study at accredited foreign institutions or approved overseas programs. Final determination of credit is made on the student's completion of the work. Prerequisite: One year of residence at UIUC, good academic standing, and prior approval of the major department and the College of Liberal Arts and Sciences. 0 to 15 hours (summer session, 0 to 8 hours). May be repeated to a maximum of 30 semester hours per academic year or to a total of 36 semester hours, all of which must be earned within one calendar year.

LIBRARY AND INFORMATION SCIENCE

Dean of Graduate School of Library and Information Science: Leigh Estabrook

School Office: 410 David Kinley Hall, 1407 West Gregory Drive, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 300. Foundations of Library and Information Science.** Examines the development of the library and information centers in relation to the society they serve, the library and information science profession, the operation and organization of libraries and information centers, building collections, and the administration of libraries and information centers; serves as an orientation to library and information science. Prerequisite: Junior standing and consent of School. 4 hours or 1 unit.
- 301. Bibliography.** Covers enumerative bibliography, the practices of compiling lists; analytical bibliography, the design, production, and handling of books as physical objects; and

historical bibliography, the history of books and other library materials, from the invention of printing to the present. Prerequisite: Library and Information Science 300 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.

303. **Library Materials for Children.** Selection and use of library materials for children in public libraries and elementary school media centers according to their needs in their physical, mental, social, and emotional development; deals with the standard selection aids for all types of print and nonprint materials and develops the ability to select and describe children's materials according to their developmental uses. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
304. **Library Materials for Young Adults.** Evaluation, selection, and use of library materials for young adults in school and public libraries and community organizations according to personal and curricular needs; studies selection sources for all formats of materials and explores techniques for utilization of materials. Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
307. **Introduction to Services Relating to Organization of Library Materials.** Emphasizes the role of library catalogs in bibliographic control; introduces the functions, forms, and arrangements of library catalogs in all types of libraries; identifies bibliographic elements in manual and machine readable catalog records; and emphasizes the basic principles, concepts, practices, and tools of descriptive and subject cataloging and file structures. Prerequisite: Junior standing and consent of the School. 2 hours or $\frac{1}{2}$ unit.
308. **Audiovisual Services in Libraries.** Designed to acquaint students with the nonprint media responsibilities of libraries; includes the evaluation, selection, and acquisition of software and hardware, the utilization of media in various types of libraries (by individuals and groups, in formal and informal programs), and the administration of integrated media collections (films, recorded sound, video, and exhibits). Prerequisite: Library and Information Science 300 and junior standing, or consent of instructor. 3 hours or 1 unit.
309. **Storytelling.** Fundamental principles of the art of storytelling including techniques of adaptation and presentation; content and sources of materials; story cycles; methods of learning; practice in storytelling; and planning the story hour for school and public libraries, recreational centers, the radio, and television. Prerequisite: Junior standing and consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
320. **Introduction to Information Services.** Emphasizes the role of public services in libraries and information centers; introduces the functions and forms of public services in all types of libraries; identifies basic types of information sources ranging from traditional print to electronic; emphasizes the historical development of the basic principles, concepts, and practices of public services. Prerequisite: Junior standing and consent of the School. 2 hours or $\frac{1}{2}$ unit.
350. **The Theory, Design, and Production of Audiovisual Materials.** Examines the theory and research related to the design and production of audiovisual materials and their application to the design and production of graphic materials, films, sound-slide programs, and television programs; also treats the management of audiovisual production services in libraries. Prerequisite: Junior standing or consent of instructor. 3 hours or 1 unit.
360. **Practicum.** Supervised field experience of professional-level duties in an approved library or information center. Prerequisite: Completion of 4 units of library and information science courses, including Library and Information Science 300; junior standing or consent of instructor. 3 hours or $\frac{1}{2}$ unit. A maximum of $\frac{1}{2}$ unit may be applied toward a degree program.
404. **Reference Sources and Services.** Explores reference services in all types of libraries; provides a comprehensive examination of widely used print and on-line sources, and develops question negotiation skills and search strategies. Prerequisite: Library and Information Science 320 or consent of instructor. 1 unit.
405. **Library Administration.** Designed to supply knowledge of the internal organization of libraries and of the principles of library administration; emphasis on comparison of the conditions found in the several kinds of libraries and on applications of the general theory of administration. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.

- 406. Media Programs and Service for Children and Young Adults.** The role, problems, and needs of children's and young adults' library services in the school and public library. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 407. Cataloging and Classification, I.** Theory and application of basic principles and concepts of descriptive and subject cataloging; emphasis on interpreting catalog entries and making a catalog responsive to the needs of users; provides beginning-level experience with choice of entries, construction of headings, description of monographs (and, to a lesser extent, of serial publications and nonprint media), filing codes, Dewey and Library of Congress classification systems, and Library of Congress subject headings. Prerequisite: Library and Information Science 307 or consent of instructor. 1 unit.
- 408. Cataloging and Classification, II.** More complex problems in making and evaluating the changing, modern library catalog; practical and administrative problems in cataloging serial publications, analytics, ephemeral materials, and microforms; deals with various nonprint media, rare books and manuscripts, foreign language materials, and materials in special subject areas. Prerequisite: Library and Information Science 407. 1 unit.
- 409. Communication Roles and Responsibilities of Libraries.** Considers mass media of communication in terms of their relations with modern library services; reviews media organization, content, and research; considers problems of intellectual freedom as an aspect of communications behavior; and discusses the potential role of electronic devices in library activities now and for the future. $\frac{1}{2}$ or 1 unit.
- 410. Adult Public Services.** The literature, history, and problems of providing library service to the general adult user; investigation of user characteristics and needs, and the effectiveness of various types of adult services. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 412. Reference Services in the Sciences.** Detailed consideration of the bibliographical and reference materials in science, technology, and related disciplines, a survey of the research and communications methods characteristic of these disciplines, and advanced training in solving associated reference problems. Prerequisite: Library and Information Science 404. $\frac{1}{2}$ or 1 unit.
- 413. Reference Services in the Social Sciences.** Detailed consideration of the bibliographical and reference materials in the social sciences and related disciplines, a survey of the research and communications methods characteristic of these disciplines, and advanced training in solving associated reference problems. Prerequisite: Library and Information Science 404. $\frac{1}{2}$ or 1 unit.
- 414. Reference Services in the Humanities.** Detailed consideration of the bibliographical and reference materials in the humanities and related disciplines, a survey of the research and communications methods characteristic of these disciplines, and advanced training in solving associated reference problems. Prerequisite: Library and Information Science 404. $\frac{1}{2}$ or 1 unit.
- 415. Library Automation.** Introduction to various types of equipment for handling information and providing services in libraries; study of applications to library operations; and introduction to systems planning, automation concepts, and computer use. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 416. Advanced Library Automation.** The development of computer programs for library processes such as circulation, acquisitions, cataloging, and document retrieval. Includes seminar presentations based on individual research in automation topics. Prerequisite: Library and Information Science 300, or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 417. Techniques for Managerial Decision Making in Library and Information Science.** Systematic techniques for achieving rational management decisions; includes problem definition, sampling, decision tables, and critical path analysis. Examples of current issues from the operation of libraries and information centers. Prerequisite: Library and Information Science 300, or consent of instructor. 1 unit.
- 424. Government Publications.** Aims to acquaint students with government publications, their variety, interest, value, acquisition, and bibliographic control, and to develop proficiency in their reference and research use; considers publications of all types and all governments (local, national, international) with special emphasis on U.S. state and

- federal governments and on the United Nations and its related specialized agencies. Prerequisite: Library and Information Science 411, 412, or consent of instructor. 1 unit.
- 427. Resources of American Research Libraries.** Acquaints students with the distribution and extent of American library resources for advanced study and research; spatial and financial aspects of library resources; methods of surveying library facilities; growth and use of union catalogs and bibliographical centers; interinstitutional agreements for specialization of collections and other forms of library cooperation; and the use of the research collection by the scientist and scholar. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 428. Library Buildings.** Studies the library's physical plant in the light of changing concepts and patterns of library service; analyzes present-day library buildings, (both new and remodeled) and their comparison with each other as well as with buildings of the past; examines the interrelationship of staff, collections, users, and physical plant; discussion supplemented by visits to new libraries and conference with their staffs. A two-day field trip is required. Prerequisite: Library and Information Science 405 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 429. Information Storage and Retrieval.** Types of systems for storage and retrieval of documents and references; history of retrieval systems, their characteristics, evaluation, and factors affecting their performance, with special reference to modern computer-based systems; procedures in the dissemination of scientific and other information; major information centers and services in the U.S. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
- 430. Advanced Reference.** Enables the student to utilize the varied resources of a large research library; deals with the methods of analyzing and solving bibliographic problems that arise in scholarly libraries and in connection with research projects. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ or 1 unit.
- 431. Online Information Systems.** Explores the state-of-the-art in online information systems, with particular emphasis on their use as part of reference service in libraries; acquaints students with the characteristics of both bibliographic and nonbibliographic databases; and trains students in the use of at least one currently available online retrieval system. Prerequisite: Library and Information Science 404. $\frac{1}{2}$ or 1 unit.
- 432. History of Libraries.** Same as Communications 432. The origins, development, and evolution of libraries and related institutions, from antiquity to the twentieth century, as a reflection of literacy, recognition of archival responsibility, humanistic achievement, scientific information needs, and service to society. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 433. Information Needs of Particular Communities.** In-depth study of the characteristics and information needs of specialist users of libraries; goals and objectives, policies, and services; reference and bibliographical aids; and effective services that satisfy these special needs. Prerequisite: Library and Information Science 411 or 412, and consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated for a total of 2 units.
- 434. Library Systems.** Development of library systems, with special reference to public libraries as a norm for the development of library services; detailed treatment of library standards, the growth and development of county and regional libraries, and the role of the state library and of federal legislation. Prerequisite: Library and Information Science 405 or consent of instructor. 1 unit.
- 437. Technical Services Functions.** Seminar on the principles, problems, trends, and issues of acquiring, identifying, recording, and conserving/preserving materials in all types of libraries and information centers; includes the special problems of serials management; emphasizes service aspects. Prerequisite: Library and Information Science 300 and 407, or consent of instructor; concurrent registration in Library and Information Science 407 is acceptable with consent of instructor. 1 unit.
- 438. Administration and Use of Archival Materials.** Administration of archives and historical manuscripts; emphasizes the processing and research use of archival materials. Prerequisite: Consent of instructor. 1 unit.
- 440. Advanced Bibliography.** Discusses the major reference bibliographies, including gen-

- eral works, subject lists in various fields, regional historical and current national bibliographies, and published library catalogs; surveys the nature of bibliographical access to the output of the world's press, descriptive bibliography, and rare-book librarianship. Prerequisite: Library and Information Science 301 or consent of instructor. $\frac{1}{2}$ or 1 unit.
441. **History of Children's Literature.** Interpretation of children's literature from the earliest times, including the impact of changing social and cultural patterns on books for children; attention to early printers and publishers of children's books and to magazines for children. 1 unit.
443. **Contemporary Book Publishing.** Surveys twentieth-century book publishing, placing it in an economic, social, and literary context; emphasizes economic structure, the relationship of author and publisher, promotion, distribution, and the influence of the industry on librarianship. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
444. **Measurement and Evaluation of Library Services.** Methods and criteria for evaluating various facets of library service, including the collection, the catalog, document delivery capabilities, reference service, technical processes, and information retrieval operations; deals with cost-effectiveness considerations. Prerequisite: Library and Information Science 300 or consent of instructor. 1 unit.
447. **Preservation of Library Materials.** Covers the broad range of library preservation and conservation for book and nonbook materials relating these efforts to the total library environment. Emphasizes how the preservation of collections affects collection management and development, technical services, access to materials and service to users. Prerequisite: Library and Information Science 300 or consent of instructor. $\frac{1}{2}$ or 1 unit.
450. **Advanced Problems in Librarianship.** Directed and supervised investigation of selected problems in library resources, reference service, research libraries, reading, public libraries, or school libraries. Prerequisite: Library and Information Science 300, or consent of instructor. $\frac{1}{4}$ to 2 units.
451. **Independent Study.** Permits the intermediate or advanced student opportunity to undertake the study of a topic not otherwise offered in the curriculum or to pursue a topic beyond or in greater depth than is possible within the context of a regular course. Prerequisite: Consent of dean. $\frac{1}{2}$ to 1 unit. May be repeated by M.S. students to a maximum of 1 unit; C.A.S. students, 2 units; or Ph.D. students, 4 units.
459. **CAS Project.** Individual study of a problem in library or information science; forms the culmination of the Certificate of Advanced Study program. Prerequisite: Admission to CAS program in library and information science. 0 to 2 units. May be taken for additional units, but only two will apply to the Certificate of Advanced Study.
469. **Principles of Research Methods.** Studies the design of research using historical, descriptive, and experimental methodologies; emphasizes applications in the library and information science fields. For doctoral students only. Prerequisite: A course in the principles of statistics, a library and information science course in quantitative methods; and consent of instructor. 1 unit.
471. **The History of Communications Media and Libraries.** Seminar in the different means of transmitting content through time and space; includes the history and comparison of libraries, books, and other communications media. Prerequisite: Open to doctoral students only. 1 unit.
472. **The Bibliographic Organization of Information and Library Materials.** Seminar in the relationship between knowledge and its bibliographic control; includes the structure of knowledge and classification, the descriptive and subject aspects of bibliography and indexing, and information theory. Prerequisite: Open to doctoral students only. 1 unit.
473. **The Social Basis of Library and Information Science.** Seminar in the interrelationships between librarians and information scientists and their communities of users; includes modern institutions of librarianship and information service, the education of librarians and information scientists, and the sociology of libraries and information centers. Prerequisite: Open to doctoral students only. 1 unit.
474. **The Management of Libraries and Information.** Seminar in the organizations and structures which facilitate both the achievement of library and information center goals

and the flow of information; includes management and decision-making tools. Prerequisite: Open to doctoral students only. 1 unit.

- 475. Seminar in Library and Information Science.** Preparation, presentation, and criticism of a scholarly paper of moderate length and publishable quality based on individual study. Prerequisite: Library and Information Science 471, 472, 473, or 474; open to doctoral students only. 1 unit. Required: To be repeated for a total of 4 units.
- 499. Thesis Research.** Individual study and research. Section A: M.S. candidates, 0 to 2 units. Section B: doctoral candidates, 0 to 4 units.

LIFE SCIENCES, SCHOOL OF

(Please refer to individual alphabetical listings: **Biology; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology and Biophysics; and Plant Biology.**)

Director of School: Jordan Konisky

School Office: 393 Morrill Hall, 505 South Goodwin Avenue, Urbana

LINGUISTICS

(Including African Languages, Arabic, Hebrew, Hindi, Persian, and Sanskrit)

Head of Department: Elmer Antonsen

Department Office: 4088 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Linguistics

- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Introduction to Language Science.** An introduction to the theory and methodology of general linguistics; includes the various branches and applications of linguistics. 3 hours.
- 202. Elements of Syntax.** Introduction to the types of syntactic and semantic phenomena found in natural language, with material drawn from a variety of languages; emphasis on the implications of such phenomena for linguistic theory; formalism and application of generative grammar. Prerequisite: Credit or concurrent registration in Linguistics 200, or consent of instructor. 3 hours.
- 225. Elements of Psycholinguistics.** Introduction to the theory and methodology of psycholinguistics with emphasis on language acquisition and linguistic behavior. 3 hours.
- 260. American Sign Language.** Same as Psychology and Speech and Hearing Science 260. See Psychology 260.
- 290. Individual Study.** Individual readings and research reports on special topics dealing with the theoretical or applied aspects of the linguistic sciences. Prerequisite: Written consent of instructor. 2 to 4 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Study and research for honors thesis; open only to seniors in the linguistics major who are eligible for departmental distinction. Prerequisite: Written

consent of instructor and linguistics course average of 4.4. 2 to 4 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)

300. **Introduction to Linguistic Structure.** Same as Anthropology 300. Introduction to the theory and methodology of the science of linguistics with special reference to phonology and syntax. 3 hours or $\frac{1}{2}$ unit.
301. **Introduction to General Phonetics.** Introduction to the main branches of general phonetics and phonological theory; emphasis on analysis of non-Western languages and research techniques. 3 hours or $\frac{1}{2}$ unit.
302. **Introduction to Language History.** Introduction to the nature of language change; includes sound change, change through language contact (such as Pidgins and Creoles), semantic change (etymology), language relationship and reconstruction, and language history as an aid to understanding cultural history (philology). This course cannot be used to fulfill departmental graduate requirements. Prerequisite: Four years of high school foreign language study or fulfillment of the College of Liberal Arts and Sciences foreign language requirement. 3 hours or $\frac{1}{2}$ unit.
303. **Non-Western Linguistic Structures.** Intensive study of linguistic structure of a selected non-Western language. 3 hours or 1 unit. May be repeated for credit with consent of instructor.
304. **Tutorials in Non-Western Languages.** Advanced or intensive language instruction in a selected non-Western language; does not cover instruction in East or Southeast Asian languages. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{2}$ to 1 unit. May be repeated with consent of instructor.
305. **Introduction to Applied Linguistics.** Same as English as an International Language 305. Introduction to the applications of general linguistic theory to the specific fields of stylistics, theory of translation, contrastive analyses, and the teaching and learning of foreign and second languages; practical assignment work. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
306. **Introduction to Computational Linguistics.** Introduces the use of computers in linguistics and application of linguistics in high technology. Topics include spelling and grammar-checking in word processing, natural language and man-machine communication, data organization, language understanding systems, and computer-assisted language instruction. Students write several computer programs. Prerequisite: Linguistics 300 or equivalent; and a Computer Science 100-level programming course (not Computer Science 106), or Computer Science 400, or consent of instructor. 3 hours or 1 unit.
307. **Introduction to Mathematical Linguistics.** Same as Anthropology 307. Principles of set theory, logic and formal systems, group theory, and automata theory; introduction to the formal theory of grammars. Prerequisite: Linguistics 300. 3 hours or 1 unit.
309. **Introduction to Indo-European Linguistics.** Same as Greek 310 and Latin 310. Introductory survey of Indo-European languages and their mutual relations; exemplification of methods of reconstruction; principles of comparative phonology and introductory survey of morphology; and discussion of theories about the original home, culture, and society of the Indo-Europeans. Prerequisite: Fulfillment of the language requirement of the College of Liberal Arts and Sciences. 3 hours or 1 unit.
311. **Introduction to Syntax: A Typological Approach.** Introduces the study of syntax through typological survey of syntactic systems of natural languages; examines material from diverse language families; implications of typological studies for syntactic theory. Prerequisite: Linguistics 300. 3 hours, or $\frac{1}{2}$ or 1 unit.
314. **Introductory Coptic, I.** Same as Coptic and Religious Studies 301. See Coptic 301.
315. **Introductory Coptic, II.** Same as Coptic and Religious Studies 302. See Coptic 302.
316. **Structure of the French Language.** Same as French 316. See French 316.
320. **Introduction to African Linguistics.** Introduction to genetic and typological classification of the main language families of Africa; concentration on grammatical and phonological characteristics. Prerequisite: Linguistics 200 or 300; consent of instructor. 3 hours or 1 unit.
323. **Language Acquisition.** Same as Communications 323 and Psychology 323. See Psychology 323.

325. **Introduction to Psycholinguistics.** Same as Communications 325. Introductory survey of psychological and linguistic approaches to the study of communication. Prerequisite: Credit or concurrent registration in Linguistics 300. 3 hours or 1 unit. Credit is not given for both Linguistics 325 and Psychology 325.
329. **Language of Religion.** Same as Religious Studies and Speech Communications 329. See Religious Studies 329.
330. **Introduction to East Asian Linguistics.** Same as East Asian Languages and Cultures 330. Introduction to genetic relation of the Far Eastern languages with other languages; concentration on synchronic analysis of phonology and syntax. Prerequisite: Linguistics 300; consent of instructor. 3 hours or 1 unit.
332. **Women and Language.** Same as Speech Communication and Women's Studies 332. See Speech Communication 332.
335. **Neurolinguistics and Second Language Learning.** Same as English as an International Language 335. See English as an International Language 335.
338. **Philosophy of Language.** Same as Philosophy 338. See Philosophy 338.
340. **History of Linguistics.** Survey of linguistic theories from ancient to modern times; special emphasis on comparative grammar and the development of structural linguistics; and extended discussion of at least one other period. 3 hours or 1 unit.
350. **Introduction to Sociolinguistics.** Same as English as an International Language 350. Critical study of the sociologically oriented general linguistic theories; special reference to language varieties, language attitudes, language diversity, language standardization, linguistic geography, and language and political roles (language loyalty); emphasis on research methodology and techniques. Prerequisite: Introductory course in linguistics or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
367. **Introduction to Germanic Linguistics.** Same as Germanic 367. See Germanic 367.
370. **Language, Culture, and Society.** Same as Anthropology 370 and Communications 370. See Anthropology 370.
375. **Speech Science, I.** Same as Speech and Hearing Science and Speech Communication 375. See Speech and Hearing Science 375.
376. **Speech Science, II.** Same as Speech and Hearing Science and Speech Communication 376. See Speech and Hearing Science 376.
380. **Introduction to Slavic Linguistics.** Same as Slavic 380. See Slavic 380.
382. **Introduction to Sanskrit Linguistics.** A linguistic introduction to the structure of Sanskrit (phonetics, phonology, and morphology) and its historical antecedents and development, with reading of sample texts. Prerequisite: Linguistics 300 and consent of instructor. 3 hours or 1 unit.
385. **Reading in a Second Language.** Same as English as an International Language 386. See English as an International Language 386.
386. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Portuguese, Slavic, and Spanish 382. See Humanities 382.
387. **The Structure of English.** Critical evaluation of traditional and structuralist grammatical descriptions; introduction to transformational grammatical studies; detailed survey of a transformational syntax of English; and brief introduction to generative phonology and morphophonemic analysis of English, especially stress. 3 hours or $\frac{3}{4}$ unit.
388. **English Phonology and Morphology for ESL Teachers.** Same as English as an International Language 388. See English as an International Language 388.
389. **Theoretical Foundations of Second Language Acquisition.** Same as English as an International Language 389. See English as an International Language 389.
400. **Introduction to General Linguistics.** Same as Anthropology 400 and English as an International Language 402. Introduction to the linguistic sciences; linguistic theory and methodology; and branches of linguistics and their application. 1 unit. Credit may not be applied toward a graduate degree in linguistics.
401. **Syntax.** Critique of traditional and contemporary theories of syntactic structure; systematic introduction to transformational grammar. Prerequisite: Linguistics 300 or equivalent. 1 unit.

402. **Phonology.** Examination of language-specific phonological problems with a view toward formulating a language-independent theory of phonology. Prerequisite: Linguistics 301 or consent of instructor. 1 unit.
403. **Seminar in Linguistic Analysis.** Discussion of advanced topics of current interest. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit with consent of instructor.
404. **Practicum.** Classroom- and homework-solving of assorted problems in syntactic and phonological analysis of many languages. Prerequisite: Linguistics 401 and 402. 1 unit. May be repeated for credit as topics vary with consent of instructor.
405. **Seminar in Stylistics.** Same as Comparative Literature 405. Seminar designed to evaluate and discuss earlier and current linguistically motivated stylistic theories; emphasis on the theoretical and methodological problems in application of linguistics to stylistic analysis of literary texts. Prerequisite: Linguistics 300 or 305; consent of instructor. 1 unit.
406. **Topics in Computational Linguistics.** Speech sampling and linguistic redundancy; phonology in speech recognition; syntactic parsing of natural language; domains of linguistic knowledge including lexical, syntactic, semantic, discourse, and pragmatic representations; quantitative reasoning; linguistic expert system; speech synthesis. Prerequisite: Linguistics 306 and 401; Linguistics 402 or consent of instructor. 1 unit.
408. **Russian Phonology.** Same as Russian 408. See Russian 408.
411. **Historical Linguistics.** Introduction to historical and comparative linguistics with particular attention to theoretical issues. Prerequisite: Credit or concurrent registration in Linguistics 300 and 301. 1 unit.
412. **Research Seminar in Historical Linguistics.** Research work in etymology, linguistic geography, and historical syntax. Prerequisite: Linguistics 411 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units, as topics vary, with consent of instructor.
413. **Pedagogical Grammar.** Same as English as an International Language 412. See English as an International Language 412.
416. **Field Methods.** Analysis of the phonetic, phonological, morphological, and syntactic structure of an undescribed language through the elicitation of data from a native language consultant. The class develops a linguistic sketch of the language, including a computerized lexicon. Prerequisite: Linguistics 401 and 402. 1 unit.
419. **Contrastive Linguistics.** Same as English as an International Language 419. Critical survey of contemporary linguistic models; special reference to their relevance in preparing contrastive analyses of languages; and detailed discussion on contrastive analysis of English and selected non-Western languages at different linguistic levels. Prerequisite: Linguistics 300 or consent of instructor. $1\frac{1}{2}$ or 1 unit.
420. **Linguistic Phonetics.** Principles of scientific description of the phonic aspect of language; distinctive features and phonetic alphabets; relations between phonetics and other linguistic levels; and inventory of speech sounds. Prerequisite: Linguistics 301 or equivalent. 1 unit.
424. **Developmental Psycholinguistics.** Same as Communications and Psychology 424. See Psychology 424.
425. **Psycholinguistics.** Same as Communications 425 and Psychology 425. See Psychology 425.
429. **Second Language Acquisition and Bilingualism.** Same as Psychology 429. Examination of the field from a psycholinguistic perspective; topics discussed include first versus second language acquisition; the nature of language aptitude and competence; methods of second language teaching; the nature of bilingualism; and comparative psycholinguistics. Prerequisite: Consent of instructor. 1 unit.
440. **Seminar in History of Linguistics.** Analysis of recent theoretical approaches. Prerequisite: Linguistics 340. 1 unit.
441. **Syntax, II.** Advanced analysis and critique of syntactic descriptions, with special attention to implications for universal grammar. Prerequisite: Linguistics 401 or consent of instructor. 1 unit.
442. **Phonology, II.** Continuation of Linguistics 402. Prerequisite: Linguistics 402. 1 unit.
450. **Linguistics and the Study of Meaning.** Consideration of those aspects of meaning which are the concern of linguistic theory. Prerequisite: Linguistics 300. 1 unit.

451. **Pragmatics.** Examination and development of theories of language use, addressing the role of pragmatics in linguistics and in linguistic theory, with special attention to the major research questions concerning natural language processing. Prerequisite: Linguistics 401 and 450, or consent of instructor. 1 unit.
460. **Seminar in Bilingualism.** A research-oriented seminar on theoretical and applied aspects of bilingualism; critical evaluation of linguistic, neurolinguistic, sociolinguistic, and psycholinguistic approaches to bilingualism; and concentration on selected case studies from Western and non-Western societies, especially Asia and Africa. Prerequisite: Linguistics 350 or an introductory course in linguistics. 1 unit.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
470. **Proseminar in Cognitive Science.** Same as Anthropology 470, Computer Science 449, Educational Psychology 471, and Psychology 471. See Anthropology 470.
475. **Experimental Phonetics, I.** Same as Speech and Hearing Science 475. See Speech and Hearing Science 475.
476. **Experimental Phonetics, II.** Same as Speech and Hearing Science 476. See Speech and Hearing Science 476.
481. **Topics in Syntactic Theory.** Investigation of syntactic universals; recent developments in the theory of syntax. Prerequisite: Linguistics 441 or consent of instructor. 1 unit. May be repeated as topics vary with consent of instructor.
482. **Topics in Phonological Theory.** Recent developments in the theory of phonology. Prerequisite: Linguistics 442 or consent of instructor. 1 unit. May be repeated for credit as topics vary with consent of instructor.
490. **Special Topics in Linguistics.** Individual studies in the areas of linguistics not covered by regular course offerings. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** 0 to 4 units.

LANGUAGES OFFERED BY THE DEPARTMENT OF LINGUISTICS.

Other languages may be offered by tutorial (see Linguistics 304). See also APPENDIX A for a list of all languages currently offered on this campus.

African Languages

211. **Elementary Lingala, I.** Same as African Studies 211. Introduction to Lingala; emphasizes grammar, pronunciation, reading and conversation in standard Lingala. Participation in language laboratory required. 5 hours.
212. **Elementary Lingala, II.** Same as African Studies 212. Continuation of elementary Lingala, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Lingala. Participation in language laboratory required. Prerequisite: African Languages 211. 5 hours.
231. **Elementary Swahili, I.** Same as African Studies 231. Beginning standard Swahili; emphasizes grammar, pronunciation, reading and conversation in standard Swahili. Participation in language laboratory required. 5 hours.
232. **Elementary Swahili, II.** Same as African Studies 232. Continuation of elementary Swahili, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Swahili. Participation in language laboratory required. Prerequisite: African languages 231. 5 hours.
241. **Elementary Wolof, I.** Same as African Studies 241. Introduction to Wolof; emphasizes grammar, pronunciation, reading, and conversation in standard Wolof. Participation in language laboratory required. 5 hours.
242. **Elementary Wolof, II.** Same as African Studies 242. Continuation of elementary Wolof, with introduction of more advanced grammar; emphasizes more fluency in speaking, reading, and writing simple sentences in standard Wolof. Participation in language laboratory required. Prerequisite: African Languages 241. 5 hours.

313. **Intermediate Lingala, I.** Same as African Studies 313. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in the standard and spoken Lingala dialects, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 212. 5 hours or 1 unit.
314. **Intermediate Lingala, II.** Same as African Studies 314. Continuation of African Languages 313. Emphasizes ability to engage in reasonably fluent discourse in Lingala, comprehensive knowledge of formal grammar, and ability to read ordinary texts in various Lingala dialects. Participation in language laboratory required. Prerequisite: African Languages 313. 5 hours or 1 unit.
333. **Intermediate Swahili, I.** Same as African Studies 333. Second-year Swahili with emphasis on developing conversational fluency; some readings on Swahili culture and customs. Prerequisite: One year of Swahili. 5 hours or 1 unit.
334. **Intermediate Swahili, II.** Same as African Studies 334. More of second-year Swahili with emphasis on conversational fluency; some reading in Swahili literature. Prerequisite: One year of Swahili. 5 hours or 1 unit.
335. **Advanced Swahili, I.** Same as African Studies 335. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: African Languages 334 or equivalent. 3 hours or $\frac{3}{4}$ unit.
336. **Advanced Swahili, II.** Same as African Studies 336. Third-year Swahili with emphasis on conversational fluency and on increased facility in reading Swahili texts, including current newspaper prose and (East) African culture materials. Prerequisite: African Languages 335 or equivalent. 3 hours or $\frac{3}{4}$ unit.
343. **Intermediate Wolof, I.** Same as African Studies 343. Survey of more advanced grammar, with emphasis on increasing conversational fluency, composition skills, study of written texts in standard and Dakar Wolof, and discussion of grammatical variations. Participation in language laboratory required. Prerequisite: African Languages 242. 5 hours or 1 unit.
344. **Intermediate Wolof, II.** Same as African Studies 344. Continuation of African Languages 343. Emphasizes ability to engage in reasonably fluent discourse in Wolof, comprehensive knowledge of formal grammar, and ability to read ordinary texts in standard and Dakar Wolof. Participation in language laboratory required. Prerequisite: African Languages 343. 5 hours or 1 unit.

Arabic

201. **Elementary Standard Arabic, I.** Mastery of the Arabic alphabet and phonetics; elementary formal grammar and the development of reading and writing skills; and conversation in the formal noncolloquial style. All students are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Standard Arabic, II.** Continuation of Arabic 201. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 201. 5 hours.
210. **Colloquial Arabic, I.** Development of conversational fluency in one of the major colloquial dialects; see *Timetable* for dialect to be taught each semester. 4 hours.
211. **Colloquial Arabic, II.** Continuation of Arabic 210. Prerequisite: Arabic 210. 4 hours.
303. **Intermediate Standard Arabic, I.** Survey of more advanced grammar; emphasis on increasing conversational fluency in the formal noncolloquial style; and reading of prose texts reflecting aspects of Arabic culture. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 202. 5 hours or 1 unit.
304. **Intermediate Standard Arabic, II.** Continuation of Arabic 303. All students are required to register for one hour per week in the language laboratory. Prerequisite: Arabic 303. 5 hours or 1 unit.

305. **Advanced Standard Arabic, I.** Practice to attain conversational fluency in the formal noncolloquial style; introduction to Arabic literature; and readings in social, political, and historic writings. Prerequisite: Arabic 304. 3 hours or $3/4$ unit.
306. **Advanced Standard Arabic, II.** Continuation of Arabic 305. Prerequisite: Arabic 305. 3 hours or $3/4$ unit.

Hebrew

201. **Elementary Modern Hebrew, I.** Acquaints students with the fundamental principles of the Hebrew Language. Develops all four language skills; reading, writing, listening and speaking. Grammar and comprehension are exercised through the textbook, the audio-visual materials and the computer. Easy stories will be used during the semester to strengthen reading comprehension. Students are required to register for one hour weekly in the language laboratory. 5 hours.
202. **Elementary Modern Hebrew, II.** Continuation of Modern Hebrew 201, with introduction of more advanced grammar, and with emphasis on more fluency in speaking and reading. Prerequisite: Hebrew 201. 5 hours.
205. **Introduction to Classical Hebrew, I.** Same as Religious Studies 205. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills. 4 hours.
206. **Introduction to Classical Hebrew, II.** Same as Religious Studies 206. Stresses basic grammar of classical (biblical) Hebrew and acquisition of translation skills; translation of simple biblical prose. Prerequisite: Hebrew 205 or equivalent. 4 hours.
210. **Biblical Prose.** Same as Religious Studies 210. Reading and discussion of selections from the Books of Samuel with emphasis on grammar and exegesis; exercises in prose composition. Prerequisite: Hebrew 205 and 206. 4 hours.
303. **Intermediate Modern Hebrew, I.** Advanced examination of the fundamental principles of the Hebrew language. Develops all four language skills: reading, writing, listening and speaking. Grammar and comprehension are exercised through the textbooks, the audio-visual materials and the computer. Examples of Hebrew fiction, largely easy stories, will be used during the semester to strengthen reading comprehension. Students are required to register for one hour weekly in the language laboratory. Prerequisite: Hebrew 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Modern Hebrew, II.** Continuation of 303. Concentration on ability to engage in reasonable fluent discourse in Hebrew, comprehensive knowledge of formal grammar, and an ability to read ordinary written Hebrew. Israeli television programs and movies are used to develop communicative skills and cultural knowledge. Prerequisite: Hebrew 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Modern Hebrew, I.** For students who have mastered the fundamental principles of the Hebrew language. Develops competence through reading Hebrew fiction and studying Israeli newspapers and television programs. Communication skills are exercised by means of class discussions, oral presentations, compositions and written reports on stories. Prerequisite: Hebrew 304 or equivalent. 3 hours or $3/4$ unit.
306. **Advanced Modern Hebrew, II.** A course for advanced knowledge of spoken and written standard Modern Hebrew with emphasis on Modern Hebrew literature and language, Israeli newspapers and Israeli television programs. Communication skills are exercised by means of class discussions, oral presentations, compositions and written reports on stories. Prerequisite: Hebrew 305 or equivalent. 3 hours or $3/4$ unit.
307. **Topics in Modern Hebrew Language and Literature, I.** Selected readings from modern Hebrew authors, with emphasis on the novel and short story; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of formal Hebrew grammar. Prerequisite: Hebrew 306 or consent of instructor. 3 hours or $3/4$ unit. May be repeated with consent of instructor.
308. **Topics in Modern Hebrew Language and Literature, II.** Selected readings from modern Hebrew authors, with special emphasis on Eastern European "Revival" literature; lectures and discussions on Hebrew literature and aesthetics; and detailed analysis of

formal Hebrew grammar. Prerequisite: Hebrew 307 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.

311. **Hebrew Poetry.** Same as Religious Studies 311. Translation and analysis of ancient Hebrew poetry, with emphasis on the development of Hebrew prosodic style and on textual criticism; research paper required for graduate credit. Prerequisite: Hebrew 210 or equivalent. 4 hours or 1 unit.

Hindi

201. **Elementary Hindi/Urdu, I.** An introduction to the Hindi/Urdu language; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, and a minimum of formal grammar and Devanagari writing; introduction to Arabic-Persian script by arrangement. All students are required to register for one hour per week in the language laboratory. 5 hours.
202. **Elementary Hindi/Urdu, II.** Second term of spoken Hindi/Urdu; includes conversation with a native Hindi/Urdu-speaking tutor under the direction of a linguist instructor, formal grammar based on conversational materials, and work on written Hindi; concentration on written Urdu by arrangement. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 201. 5 hours.
301. **Intensive Hindi, I.** An intensive course on the Hindi language including conversation with a native Hindi-speaking tutor under the direction of a linguist-instructor; study of the formal grammar and the Devanagari script. 10 hours or 2 units.
302. **Intensive Hindi, II.** Includes drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; increasing study of the written language and more formal grammar; and concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 301 or equivalent, or consent of instructor. 10 hours or 2 units.
303. **Intermediate Hindi, I.** First term of second year of the Hindi language, including drill for more advanced conversational fluency; introduction to a greater variety of styles and levels of discourse and usage; and increasing study of the written language and more formal grammar. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 202 or equivalent. 5 hours or 1 unit.
304. **Intermediate Hindi, II.** Concentration on ability to engage in reasonably fluent discourse in Hindi, on comprehensive knowledge of formal grammar, and on ability to read ordinary texts in Hindi. All students in this course are required to register for one hour per week in the language laboratory. Prerequisite: Hindi 303 or equivalent. 5 hours or 1 unit.
305. **Advanced Hindi, I.** A course for advanced knowledge of spoken and written Hindi. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 304 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
306. **Advanced Hindi, II.** A course for advanced knowledge of spoken and written Hindi with emphasis on modern Hindi literature and language. All students are required to work at least one hour each week with a native informant and/or in the language laboratory. Prerequisite: Hindi 305 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
308. **Introduction to South Asian Literature.** Introduces selected literatures of South Asia in a cross-cultural and comparative perspective; emphasizes relating literary texts and trends to the historical, sociocultural, political, and literary contexts of the subcontinent. Texts for South Asian languages are offered in English translation; in addition, there will be texts by South Asian authors written in English. Knowledge of a South Asian language not required. Prerequisite: Consent of course coordinator. 3 hours or $\frac{3}{4}$ unit.

Persian

201. **Elementary Persian, I.** Introduction to Persian, including conversation with a native speaker under the direction of a linguist-instructor, and a minimum of formal grammar and writing. 5 hours.
202. **Elementary Persian, II.** Continuation of Persian 201, with introduction of more advanced grammar and with emphasis on more fluency in speaking and reading. Prerequisite: Persian 201 or equivalent. 5 hours.
205. **Introduction to Persian Culture and Literature, I.** Same as Comparative Literature 203. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
206. **Introduction to Persian Culture and Literature, II.** Same as Comparative Literature 204. Continuation of Persian 205. A survey of Persian civilization with emphasis on Persian literary and aesthetic expression. Knowledge of Persian is not required. 3 hours.
303. **Intermediate Persian, I.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 202. 5 hours or 1 unit.
304. **Intermediate Persian, II.** A general review of the essentials of grammar, selected reading of materials emphasizing Iranian life and culture, compositions, and practice in speech. Prerequisite: Persian 303. 5 hours or 1 unit.
305. **Advanced Persian, I.** Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 304. 3 hours or $3/4$ unit.
306. **Advanced Persian, II.** Continuation of Persian 305. Designed to improve competence in speaking, writing, and reading Persian; includes reading in modern and classical Persian prose and poetry. Prerequisite: Persian 305. 3 hours or $3/4$ unit.

Sanskrit

201. **Elementary Sanskrit, I.** Introduction to Sanskrit, treating in full the grammar of the language as preparation for reading. 4 hours.
202. **Elementary Sanskrit, II.** Continuation of Sanskrit 201. Prerequisite: Sanskrit 201. 4 hours.
303. **Readings in Sanskrit, I.** Same as Religious Studies 312. Introduction to the reading of Sanskrit texts. Prerequisite: Sanskrit 202. 3 hours or 1 unit.
304. **Readings in Sanskrit, II.** Same as Religious Studies 313. Readings in Sanskrit texts. Topics may vary according to students' needs; they may include religious texts, classical literature, or a general survey of texts. Prerequisite: Sanskrit 303 and consent of instructor. 3 hours or 1 unit. May be repeated as topics vary.

MANUFACTURING ENGINEERING

Director of Program: S.G. Kapoor

Program Office: 144 Mechanical Engineering Building, 1206 West Green Street, Urbana

210. **Introduction to Manufacturing Systems.** A broad-based introduction of various topics in manufacturing engineering including materials processing, manufacturing automation and process control, product/process design, and planning. Prerequisite: Junior standing in Engineering or consent of instructor. 3 hours.
320. **Decision-Making and Control Applications in Manufacturing.** Integrates production planning, production scheduling, and process supervision and control into a manufacturing hierarchy. Demonstrates interfaces with other manufacturing functions. Focuses on the integration of the functions as well as the integration of decision-making and control considerations. Prerequisite: Consent of instructor. A course in probability is

desirable. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit for students in the College of Engineering, except by special permission of the student's department.

330. **Interfacing Methods for Manufacturing Systems.** An introduction to the basic concepts and practical techniques of the real-time computing and software interfacing for manufacturing systems. Topics covered include: interfacing of sensors and actuators used in manufacturing systems; computer interfacing and real-time monitoring of machine tools and robots; intercomputer communication through network for a manufacturing cell; and human-machine-computer interfaces. Prerequisite: Computer Science 101 or equivalent. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit for students in the College of Engineering, except by special permission of the student's department.
340. **Processing and Finishing of Materials.** An overview of the fundamentals of materials processing science, powder science, phase separation/crystal nucleation and growth, and casting processes; applications in fabrication of plastics, polymers, glasses and ceramics; finishing processes. Prerequisite: Chemistry 102, Physics 107, Mathematics 285, Theoretical and Applied Mechanics 154/221 or equivalent, Mechanical Engineering 231 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit for students in the College of Engineering, except by special permission of the student's department.
350. **Information Management for Manufacturing Systems.** An introduction to the role of information in manufacturing systems, components of an information system, structures for data storage, data maintenance, data base management systems, and networking data. Prerequisite: Computer Science 101 or equivalent. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit for students in the College of Engineering, except by special permission of the student's department.
393. **Special Topics in Manufacturing Engineering.** Study of advanced problems related to manufacturing engineering. Prerequisite: Senior standing or consent of instructor. 1 to 3 hours.

MATERIALS SCIENCE AND ENGINEERING

(Including Ceramic Engineering and Metallurgical Engineering)

Head of Department: James Economy

Department Office: 201 Metallurgy and Mining Building, 1304 West Green Street, Urbana

Ceramic Engineering

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Ceramic Crystal Chemistry.** Crystal structure and crystal chemistry of ceramic materials, including the structure of silicates; geometrical crystallography and discussions of crystal character and crystal growth of ceramic materials. 3 hours.
205. **Phase Equilibria in Ceramic Systems.** The concepts, interpretations, and utilization of phase equilibrium diagrams in multicomponent ceramic systems at high temperatures; methods of determining equilibrium relationships; and interpretation of binary, ternary, and quaternary systems emphasizing quantitative calculations, metastability, and the origin of microstructure. Lecture and discussion. Prerequisite: Concurrent registration in Materials Science and Engineering 301 or consent of instructor. 3 hours.
216. **Rate Processes in Ceramic Engineering.** Reaction kinetics of ceramic processes; high-temperature phase transformations, sintering and grain growth, nucleation and crystal growth from melts; and mechanisms of material transport in solid and liquid systems. Prerequisite: Materials Science and Engineering 301; junior standing in ceramic engineering. 3 hours.
299. **Senior Thesis.** Research in ceramics and ceramic engineering. Written permission from the instructor with whom the student is to work must be presented to the student's

adviser at the time of registration. To receive credit, a thesis must be presented. Prerequisite: Senior standing; grade-point average of 4.0 or better. 1 to 5 hours. May be repeated to a maximum of 5 hours. A minimum total credit of 3 hours is required.

- 307. **Thermal and Mechanical Properties of Ceramics.** Interprets the thermal and mechanical behavior of crystalline and amorphous ceramics in terms of atomistic concepts of materials; examines influences of microstructure, composition, temperature, pressure, time and other controllable parameters. Prerequisite: Ceramic Engineering 216 and Theoretical and Applied Mechanics 221. 3 hours or $\frac{3}{4}$ unit.
- 320. **Ceramic Materials and Properties.** Same as Materials Science and Engineering 320. See Materials Science and Engineering 320.
- 321. **Ceramic Processing and Microstructure Development.** Same as Materials Science and Engineering 321. See Materials Science and Engineering 321.
- 322. **Process Design.** Same as Materials Science and Engineering 322. See Materials Science and Engineering 322.
- 323. **Ceramic Engineering Processing Laboratory.** Same as Materials Science and Engineering 323. See Materials Science and Engineering 323.
- 324. **Refractory Technology.** Same as Materials Science and Engineering 324. See Materials Science and Engineering 324.
- 325. **Ceramic Coatings.** Same as Materials Science and Engineering 325. See Materials Science and Engineering 325.
- 326. **Chemistry and Technology of Glass.** Same as Materials Science and Engineering 326. See Materials Science and Engineering 326.
- 327. **Ceramic Microscopy.** Same as Materials Science and Engineering 327. See Materials Science and Engineering 327.
- 328. **Electrical Ceramics.** Same as Materials Science and Engineering 328. See Materials Science and Engineering 328.
- 330. **Chemically Bonded Ceramics.** Same as Materials Science and Engineering 330. See Materials Science and Engineering 330.
- 383. **Hybrid Circuit Fabrication Laboratory.** Same as Electrical and Computer Engineering 346 and Materials Science and Engineering 383. See Electrical and Computer Engineering 346.
- 390. **Special Topics in Ceramics.** Independent study projects and courses on special topics. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{4}$ to 2 units. May be repeated. Students may also register in this course more than once in a semester to a maximum of 10 hours or 3 units.
- 420. **Ceramic Chemistry.** Same as Materials Science and Engineering 420. See Materials Science and Engineering 420.
- 421. **Structural Physical Ceramics.** Same as Materials Science and Engineering 421. See Materials Science and Engineering 421.
- 422. **Dielectric Properties of Ceramic Materials.** Same as Materials Science and Engineering 422. See Materials Science and Engineering 422.
- 423. **Glass Technology.** Same as Materials Science and Engineering 423. See Materials Science and Engineering 423.
- 424. **Physics of Strong Solids.** Same as Materials Science and Engineering 424. See Materials Science and Engineering 424.
- 425. **Physical Chemistry of Clays and Soils.** Same as Materials Science and Engineering 425 and Soils 414. See Soils 414.
- 426. **Mineralogy of Clays.** Same as Geology 461 and Materials Science and Engineering 426. See Geology 461.
- 427. **Petrology of Clay Minerals.** Same as Geology 462 and Materials Science and Engineering 427. See Geology 462.
- 429. **Seminar in Ceramics.** Same as Materials Science and Engineering 429. See Materials Science and Engineering 429.
- 490. **Special Topics in Ceramics.** Individual study or courses of an advanced nature in various areas of ceramic engineering not covered by regular course offerings. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated. Students may also register in this course more than once in a semester to a maximum of 2 units.

491. **Laboratory Investigations in Ceramics.** Special investigations in materials providing an opportunity for instruction in experimental methods of research. Prerequisite: Graduate standing and consent of instructor. Available only to nonthesis students enrolled in a Master of Science Program. 0-2 units. May be repeated to a maximum of 2 units.
497. **Research Seminars.** Same as Materials Science and Engineering and Metallurgical Engineering 497. See Materials Science and Engineering 497.
499. **Thesis Research.** Research in any of the branches of ceramics. Prerequisite: Graduate standing in ceramic engineering. 0 to 4 units.

Materials Science and Engineering

100. **Materials Lectures.** A lecture and demonstration course by the faculty to orient freshmen to the field of materials science and engineering. 1 hour.
180. **Introduction to Materials Technology.** Metals, polymers, ceramics, electronic materials, and composites; principles of properties and processing; why materials impact everyday life, the environment, industrial development, global competition, new products, and technological progress; examples of needs for advanced materials in pollution control, transportation, energy, aerospace, communication, infrastructures, defense, and medicine. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated to a maximum of 5 hours. Students may also register in this course more than once in the same semester to a maximum of 5 hours.
200. **Introduction to Materials Science and Engineering.** An introduction to the materials science and engineering of ceramics, electronic materials, metals and polymers. Studies bonding; fundamentals of crystallography, imperfections, semi-conductors and polymer structure; compound formation; introduction to phase diagrams and processing of various materials. Prerequisite: Physics 107, Mathematics 242, Chemistry 102, and credit or concurrent registration in Physics 108. 3 hours.
207. **Materials Science and Engineering Lab, I.** Experiments using optical and scanning microscope and various thermal and thermodynamic measuring techniques. Introduction to use of laboratory test instruments. Prerequisite: Credit or concurrent registration in Materials Science and Engineering 301 and 305, and in Industrial Engineering 238. 2 hours.
208. **Materials Science and Engineering Lab, II.** Experiments characterizing mechanical, transport, and magnetic-dielectric properties of materials. Prerequisite: Materials Science and Engineering 207, and credit or concurrent registration in Materials Science and Engineering 304 and 306. 2 hours.
290. **Special Topics in Materials Science and Engineering.** Studies of introductory nature of various areas of materials science and engineering. May be presented as a course or as individual study. 1 to 4 hours. May be repeated. Students may also register for this course more than once in the same semester.
297. **Senior Seminar.** Review of current materials science and engineering literature, classroom reports and discussions, preparation of technical abstracts and reports. Consideration of professional practice, job selection, employment practice, continuing education, professional growth and economics of the materials industries. Prerequisite: Senior standing in materials science and engineering, metallurgical engineering, or ceramic engineering programs. 2 hours.
299. **Senior Thesis.** Individual research in an area of materials science and engineering under the supervision of members of the staff. Results of research may be used for a senior (undergraduate) thesis. Prerequisite: Senior standing, grade-point average of 4.0 or better, and consent of instructor. 1 to 5 hours. May be repeated to a maximum of 6 hours; a minimum total credit of 3 hours is required.
301. **Thermodynamics of Materials.** Same as Chemistry 341. Examines basic thermodynamic principles including energy, entropy, and free energy; describes the macroscopic prop-

- erties of various materials systems such as equilibrium states, phases, and phase transitions; emphasizes metals, ceramics, polymers, and electronic materials. Particular attention is paid to the application of phase diagrams; introduces the statistical interpretation of thermodynamics on the atomistic level. Prerequisite: Chemistry 102; Physics 107; and Mathematics 242 or 245. 4 hours or 1 unit. Students may not receive credit for both Materials Science and Engineering 301 or Chemistry 341 and 344.
302. **Kinetic Processes in Materials.** Studies kinetics of chemical reactions; rate equations, reaction mechanisms; transport processes; diffusion equations, atomic and molecular diffusion. Phase transformations; nucleation, crystallization, displacive, spinodal decomposition. Examines surface and interface phenomena; sintering, grain growth, recovery and recrystallization. Prerequisite: Materials Science and Engineering 200 and 301. 3 hours or $\frac{3}{4}$ unit.
303. **Synthesis of Materials.** Studies fundamentals of the synthesis of materials. Examines principles of synthesis; processes, approaches, synthetic methodology and probes; methodologies in materials synthesis; polymerization, sol-gel processes, liquid and vapor phase synthesis, materials coupling reactions, and precursor-derived, radiation-induced and asymmetric synthesis. Prerequisite: Materials Science and Engineering 200 and credit or concurrent registration in Materials Science and Engineering 301. 3 hours or $\frac{3}{4}$ unit.
304. **Physics of Metals.** The nature of the perfect and imperfect crystal, the electronic structure of solids, electrical conduction in metals and semiconductors, and dielectric and magnetic properties of solids. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
305. **Microstructure Characterization.** Studies the fundamentals and applications of various forms of microscopy (image formation) and diffraction for characterization of physical microstructure of materials and of various forms of spectroscopy for characterization of chemical microstructure. Prerequisite: Physics 108, Chemistry 102, and Materials Science and Engineering 200. 4 hours or 1 unit.
306. **Thermal-Mechanical Behavior of Materials.** Studies fundamentals of elastic, viscoelastic and plastic deformation of materials, elementary theory of statics and dynamics of dislocations; examines strengthening mechanisms and behavior of composites; fracture and fatigue behavior; fundamentals of thermal behavior: heat capacity, thermal expansion and conductivity; effects of thermal stress. Prerequisite: Theoretical and Applied Mechanics 221 and Materials Science and Engineering 301. 3 hours or $\frac{3}{4}$ unit. Students may not receive credit for both Materials Science and Engineering 306 and either Civil Engineering 310, Mechanical Engineering 231, or Theoretical and Applied Mechanics 224.
320. **Ceramic Materials and Properties.** Same as Ceramic Engineering 320. Basic principles and understanding of ceramic materials and properties, emphasizing structure-property relations. Gives a fundamental appreciation of the development, use, and control of the properties of a wide variety of ceramic materials from a physico-chemical point of view. Prerequisite: Junior standing in engineering, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Graduate students in ceramic engineering or the ceramic concentration in materials science may not receive credit for this course.
321. **Ceramic Processing and Microstructure Development.** Same as Ceramic Engineering 321. Basic principles and understanding of microstructure development and processing of ceramic materials will be addressed, emphasizing structure-property-processing relationships; knowledge of a variety of processing methodologies and their effects on microstructural development will be gained; illustrates and discusses several ceramic components within this context. Prerequisite: Materials Science and Engineering 320 or consent of instructor. 4 hours or 1 unit.
322. **Process Design.** Same as Ceramic Engineering 322. Reviews the basic concepts of heat and mass transfer, control theory and statistical analysis in the context of fabrication processes typical of materials industries; supplements the numerical procedures and algorithms that constitute a computational repertoire, adequate for the engineering

practice. In the frame of an actual engineering design project, the combined application of the principles of materials processing, plant layout reactor design, peripheral facilities, logistics of supply, and economic feasibility are practiced. Prerequisite: Materials Science and Engineering 321. 3 hours or $\frac{3}{4}$ unit.

- 323. Ceramic Engineering Processing Laboratory.** Same as Ceramic Engineering 323. Conducts wide range of ceramic processing experiments and demonstrations; emphasizes pertinent unit operations; requires technical reports. The purpose is to develop fundamental understanding and skills as regards major kinds of ceramic processes. Prerequisite: Materials Science and Engineering 301, 302 and 320; and concurrent registration in Materials Science 321 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
- 324. Refractory Technology.** Same as Ceramic Engineering 324. Engineering properties and thermochemistry of polycrystalline materials for use at elevated temperatures including processing of raw materials and the manufacture, heat treatment, quality control, and specification of refractory products; particular emphasis on oxides, silicates, carbides, borides, cermets, and refractory metals with a correlation of the properties of those materials to certain design criteria. Includes laboratory if taken for 1 unit of graduate credit. Prerequisite: Senior standing in engineering. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 325. Ceramic Coatings.** Same as Ceramic Engineering 325. Examines principles and technology of a wide range of ceramic coatings; emphasizes chemistry and physics that underlie coating properties, and application processes; and studies types of coatings treated including porcelain enamels, glazes, melt-sprayed coatings, vapor deposited coatings, electrolytically deposited coatings, weld-rod coatings, and sputtered coatings. Prerequisite: Materials Science and Engineering 301 or Metallurgical Engineering 370; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 326. Chemistry and Technology of Glass.** Same as Ceramic Engineering 326. Glass structure and constitution and their relationship to chemical, physical, and electrical properties; melting, forming, and annealing operations; preparation of glasses and measurement of important glass properties; lectures and laboratory. Prerequisite: Junior standing in engineering, chemistry, physics, or geology. 3 hours or $\frac{3}{4}$ unit.
- 327. Ceramic Microscopy.** Same as Ceramic Engineering 327. Studies the optical activity in isotropic and anisotropic media with particular emphasis on the materials and products of ceramics; the application of these principles and related topics of optical microscopy to the study of the morphology, aggregation, size, and microstructure of the products of high-temperature thermochemical reactions and equilibria. Includes studies in thermal microscopy if taken for 1 unit of graduate credit. Prerequisite: Ceramic Engineering 205 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 328. Electrical Ceramics.** Same as Ceramic Engineering 328. Presents the subject of dielectric crystals and their electrical properties; discussion and correlation of ferroelectric and piezoelectric properties of several crystal classes; coverage in detail of the perovskite class of ferroelectric compounds; and discussion of spinel, garnet, and hexagonal type ferrimagnetic crystals and their properties. Prerequisite: Materials Science and Engineering 321 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 330. Chemically Bonded Ceramics.** Same as Ceramic Engineering 330. Examines the principles and technology of producing ceramic materials bonded by hydrated compounds formed by hydration reactions of inorganic cements. Prerequisite: Senior standing. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 340. Advanced Mechanical Properties of Solids.** Same as Metallurgical Engineering 340. Advanced presentation of the mechanical behavior of solids; examines crystal plasticity, dislocations, point defects and grain boundaries, creep and fatigue behavior, fracture. Prerequisite: Materials Science and Engineering 306 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 342. Metals Laboratory.** Same as Metallurgical Engineering 342. Advanced metallurgy laboratory. Examines effects of heat treatment; mechanical testing, oxidation and corrosion; and metallography of selected alloys. Prerequisite: Materials Science and Engineering 207, 208, and 340. 3 hours or $\frac{3}{4}$ unit.
- 343. Design of Engineering Alloys.** Same as Metallurgical Engineering 343. Examines the application of science and engineering principles to the design, selection and perfor-

mance of engineering alloys. Studies alloy classes, design, effect of alloying elements, relation to processing variables, and structure-property relationships; design project. Prerequisite: Materials Science and Engineering 340, or consent of instructor. 3 hours or $3/4$ unit.

- 344. Welding and Joining Processes.** Same as Civil Engineering 375 and Metallurgical Engineering 344. The physical principles of fusion welding; heat flow; thermal cycles; physical metallurgy and mechanical properties of welded joints; applications of welding to large structures; testing of welds; nondestructive testing; design, economics, and weld specifications; and laboratory experiments in welding. Prerequisite: Theoretical and Applied Mechanics 224 or equivalent. 3 hours, or $3/4$ or 1 unit.
- 345. Corrosion of Metals.** Same as Metallurgical Engineering 345. Electrochemistry, thermodynamics, and kinetics of corrosion; behavior of ferrous and nonferrous metals; corrosion rates; corrosion control; cathodic and anodic protection; high-temperature corrosion; corrosion testing; and electrolytic machining methods. 3 hours, or $1/4$ or 1 unit.
- 346. Physical Metallurgy for Engineers.** Same as Metallurgical Engineering 346. Fundamentals of crystallography, imperfections, alloying, and deformation; consideration of composition, temperature, and prior thermal and mechanical treatment in the use of metals, with emphasis on their mechanical properties. Prerequisite: Credit or concurrent registration in Theoretical and Applied Mechanics 221 or Aeronautical and Astronautical Engineering 224, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 347. Advanced Physical Metallurgy.** Same as Metallurgical Engineering 347. Advanced physical metallurgy designed for graduate students whose undergraduate degrees are in engineering or physical science fields other than metallurgy or materials science; discusses the standard topics of physical metallurgy with an emphasis on underlying physical principles; and includes selected laboratory experiments. Prerequisite: Advanced undergraduate standing in a field other than metallurgy. 4 hours or 1 unit.
- 350. Introduction to Polymer Science and Engineering.** Fundamentals of polymer science and engineering. Polymer solution properties, conformation and molecular weight characterization. Rheological and viscoelastic behavior: relaxations and transitions, rubber elasticity. Crystallinity, morphology and deformation of crystalline polymers. Blends and composites. Methods of fabrication. Prerequisite: Advanced undergraduate or graduate standing. 3 hours, or $3/4$ or 1 unit. Students in the polymer concentration in materials science and engineering may not receive graduate credit for this course.
- 351. Introduction to Polymer Synthesis.** Fundamentals of polymer synthesis and configuration characterization. Examines step-growth, addition, and coordination polymerization; kinetics and molecular weight distributions. Studies co-polymers; applications of IR, NMR, and ESCA to configuration characterization. Prerequisite: Concurrent registration in Materials Science and Engineering 350, or consent of instructor. 1 hour or $1/4$ unit. Students may not receive credit for both Materials Science and Engineering 351 and 303.
- 352. Polymer Characterization Laboratory.** Characterizes polymeric materials experimentally to investigate molecular, microstructural and macroscopic aspects of their mechanical, thermal, electrical, and optical properties. Prerequisite: Materials Science and Engineering 350 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 353. Plastics Engineering.** An introductory course to plastics engineering. Examines components of plastics and data banks; viscoelasticity, yield, and fracture; reinforced polymers; and forming, design (project), and current advances. Prerequisite: Materials Science and Engineering 350. 3 hours or $3/4$ unit.
- 355. Polymer Physics, I: Structure and Properties.** Techniques and applications of polymer crystal structure and morphology observation; x-ray, electron, light and neutron scattering and diffraction; light and electron microscopy. Morphology-processing-property relationships of crystalline polymers, blends and copolymers; liquid, plastic and condensation crystals; deformation mechanisms and orientation characterization; relaxations and transitions; crystallization theory. Prerequisite: Materials Science and Engineering 350 or consent of instructor. 3 hours or $3/4$ unit.
- 380. Surfaces and Colloids.** An introduction to the chemistry and physics of surfaces and interfaces, with emphasis on behavior in liquid media; major areas include surface

composition, surface and interfacial forces, colloidal stability and flocculation, and amphiphilic molecules. Prerequisite: Materials Science and Engineering 301, Chemistry 342, or Physics 361; or equivalent undergraduate course in thermodynamics or physical chemistry, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

- 381. Electron Microscopy and Diffraction Theory.** Theory and application of transmission electron microscopy and diffraction with emphasis on thin crystals; electron optics, interference phenomena, interpretation of images and diffraction patterns, specimen preparation, etc. Prerequisite: Materials Science and Engineering 305 or equivalent. 3 hours or 1 unit.
- 382. Computer Simulation Studies in Materials Science.** Students develop and run computer programs which simulate various phenomena that are significant in the materials field including: atomistic diffusion; polymer conformational properties; dendritic crystallization; flow through a porous medium; gelation; charge transport in amorphous semi-conductors; and fracture in metals, ceramics, composites, and cements. Prerequisite: Previous programming experience in any computer language; and senior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 383. Hybrid Circuit Fabrication Laboratory.** Same as Ceramic Engineering 383 and Electrical and Computer Engineering 346. See Electrical and Computer Engineering 346.
- 390. Special Topics in Materials.** Independent study projects and courses on special topics. Prerequisite: Consent of instructor. 1 to 5 hours, or $\frac{1}{4}$ to 2 units. May be repeated. Students may also register in this course more than once in the same semester to a maximum of 10 hours or 3 units.
- 400. Statistical Thermodynamics of Materials.** Presents the atomistic concepts of statistical thermodynamics and shows its relationship to classical phenomenological thermodynamics. Applies the methods of statistical thermodynamics and statistical mechanical mechanics to describing the properties of a variety of materials, especially ceramics, polymers, electronic materials and metals. Prerequisite: Undergraduate course in thermodynamics or consent of instructor. 1 unit.
- 401. Kinetic Processes in Materials.** Examines the fundamentals of rate processes in materials, both from a phenomenological and an atomistic point of view, with special emphasis on the kinetics of transformations and the transport of matter in solids. Prerequisite: Graduate course in statistical thermodynamics or consent of instructor. 1 unit.
- 420. Ceramic Chemistry.** Same as Ceramic Engineering 420. Silica, silicates, fusions, and phase relations. Prerequisite: Courses in chemistry and physics. 1 unit.
- 421. Structural Physical Ceramics.** Same as Ceramic Engineering 421. Structural chemistry and crystallization behavior of ceramic systems at elevated temperatures; nucleation and crystal growth; mineral synthesis; and high-temperature reaction kinetics including phase transformations and diffusion. $\frac{3}{4}$ or 1 unit.
- 422. Dielectric Properties of Ceramic Materials.** Same as Ceramic Engineering 422. Review of fundamental properties of vector fields; consideration of the reaction of insulating solids to external electric fields in terms of dielectric theory; the properties of ceramic dielectrics including treatment of ferroelectrics in terms of present theory; and correlation of the piezoelectric properties of ferroelectric crystals and ceramics with the crystal structure, microstructure, and the ferroelectric properties. Prerequisite: Mathematics 345 and 343, or consent of instructor. $\frac{3}{4}$ or 1 unit.
- 423. Glass Technology.** Same as Ceramic Engineering 423. Following a brief review of unit processes and operations in glass manufacture, the course treats selected major topics relating to the glass preparation process and the chemical, mechanical, optical, and electrical properties of glass from a dominantly theoretical and research point of view. Prerequisite: Materials Science and Engineering 326 or equivalent, or consent of instructor. $\frac{3}{4}$ or 1 unit.
- 424. Physics of Strong Solids.** Same as Ceramic Engineering 424. Characterization and interpretation of physical properties of single-phase and composite materials of high strength; covalently bonded semiconductors; transition-metal carbides; borides and nitrides; graphite; glass; fibers; and precipitation-hardened metals. Prerequisite: Materi-

- als Science and Engineering 306, Chemistry 342, Physics 490, or consent of instructor. 1 unit.
425. **Physical Chemistry of Clays and Soils.** Same as Ceramic Engineering 425 and Soils 414. See Soils 414.
426. **Mineralogy of Clays.** Same as Ceramic Engineering 426 and Geology 461. See Geology 461.
427. **Petrology of Clay Minerals.** Same as Ceramic Engineering 427 and Geology 462. See Geology 462.
429. **Seminar in Ceramics.** Same as Ceramic Engineering 429. Seminar on current research in ceramic science and engineering; includes presentations by visiting lecturers, staff and students. Prerequisite: Graduate standing. 0 or $1/4$ unit. May be repeated to a maximum of $1/2$ unit.
440. **Defects and Plastic Deformation in Metals.** Same as Metallurgical Engineering 440. Studies point, line, and surface defects in metals; configuration, thermodynamics, and motion; quantitative description of single dislocation properties; and interactions among defects. For students in metallurgy, ceramics, physics, and other solid state sciences. Prerequisite: Mathematics 345 and Materials Science and Engineering 304 and 306; or consent of instructor. 1 unit.
441. **Dislocations and Mechanical Properties of Metals.** Same as Metallurgical Engineering 441. General static and dynamic properties of single dislocations in crystals; dislocation interactions; properties of dislocation arrays; and role of dislocations in metallurgical phenomena with particular emphasis on mechanical properties. Prerequisite: Consent of instructor. 1 unit.
442. **Solidification Processing.** Same as Mechanical Engineering 452 and Metallurgical Engineering 442. See Mechanical Engineering 452.
449. **Seminar in Metals.** Same as Metallurgical Engineering 449. Seminar on current research in metals science and engineering; includes presentations by visiting lecturers, staff and students. Prerequisite: Graduate standing. 0 or $1/4$ unit. May be repeated to a maximum of $1/2$ unit.
455. **Molecular Statistics of Polymer Viscoelasticity.** Examines the rubber elastic and viscoelastic properties of polymers from the molecular statistical point of view. Describes and compares theoretical models in terms of their conceptual foundations and mathematical development. Analyzes experiments to test the theories in terms of the experimental design and data treatment. Compares the theoretical predictions and experimental findings. Prerequisite: Materials Science and Engineering 350 and 400, or equivalent graduate courses. Advanced undergraduate mathematics courses are helpful but not required. 1 unit.
459. **Seminar in Polymers.** Seminar on current research in polymer science and engineering; includes presentations by visiting lecturers, staff and students. Prerequisite: Graduate standing. 0 or $1/4$ unit. May be repeated to a maximum of $1/2$ unit.
469. **Seminar in Electronic Materials.** Seminar on current research in electronic materials including presentations by visiting lecturers, staff and students. Prerequisite: Graduate standing. 0 or $1/4$ unit. May be repeated to a maximum of $1/2$ unit.
480. **Advanced X-Ray Diffraction.** X-ray diffraction as applied to the study of inorganic materials; effects of cold work, annealing, substructures, preferred orientation, and ordering; and principles of electron and neutron diffraction. Prerequisite: Consent of instructor. 1 unit.
482. **Surface Physics.** Same as Physics 430. Introduction to theory and experiment of atomic behavior on crystal surfaces; thermodynamics of surfaces; surface energy; diffraction and structure; gas-solid collisions; Brownian motion, diffusion, and evaporation; electron and ion emission, tunnelling; Van der Waals forces; theory of chemical interactions; and kinetics and statistics of adsorption. Prerequisite: Materials Science and Engineering 401 or Physics 489, or consent of instructor. 1 unit.
490. **Special Topics in Materials.** Individual study or courses of an advanced nature in various areas of materials science and engineering not covered in listed courses. Prerequisite: Graduate standing and consent of instructor. $1/4$ to 1 unit. May be repeated.

Students may also register in this course more than once in the same semester to a maximum of 2 units.

491. **Laboratory Investigations in Materials.** Special investigations in materials providing an opportunity for instruction in experimental methods of research. Prerequisite: Graduate standing and consent of instructor. Available only to nonthesis students enrolled in a Master of Science Program. 0 to 2 units. May be repeated to a maximum of 2 units.
497. **Research Seminars.** Same as Ceramic Engineering 497 and Metallurgical Engineering 497. Discussions and lectures on current research under the direction of individual staff members. Prerequisite: Graduate standing and consent of instructor. 0 or $1/4$ unit. May be repeated.
498. **Colloquium on Materials Research.** Reviews current materials research in other laboratories by visiting lecturers; also presents some of the research currently done in the department. Required of all graduate students in the department. 0 or $1/4$ unit. May be repeated. No more than $1/2$ unit may be counted toward the M.S. degree.
499. **Thesis Research.** Individual research in specialized problems under the supervision of members of the staff. Results of research may be used for graduate thesis. 0 to 4 units.

Metallurgical Engineering

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
299. **Thesis.** Investigation of special problems and preparation of a thesis. May be substituted for certain technical subjects in the senior year. Prerequisite: Senior standing; approval of head of department. 1 to 5 hours.
340. **Advanced Mechanical Properties of Solids.** Same as Materials Science and Engineering 340. See Materials Science and Engineering 340.
342. **Metals Laboratory.** Same as Materials Science and Engineering 342. See Materials Science and Engineering 342.
343. **Design of Engineering Alloys.** Same as Materials Science and Engineering 343. See Materials Science and Engineering 343.
344. **Welding and Joining Processes.** Same as Civil Engineering 375 and Materials Science and Engineering 344. See Materials Science and Engineering 344.
345. **Corrosion of Metals.** Same as Materials Science and Engineering 345. See Materials Science and Engineering 345.
346. **Physical Metallurgy for Engineers.** Same as Materials Science and Engineering 346. See Materials Science and Engineering 346.
347. **Advanced Physical Metallurgy.** Same as Materials Science and Engineering 347. See Materials Science and Engineering 347.
370. **Physical Metallurgy, I.** First of a two-semester sequence treating metallurgical phenomena and their utilization in engineering materials and processes; defects, diffusion, phase diagrams, solidification and casting, and plastic deformation and annealing. Prerequisite: Junior standing in engineering; Mathematics 345; Theoretical and Applied Mechanics 221. 3 hours or $3/4$ unit.
371. **Physical Metallurgy Laboratory, I.** Laboratory course to be taken simultaneously with Metallurgical Engineering 370. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 370. 3 hours or 1 unit.
372. **Physical Metallurgy, II.** Continuation of Metallurgical Engineering 370. Precipitation; eutectoid reactions; martensite; ordering; surface reactions; cast iron; and joining. Prerequisite: Metallurgical Engineering 370 or consent of instructor. 3 hours or $3/4$ unit.
373. **Physical Metallurgy Laboratory, II.** Laboratory course to be taken simultaneously with Metallurgical Engineering 372. Experiments using various metallographic, physical, and mechanical property observations to relate structure to properties and illustrate behavior of materials. Prerequisite: Concurrent registration in Metallurgical Engineering 372. 3 hours or 1 unit.

- 390. Special Topics in Metallurgy.** Independent study projects and courses on special topics. Prerequisite: Consent of instructor. 1 to 5 hours. $\frac{1}{4}$ to 2 units. May be repeated. Students may also register in this course more than once in a semester to a maximum of 10 hours or 3 units.
- 440. Defects and Plastic Deformation in Metals.** Same as Materials Science and Engineering 440. See Materials Science and Engineering 440.
- 441. Dislocations and Mechanical Properties of Metals.** Same as Materials Science and Engineering 441. See Materials Science and Engineering 441.
- 442. Solidification Processing.** Same as Materials Science and Engineering 442 and Mechanical Engineering 452. See Mechanical Engineering 452.
- 449. Seminar in Metals.** Same as Materials Science and Engineering 449. See Materials Science and Engineering 449.
- 490. Special Topics in Metallurgy.** Individual study or courses of an advanced nature in various areas of metallurgical engineering not covered by regular course offerings. Prerequisite: Graduate standing and consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated. Students may also register in this course more than once in a semester to a maximum of 2 units.
- 491. Laboratory Investigations in Metallurgy.** Special investigations in materials providing an opportunity for instruction in experimental methods of research. Prerequisite: Graduate standing and consent of instructor. Available only to nonthesis students enrolled in a Master of Science program. 0 to 2 units. May be repeated to a maximum of 2 units.
- 497. Research Seminars.** Same as Ceramic Engineering 497 and Materials Science and Engineering 497. See Materials Science and Engineering 497.
- 499. Thesis Research.** Individual research in specialized problems under the supervision of members of the staff. Results of research may be used for graduate thesis. 0 to 4 units.

MATHEMATICS

Chair of Department: C. Ward Henson

Department Office: 273 Altgeld Hall, 1409 West Green Street, Urbana

- 102. Introductory Algebra.** Methods of elementary algebra, including simplification of algebraic expressions, solving linear and quadratic equations, equations of lines, systems of linear equations, and radicals. Enrollment is restricted. Prerequisite: Score on appropriate placement test, or consent of Mathematics Department. 3 hours. Credit may not be used toward graduation in the College of LAS.
- 103. Elementary Algebra Review.** Review and supplementary material in intermediate algebra in preparation for, or as a supplement to, Algebra (Mathematics 112). 0 hours. Not intended for credit toward a baccalaureate degree.
- 104. Trigonometry Tutorial.** Trigonometry instruction in small classes as a supplement to Mathematics 114. Prerequisite: Concurrent registration in Mathematics 114. 0 hours. Not intended for credit toward a baccalaureate degree.
- 112. Algebra.** Rapid review of basic techniques of factoring, rational expressions, equations and inequalities; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; and the binomial theorem. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: $1\frac{1}{2}$ units of high school algebra, and 1 unit of high school geometry. 3 hours. Credit is not given for both Mathematics 112 and 116. Credit not applicable toward graduation in certain colleges.
- 114. Trigonometry.** Studies degrees and radians, the trigonometric functions, identities and equations, inverse functions, oblique triangles and applications. Students who need both algebra and trigonometry should enroll in Mathematics 116. Prerequisite: $1\frac{1}{2}$ units of high school algebra, or concurrent registration in Mathematics 112; 1 unit of high school geometry. 2 hours. Credit is not given for both Mathematics 114 and 116. Credit not applicable toward graduation in certain colleges.

- 116. Algebra and Trigonometry.** A unified treatment of algebra and trigonometry that combines Mathematics 112 and 114. Students who need Mathematics 112 and 114 should enroll in Mathematics 116. Prerequisite: $1\frac{1}{2}$ units of high school algebra; 1 unit of high school geometry. 5 hours. Credit is not given for both Mathematics 116 and 112. Students with credit in Mathematics 114 may receive 3 hours credit for Mathematics 116. Credit not applicable toward graduation in certain colleges.
- 118. Numeracy.** An elementary course for students whose major interests are not in engineering or the physical sciences; emphasizes understanding of mathematical aspects of modern, real-world problems; includes concepts from combinatorics, exponential growth, probability and statistics; problem-solving strategies. Prerequisite: 2 units of high school algebra. 3 hours.
- 119. Ideas in Geometry.** A general education course in mathematics, for students who do not have mathematics as a central part of their studies. The goal is to convey the spirit of mathematical thinking through topics chosen mainly from planar geometry. Prerequisite: 2 units of high school algebra; 1 unit of high school geometry; or equivalent. 3 hours.
- 120. Calculus and Analytic Geometry, I.** A first course in calculus and analytic geometry; basic techniques of differentiation and integration with applications including curve sketching; antidifferentiation, the Riemann integral, fundamental theorem, exponential and circular functions. Students with strong backgrounds in analytic geometry should normally enroll in Mathematics 135. Prerequisite: Mathematics 116; or Mathematics 112 and 114; or an adequate mathematics placement test score. 5 hours. Credit is not given for both Mathematics 120 and either 121, 134, or 135.
- 121. Calculus and Analytic Geometry, I.** A first course in calculus and analytic geometry; basic techniques of differentiation and applications including curve sketching; antidifferentiation, the Riemann integral, fundamental theorem; applications to area. Students with strong backgrounds in analytic geometry should enroll in Math 135. Prerequisite: Mathematics 116; or Mathematics 112 and 114; or adequate mathematics placement test score. 3 hours. Credit is not given for both Mathematics 121 and either 120, 134, or 135.
- 124. Finite Mathematics.** An introduction to finite mathematics for students in the social sciences; introduces the student to the basic ideas of logic, set theory, probability, vectors and matrices, and Markov chains. Problems are selected from social sciences and business. Prerequisite: Mathematics 112, or an adequate mathematics placement test score. 3 hours.
- 125. Elementary Linear Algebra with Applications.** Basic concepts and techniques of linear algebra; includes systems of linear equations, matrices, determinants, vectors in n -space, and eigenvectors, together with selected applications, such as Markov processes, linear programming, economic models, least squares, and population growth. Prerequisite: Mathematics 112, or an adequate placement test score. 3 hours. Credit is not given for both Mathematics 125 and 225.
- 130. Calculus and Analytic Geometry, II.** Second course in calculus and analytic geometry: techniques of integration, conic sections, polar coordinates, and infinite series. Prerequisite: Mathematics 120. 3 hours. Credit is not given for both Mathematics 130 and Mathematics 131.
- 131. Calculus and Analytic Geometry, II.** A second course in calculus and analytic geometry; applications of integration, exponential and circular functions, techniques of integration, infinite series, polar coordinates, conic sections. Prerequisite: Mathematics 121 or consent of instructor. 3 or 5 hours. Credit is not given for both Mathematics 131 and 130; students who have taken Mathematics 120 may receive only 3 hours credit for Mathematics 131.
- 134. Calculus for Social Scientists, I.** Introduction to the concept of functions and the basic ideas of the calculus. Prerequisite: Mathematics 112. 4 hours. Credit is not given for Mathematics 134 and Mathematics 120, 121, or 135.
- 135. Calculus.** First course in calculus. Differentiation and integration; applications to curve-tracing, maxima and minima, area, and volume. Prerequisite: Completion of a thorough course in plane and solid analytic geometry, or equivalent. 5 hours. Credit is not given for both Mathematics 135 and 120, 121, or 134.

- 149. Honors Course in Mathematics.** Prerequisite: Concurrent registration in an honors section of Mathematics 120, 130, 131, 135, 242, or 245; consent of the department. Enrollment is strictly limited to students with superior mathematical talents. 1 hour.
- 161. Statistics.** Same as Statistics 100. See Statistics 100.
- 190. Symbolic Computation Lab.** Laboratory component to courses using a symbolic programming package. Prerequisite: Consent of department. Concurrent registration in a designated section of a mathematics course with symbolic computation component. 1 hour. May be taken only once for credit.
- 198. Freshman Seminar.** Guides the student in the study of selected topics not considered in standard courses. Prerequisite: Enrollment in the mathematics honors program; consent of department. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Computers for Elementary Teachers.** Introduction to computers and basic programming principles and practices with special emphasis on applications to elementary mathematics. 3 hours. May be used for credit only in teacher preparation programs leading to certification in elementary or early childhood education.
- 201. Mathematics for Elementary Teachers.** Analyzes the mathematical issues underlying elementary school mathematics. Topics include sets, place-value notation, arithmetic algorithms, elementary number theory, rational and irrational numbers, applications. Simple programming problems are assigned. Prerequisite: Mathematics 200 or equivalent. 3 hours. May be used for credit only in teacher preparation programs leading to certification in elementary or early childhood education.
- 210. Theory of Interest.** A study of compound interest and annuities; applications to problems in finance. Prerequisite: Mathematics 130, 131 or equivalent. 3 hours.
- 213. Introduction to Discrete Mathematics.** Beginning course on discrete mathematics, including sets and relations, functions, basic counting techniques, recurrence relations, graphs and trees, and matrix algebra; emphasis throughout is on algorithms and their efficacy. Prerequisite: Mathematics 120 or 135 or equivalent. 3 hours.
- 225. Introductory Matrix Theory.** Systems of linear equations, matrices and inverses, determinants, and a glimpse at vector spaces, eigenvalues and eigenvectors. Prerequisite: Mathematics 120 or equivalent. 2 hours. Credit is not given for both Mathematics 225 and 125. Also, students with earned credit in Mathematics 315 may not receive additional credit for Mathematics 225, when 225 is taken after 315.
- 242. Calculus of Several Variables.** Third course in calculus and analytic geometry: three dimensional space, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 130 or 131. 3 hours. Credit is not given for both Mathematics 242 and either Mathematics 244 or 245.
- 244. Calculus for Social Scientists, II.** Continuation of Mathematics 134. The calculus of the trigonometric functions, Taylor polynomials, and infinite series; analytic geometry in n dimensions, vector calculus, classical extremum problems in n variables, and Lagrange multipliers; and multiple integrals. Prerequisite: Mathematics 134 or consent of instructor. 5 hours. Students may not receive credit for both Mathematics 244 and either Mathematics 242 or 245.
- 245. Calculus, II.** Continuation of Mathematics 135. Polar coordinates, vectors and parametric equations, infinite series, functions of several variables, partial derivatives, and multiple integrals. Prerequisite: Mathematics 135. 5 hours. Students may not receive credit for both Mathematics 245 and either Mathematics 242 or 244.
- 247. Intermediate Analysis.** Advanced calculus for students in mathematics: topics include continuity, gradients, Jacobians, optimization, vector integration, Stokes' theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 247 and 280. (Counts for advanced hours in LAS.)
- 257. Numerical Methods.** Same as Computer Science 257. See Computer Science 257.
- 263. Statistics for Scientists.** Same as Statistics 210. See Statistics 210.
- 270. Actuarial Problem Solving.** Methods and techniques of solving problems in actuarial mathematics for advanced students intending to enter the actuarial profession. Prerequisite: Consent of instructor. 1 to 2 hours. May be repeated to a maximum of 4 hours.

- 280. Advanced Calculus.** Introductory study of vector calculus and functions of several variables; topics include directional derivatives; Jacobians; change of variables in multiple integrals; maxima and minima; line and surface integrals; theorems of Gauss, Green, and Stokes; infinite series; and uniform convergence. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Students may not receive credit for both Mathematics 280 and 247. (Counts for advanced hours in LAS.)
- 285. Differential Equations and Orthogonal Functions.** Intended for engineering students and others who require a working knowledge of differential equations; included are techniques and applications of ordinary differential equations and an introduction to partial differential equations. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours. Credit is not given for both Mathematics 285 and 341. (Counts for advanced hours in LAS.)
- 290. Individual Study.** Guided individual study of advanced topics not covered in other courses. Prerequisite: Mathematics 347 with grade of B or better, or consent of department. 2 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Guided individual study of advanced topics not covered in other courses; for students seeking honors credit. Prerequisite: Mathematics 347 with grade of B or better, or consent of Mathematics Honors Committee. 2 hours. May be repeated to a maximum of 8 hours. (Counts for advanced hours in LAS.)
- 296. Honors Seminar.** Careful study of a selected area of mathematics, carried out either deductively from axioms or inductively through problems; subject matter varies with instructor. Prerequisite: Consent of Mathematics Honors Committee. 3 hours. May be repeated to a maximum of 6 hours.
- 302. Topics in Geometry.** Historical development of geometry; includes tacit assumptions made by Euclid; the discovery of non-Euclidean geometries; geometry as a mathematical structure; and an axiomatic development of plane geometry. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 303. Advanced Aspects of Euclidean Geometry.** Selected topics from geometry, including the nine-point circle, theorems of Ceva and Menelaus, regular figures, isometries in the plane, ordered and affine geometries, and the inversive plane. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 305. Teacher's Course.** Presents selected topics in mathematics that are related to the content of secondary school mathematics programs; provides background for enrichment topics for secondary school students. Subject matter varies with the instructor. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 306. History of Calculus.** An examination of the historical origins and genesis of the concepts of the calculus; includes mathematical developments from the ancient Greeks to the eighteenth century. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 308. Actuarial Statistics, I.** Same as Statistics 308. See Statistics 308.
- 309. Actuarial Statistics, II.** Same as Statistics 309. See Statistics 309.
- 312. Graph Theory and Its Applications.** Examines basic concepts and applications of graph theory, where graph refers to a set of vertices and edges that join some pairs of vertices; topics include subgraphs, connectivity, trees, cycles, vertex and edge coloring, planar graphs and their colorings. Draws applications from computer science, operations research, chemistry, the social sciences, and other branches of mathematics, but emphasis is placed on theoretical aspects of graphs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 313. Combinatorial Mathematics.** Same as Computer Science 313. Permutations and combinations, generating functions, recurrence relations, inclusion and exclusion, Polya's theory of counting, and block designs. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 314. Introduction to Mathematical Logic.** Introduction to the formalization of mathematics and the study of axiomatic systems; expressive power of logical formulas; detailed treatment of propositional logical and predicate logic; compactness theorem and Godel completeness theorem, with applications to specific mathematical theories; algorithmic aspects of logical formulas. Proofs are emphasized in this course, which can serve as an

introduction to abstract mathematics and rigorous proof; some ability to do mathematical reasoning required. Prerequisite: Mathematics 242 or 245, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

- 315. Linear Transformations and Matrices.** An introductory course emphasizing techniques of linear algebra; topics include matrix operations, determinants, linear equations, vector spaces, linear transformations, eigenvalues, and eigenvectors. Prerequisite: Mathematics 242 or 245; elementary knowledge of matrix multiplication, Gaussian elimination, matrix inverses, and calculation of determinants (students who lack this linear algebra background can take Mathematics 125 or 225). 3 hours or $\frac{3}{4}$ unit.
- 317. Introduction to Abstract Algebra.** An introductory course in abstract algebra; includes modular arithmetic, permutations, group theory through the isomorphism theorems, ring theory through the notions of prime and maximal ideals, and additional topics such as unique factorization domains and classification of groups of small order. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 318. Introduction to Linear Algebra.** Abstract approach emphasizing concept of linear transformation; topics include linear equations, vector spaces, linear transformations, matrices, determinants, invariant subspaces, direct sum decompositions, canonical forms, inner product spaces, and bilinear forms. Emphasizes proofs. Prerequisite: Mathematics 317 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 319. Applied Modern Algebra.** Same as Electrical and Computer Engineering 319. Sets and functions, finite-state machines, partially ordered sets, Boolean algebras, normal form of switching functions, the semigroup of a machine, and group codes. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 323. The Calculus of Curves and Surfaces.** Applications of the calculus to the study of shape and curvature of curves and surfaces; introduction to vector fields, differential forms on Euclidean spaces, and the method of moving frames for low-dimensional differential geometry. Prerequisite: Mathematics 242 or 245; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 332. Introduction to Set Theory and Topology.** Informal set theory, cardinal and ordinal numbers, and axiom of choice; topology of metric spaces and introduction to general topological spaces. Prerequisite: Credit or concurrent registration in Mathematics 347. 3 hours or $\frac{3}{4}$ unit.
- 339. Philosophy of Mathematics.** Same as Philosophy 339. See Philosophy 339.
- 341. Differential Equations.** A basic course in ordinary differential equations; topics include existence and uniqueness of solutions and the general theory of linear differential equations; treatment is more rigorous than that given in Mathematics 285. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Mathematics 341 and 285.
- 342. Fourier Series and Boundary Value Problems.** Deals with the theory of Fourier series and applications to solving partial differential equations. Prerequisite: Mathematics 285 or 341. 3 hours or $\frac{3}{4}$ unit.
- 344. Elementary Real Analysis.** Careful treatment of the theoretical aspects of the calculus of functions of a real variable; topics include the real number system, limits, continuity, derivatives, and the Riemann integral. Prerequisite: Mathematics 242 or 245. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Mathematics 344 and 347.
- 346. Complex Variables and Applications.** For students who desire a working knowledge of complex variables; covers the standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, and potential fields. Students desiring a systematic development of the foundations of the subject should take Mathematics 348. Prerequisite: Mathematics 280 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Mathematics 346 and 348.
- 347. Introduction to Higher Analysis: Real Variables.** Careful development of elementary real analysis including such topics as completeness property of the real number system; basic topological properties of n -dimensional space; convergence of numerical sequences and series of functions; properties of continuous functions; and basic theorems concerning differentiation and Riemann integration. Prerequisite: Mathematics 242 or 245 (or equivalent) and junior standing; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Mathematics 347 and 344.

- 348. Introduction to Higher Analysis: Complex Variables.** For students who desire a rigorous introduction to the theory of functions of a complex variable; topics include Cauchy's theorem, the residue theorem, the maximum modulus theorem, Laurent series, the fundamental theorem of algebra, and the argument principle. Prerequisite: Mathematics 347. 3 hours or $\frac{3}{4}$ unit. Credit is not given for both Mathematics 348 and 346.
- 350. Numerical Analysis: A Comprehensive Introduction.** Same as Computer Science 350. See Computer Science 350.
- 351. Topics in Applied Mathematics.** Deals with topics in the application of mathematics to the physical, biological, and social sciences; see *Timetable* or department office for current topics. Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated with consent of instructor.
- 353. Elementary Theory of Numbers.** Topics covered include divisibility, primes, congruences, quadratic reciprocity, and Farey sequences. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 355. Numerical Methods for Partial Differential Equations.** Same as Computer Science 355. See Computer Science 355.
- 358. Numerical Linear Algebra.** Same as Computer Science 358. See Computer Science 358.
- 359. Numerical Approximation and Ordinary Differential Equations.** Same as Computer Science 359. See Computer Science 359.
- 361. Introduction to Probability Theory, I.** Same as Statistics 351. Introduction to mathematical probability; includes the calculus of probability, combinatorial analysis, random variables, expectation, distribution functions, moment-generating functions, and central limit theorem. Prepares students for Mathematics 366. Prerequisite: Mathematics 242 or 245, or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 363. Introduction to Mathematical Statistics and Probability, I.** Same as Statistics 310. See Statistics 310.
- 364. Introduction to Mathematical Statistics and Probability, II.** Same as Statistics 311. See Statistics 311.
- 365. Analysis of Variance.** Same as Statistics 324. See Statistics 324.
- 366. Introduction to Probability Theory, II.** Same as Statistics 356. Continuation of Mathematics 361. Includes random walks, discrete and continuous time Markov chains, and special topics selected from weak stationarity, multivariate central limit theorem, probability model building, stochastic equations, martingale theory, and renewal theory. Prerequisite: Mathematics 361 or Statistics 311. 3 hours or $\frac{3}{4}$ unit.
- 368. Topics in Applied Statistics.** Same as Statistics 330. See Statistics 330.
- 369. Methods of Applied Statistics.** Same as Statistics 320. See Statistics 320.
- 371. Actuarial Theory, I.** Distribution of the time-to-death random variable for a single life, and its implications for evaluations of insurance and annuity functions, net premiums, and reserves. Prerequisite: Mathematics 308 and 210. 4 hours or 1 unit.
- 372. Actuarial Theory, II.** Continuation of Mathematics 371. Emphasis is on multiple-life functions. Prerequisite: Mathematics 371. 3 hours or $\frac{3}{4}$ unit.
- 373. Combinatorial Algorithms.** Same as Computer Science 373. See Computer Science 373.
- 375. Automata, Formal Languages, and Computational Complexity.** Same as Computer Science 375. See Computer Science 375.
- 376. Actuarial Risk Theory.** Mathematical analysis of the risk to an insurer due to variations in expected claim numbers and amounts; optimal insurance systems; the probability of ruin in the long run; reinsurance; dividend formulas. Prerequisite: Credit or concurrent registration in Statistics 309 or 311. 3 hours or $\frac{3}{4}$ unit.
- 381. Vector and Tensor Analysis.** Vector spaces, transformation properties, covariant and contravariant tensors, and differential geometry of surfaces; applications to relativity theory. Prerequisite: Mathematics 247, 280 or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 383. Linear Programming.** Same as Computer Science 383. Systems of linear inequalities, the standard canonical and general linear problems, and simplex methods of solution. Prerequisite: Mathematics 125, 225, or 315; or equivalent. 3 hours or $\frac{3}{4}$ unit.
- 384. Nonlinear Programming.** Iterative and analytical solutions of constrained and unconstrained problems of optimization; gradient and conjugate gradient solution

methods; Newton's method, Lagrange multipliers, and duality and the Kuhn-Tucker theorem; and quadratic, convex, and geometric programming. Prerequisite: Mathematics 242 or 245, and a knowledge of linear algebra equivalent to Mathematics 315, or consent of instructor. 3 hours or $3/4$ unit.

385. **Differential Equations, II.** Continuation of Mathematics 285. Linear systems of differential equations, including a self-contained development of the necessary matrix theory; the Laplace transform; and nonlinear differential equations. Prerequisite: Mathematics 285 or 341. 3 hours or $3/4$ unit.
388. **Mathematical Methods in Engineering and Science.** Matrices, determinants, bounds and approximations to eigenvalues, introduction to linear operator theory and inner product spaces, orthogonal expansions, and Fourier transforms. Prerequisite: Mathematics 280 or equivalent. 3 hours or $3/4$ unit.
391. **Logic Design.** Same as Computer Science 362 and Electrical and Computer Engineering 362. See Electrical and Computer Engineering 362.
393. **Statistical Computing.** Same as Statistics 328. See Statistics 328.
394. **Time Series Analysis.** Same as Statistics 329. See Statistics 329.
400. **General Seminar.** General seminar required of all graduate students who have passed the departmental written qualifying examination for the Ph.D. 0 units.
401. **Second Course in Abstract Algebra, I.** Isomorphism theorems for groups; solvability of p -groups; simplicity of the alternating group on 5 letters; Sylow theorems and Jordan-Hölder theorem; principal ideal domains; Gauss' lemma; Eisenstein's criterion; fundamental theorem of Galois theory; finite fields; cyclotomic fields; and solvability of equations by radicals. Prerequisite: Mathematics 317 and 318. 1 unit.
402. **Second Course in Abstract Algebra, II.** Modules; Hilbert basis theorem; Krull-Schmidt theorem; Wedderburn theorem on semisimple rings; finitely generated modules over principal ideal domains, with applications to abelian groups and canonical forms for matrices; categories and functors; tensor products; and bilinear and quadratic forms. Prerequisite: Mathematics 401. 1 unit.
403. **Commutative Algebra.** Commutative rings and modules, prime ideals, localization, noetherian rings, primary decomposition, integral extensions and Noether normalization, the Nullstellensatz, dimension, flatness, Hensel's lemma, graded rings, Hilbert polynomial, valuations, regular rings, singularities, unique factorization, homological dimension, depth, completion. Possible further topics: smooth and étale extensions, ramification, Cohen-Macaulay modules, complete intersections. Prerequisite: Mathematics 402 or consent of instructor. 1 unit.
404. **Group Theory.** Structure of groups, derived groups, nilpotence and solvability, and extensions and products. Prerequisite: Mathematics 402 or equivalent. 1 unit.
405. **Algebraic Number Theory.** Further development of the theory of fields covering topics from valuation theory, ideal theory, units in algebraic number fields, ramification, function fields, and local class field theory. Prerequisite: Mathematics 402 or equivalent. 1 unit.
406. **Homological Algebra.** Definition and properties of the functors Ext and Tor; projective, injective, and flat modules; group extensions; dimensions of rings, and Hilbert theorem on syzygies. Prerequisite: Mathematics 402 or equivalent. 1 unit.
407. **Group Representation Theory.** Representation of groups by linear transformations, group algebras, character theory, and modular representations. Prerequisite: Mathematics 402 or equivalent. 1 unit.
408. **Lie Algebras.** Examples of Lie algebras (low dimensions, Lie algebras of Lie groups, free algebras, and universal enveloping algebra); Poincaré-Birkhoff-Witt theorem; nilpotent and solvable algebras; Cartan subalgebras; structure of semisimple algebras; real forms; and representations. Prerequisite: Mathematics 401; credit or concurrent registration in Mathematics 402. 1 unit.
409. **Noncommutative Rings.** Structure of Artinian rings, Morita theory, radicals, Brauer groups, finiteness conditions, and other topics at the choice of the instructor. Prerequisite: Mathematics 402 or consent of instructor. 1 unit.
410. **Mathematical Logic.** Development of first order predicate logic; completeness theorem;

- formalized number theory and the Godel incompleteness theorem. Prerequisite: Mathematics 314 or 317 or consent of instructor. 1 unit.
411. **Model Theory.** Techniques for constructing models, including compactness and Lowenheim-Skolem theorems, unions of elementary chains, and omitting types construction; categorical theories; ultraproducts; saturated models; quantifier elimination; applications to algebraically closed fields, real closed fields, and other fundamental structures of mathematics. Prerequisite: Mathematics 410, or consent of instructor. 1 unit.
412. **Recursive Function Theory.** Various characterizations of the class of recursive (i.e., computable) functions; the Church-Turing thesis; unsolvability of the halting problem; the recursion theorem and the enumeration theorem; relative computability, the jump operation, and the arithmetical hierarchy; recursively enumerable sets; degrees of unsolvability; and the priority method. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.
413. **Set Theory.** Zermelo-Fraenkel axiomatic set theory; basic concepts in set theory such as ordinal, cardinal, rank, and definition by transfinite recursion; Godel's constructible universe; introduction to forcing; Boolean valued universes; large cardinals; consistency and independence of the continuum hypothesis and the axiom of choice. Prerequisite: Mathematics 410 or consent of instructor. 1 unit.
414. **Advanced Topics in Logic.** Prerequisite: Mathematics 410; consent of instructor. 1 unit.
415. **Advanced Topics in the Theory of Groups.** Prerequisite: Consent of instructor. 1 unit.
416. **Advanced Topics in Abstract Algebra.** Prerequisite: Consent of instructor. 1 unit.
418. **Graph Theory.** Same as Computer Science 472. Structure of graphs; planarity and colorability of graphs; matrices associated with a graph; and automorphism group of a graph. Prerequisite: Mathematics 313 or 317, or equivalent. 1 unit.
422. **Algebraic Geometry.** Properties of affine and projective varieties defined over algebraically closed fields; rational mappings, birational geometry and divisors, especially on curves and surfaces; introduction to the language of schemes; and Riemann-Roch theorem for curves. Prerequisite: Mathematics 402. 1 unit.
423. **Differentiable Manifolds.** Definition and properties of differentiable manifolds and maps, introducing vector fields, tangent bundles, differential forms, exterior derivatives, and foliations. Prerequisite: Mathematics 323 or 381, or consent of instructor. 1 unit.
424. **Riemannian Geometry.** Local and global properties of Riemannian manifolds. Prerequisite: Mathematics 423. 1 unit.
425. **Linear Analysis on Manifolds.** Study of topological invariants of differentiable and complex manifolds. Prerequisite: Mathematics 423 and 431, or consent of instructor. 1 unit.
427. **Lie Groups.** Study of groups which are also differentiable manifolds. Prerequisite: Mathematics 423. 1 unit.
428. **Topics in Geometry.** Prerequisite: Consent of instructor. 1 unit.
431. **Algebraic Topology, I.** Homological algebra techniques, simplicial and singular homology, fundamental group and covering spaces, and applications. Prerequisite: Mathematics 318 and 332; concurrent registration in Mathematics 401 or consent of instructor. 1 unit.
432. **Algebraic Topology, II.** Continuation of Mathematics 431. Axiomatic homology theory, fibrations and cofibrations, CW-complexes, cohomology products, and other topics. Prerequisite: Mathematics 431; concurrent registration in Mathematics 402. 1 unit.
433. **Fiber Spaces and Characteristic Classes.** Continuation of Mathematics 432. Study of fiber bundles and their associated characteristic classes; applications to geometric problems. Prerequisite: Mathematics 432. 1 unit.
435. **General Topology, I.** Study of topological spaces and maps, including Cartesian products, identifications, connectedness, compactness, uniform spaces, and function spaces. Prerequisite: Mathematics 332 or consent of instructor. 1 unit.
436. **General Topology, II.** Continuation of Mathematics 435. Prerequisite: Mathematics 435. 1 unit.
438. **Topics in Topology.** Prerequisite: Consent of instructor. 1 unit.
440. **Theory of Functions of a Complex Variable, I.** Topics include the Cauchy theory, har-

monic functions, entire and meromorphic functions, and the Riemann mapping theorem. Prerequisite: Mathematics 346 and 347, or Mathematics 348. 1 unit.

- 441. Real Analysis, I.** Lebesgue measure on the real line; integration and differentiation of real valued functions of a real variable; and additional topics at discretion of instructor. Prerequisite: Mathematics 347 or equivalent. 1 unit. Credit is not given for both Mathematics 441 and 481.
- 442. Real Analysis, II.** Abstract measure theory; integration on general measure spaces; and introduction to functional analysis. Prerequisite: Mathematics 441. 1 unit.
- 443. Ordinary Differential Equations.** Existence, uniqueness, and continuation of solutions; topics selected from the following: the theory of linear differential operators, Sturm-Liouville theory, stability theory, and qualitative theory of differential equations. Prerequisite: Mathematics 347; a first course in ordinary differential equations. 1 unit.
- 444. Partial Differential Equations.** A basic introduction to the study of partial differential equations; topics include: the Cauchy problem, power-series methods, characteristics, classification, canonical forms, well-posed problems, Riemann's method for hyperbolic equations, the Goursat problem, the wave equation, Sturm-Liouville problems and separation of variables, Fourier series, the heat equation, integral transforms, Laplace's equation, harmonic functions, potential theory, the Dirichlet and Neumann problems, and Green's functions. Prerequisite: Consent of instructor. 1 unit.
- 445. Theory of Functions of a Complex Variable, II.** Continuation of Mathematics 440. Topics include subharmonic functions, Nevanlinna theory, analytic continuation and Riemann surfaces, and univalent functions. Prerequisite: Mathematics 440. 1 unit.
- 446. Hilbert Spaces.** Geometrical properties of Hilbert spaces; linear operators; and the spectral theory for self adjoint and related operators. Prerequisite: Mathematics 442. 1 unit.
- 447. Banach Spaces.** Geometrical properties of Banach spaces; bounded linear operators; applications to analysis; and linear topological spaces. Prerequisite: Mathematics 442. 1 unit.
- 448. Harmonic Analysis.** Harmonic analysis on the circle, the line, and the integers, i.e., Fourier series and transforms; locally compact Abelian groups; convergence and summability; conjugate functions; Hardy spaces; uniqueness; Tauberian theorems; almost-periodic functions; commutative Banach algebras. Prerequisite: Mathematics 348 and 442; knowledge of Banach spaces. 1 unit.
- 451. Theory of Probability, I.** Same as Statistics 451. Mathematical foundations or probability and stochastic processes; probability measures, random variables, distribution functions, convergence theory, the Central Limit Theorem, conditional expectation, and martingale theory. Prerequisite: Mathematics 442. 1 unit. Credit is not given for both Mathematics 451 and either 481 or 482.
- 452. Theory of Probability, II.** Same as Statistics 452. Continuation of Mathematics 451. Prerequisite: Mathematics 451. 1 unit. Credit is not given for both Mathematics 452 and 482.
- 453. Analytic Theory of Numbers, I.** Problems in number theory treated by methods of analysis; topics chosen from prime number theory, Riemann zeta function, sieve methods, diophantine approximation, metric theory, partitions, lattice points, Waring's problem, and asymptotic properties of arithmetical functions. Prerequisite: Mathematics 317 or 348. 1 unit.
- 454. Analytic Theory of Numbers, II.** Continuation of Mathematics 453. Prerequisite: Mathematics 453. 1 unit. May be repeated.
- 455. Mathematical Methods of Physics.** Introduction to inner product spaces, linear operators, and Schwartz distribution theory; Green's functions for ordinary differential equations; and integral equations: Hilbert-Schmidt theory and Sturm-Liouville theory. Prerequisite: Mathematics 280 and 346. 1 unit.
- 456. Mathematical Methods of Physics.** Calculus of variations: Euler-Lagrange theory, Rayleigh-Ritz method, and Dirichlet principle; integral transform methods and separation of variables; and approximation methods: finite differences, Galerkin's method, and asymptotic expansions. Prerequisite: Mathematics 455 or consent of instructor. 1 unit.

457. **Numerical Solution of Ordinary Differential Equations.** Same as Computer Science 457. See Computer Science 457.
458. **Topics in Numerical Analysis.** Same as Computer Science 458. See Computer Science 458.
459. **Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Nuclear Engineering, Physics and Theoretical and Applied Mechanics 459. An advanced methods course in asymptotic methods, with examples drawn from fluid mechanics, but designed to be mathematically instructive to all students of applied mathematics, engineering, and the physical sciences. Prerequisite: Mathematics 346 or Physics 413; or consent of instructor. 1 unit.
460. **General Relativity and Cosmology.** Same as Astronomy and Physics 424. See Physics 424.
461. **Applied Stochastic Processes.** Same as Statistics 455. Introduction to topics such as spectral analysis, filtering theory, and prediction theory of stationary processes; Markov chains and Markov processes. Prerequisite: Mathematics 346 and 347. 1 unit.
465. **Topics in Automata Theory.** Same as Computer Science 465 and Electrical and Computer Engineering 465. Prerequisite: Consent of instructor. 1 unit.
466. **Topics in Ordinary Differential Equations.** Introduction to current research in such areas as stability and asymptotic behavior of solutions; topological dynamics; numerical methods; and boundary value problems and spectral theory of differential operators. Prerequisite: Consent of instructor. 1 unit.
468. **Topics in Analysis.** Prerequisite: Consent of instructor. 1 unit.
470. **Statistical Decision Functions.** Same as Statistics 470. See Statistics 470.
471. **Multivariate Analysis.** Same as Statistics 471. See Statistics 471.
472. **Special Topics in Actuarial Theory.** Selected topics in advanced actuarial science. Prerequisite: Consent of instructor. 1 unit. May be repeated once for credit.
475. **Topics in Combinatorics.** Same as Computer Science 475. See Computer Science 475.
476. **Coding Theory.** Same as Electrical and Computer Engineering and Computer Science 456. See Electrical and Computer Engineering 456.
477. **Graduation and Demography.** Construction and graduation of mortality and other tables; mathematical aspects of demography, especially measures of mortality and morbidity; and risk theory and reinsurance. Prerequisite: Mathematics 370 and 371. 1 unit.
478. **Topics in Statistics.** Same as Statistics 478. See Statistics 478.
479. **Computational Complexity.** Same as Computer Science 479 and Electrical and Computer Engineering 479. See Electrical and Computer Engineering 479.
480. **Optimization by Vector Space Methods.** Same as Electrical and Computer Engineering 480. Introduction to normed, Banach, and Hilbert spaces; applications of the projection theorem and the Hahn-Banach Theorem to problems of minimum norm, least squares estimation, mathematical programming, and optimal control; the Kuhn-Tucker Theorem and Pontryagin's maximum principle; and introduction to iterative methods. Prerequisite: Mathematics 315 or 383, and Mathematics 347 or consent of instructor. 1 unit.
481. **Probability and Measure, I.** Same as Statistics 453. See Statistics 453.
482. **Probability and Measure, II.** Same as Statistics 454. See Statistics 454.
483. **Optimization in Networks.** Theory and methods for optimization over directed graphs; paths, cuts, flows, and potentials; matchings; PERT and CPM; max flow, min path, out-of-kilter, Hungarian, and other algorithms; nonlinear cost functionals; painting theory; and existence and duality. Prerequisite: Mathematics 242 or 245. 1 unit.
484. **Conjugate Duality and Optimization.** Convex analysis for constrained extremum problems; convex sets, cones, and functions; separation; Fenchel transform; duality correspondences; differential theory; nonlinear programming; sensitivity; and perturbational duality for primal, dual, and Lagrangian problems. Prerequisite: Mathematics 315 and 347, or consent of instructor. 1 unit.
485. **Topics in Optimization.** May be repeated for credit. Prerequisite: Consent of instructor. 1 unit.
486. **Parallel Numerical Algorithms.** Same as Computer Science 454. See Computer Science 454.

- 487. Theory of Approximation.** Same as Computer Science 487. General approximation theory in normed linear spaces; primary emphasis on functions defined on an interval, and periodic functions; existence and uniqueness theorems; characterization of Chebyshev approximants; degree of approximation; interpolation with emphasis on the quality of interpolants as approximants; and use of approximations in computing. Prerequisite: Mathematics 318 and 348, or consent of instructor. 1 unit.
- 488. Topics in Applied Mathematics.** Prerequisite: Consent of instructor. 1 unit.
- 490. Reading Course.** Prerequisite: Consent of instructor. 1 to 2 units.
- 499. Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

MECHANICAL AND INDUSTRIAL ENGINEERING

Head of Department: A. L. Addy

Department Office: 154 Mechanical Engineering Building, 1206 West Green Street, Urbana

Industrial Engineering

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Engineering Economics.** Principles of engineering economy and their applications to manufacturing problems; relevant accounting principles; studies of typical manufacturing processes and their economic factors; and exercises in planning processes for maximum efficiency. Prerequisite: Junior standing in engineering. 3 hours.
- 232. Methods-Time Analysis.** Principles of motion economy affecting the design of a product or service; the effective use of human effort as related to the tools and equipment used in manufacturing and commercial endeavors; reasons for time study and the principles of determining time standards; study of standard data and other specific types of micromotion standards; and applications of all phases of the studies to specific cases. Prerequisite: Industrial Engineering 248 and junior standing. 3 hours.
- 238. Analysis of Data.** Nature of probabilistic models for observed data; discrete and continuous distribution function models; inferences on universe parameters based on sample values; and introduction to control charts, acceptance sampling, and measurement theory. Prerequisite: Completion of basic calculus. 3 hours.
- 248. Human Factors in Human-Machine Systems.** Same as Psychology 258. See Psychology 258.
- 291. Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of industrial engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in industrial engineering; must be taken in Spring Semester. 0 hours.
- 296. Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 297. Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
- 305. Principles of Ergonomics.** Same as Physiology and Kinesiology 305. Concepts and design criteria to achieve optimum mutual adjustment of man and his work; consideration of such topics as static and dynamic forces on the human frame; response to environmental stress (heat, vibration, noise); vigilance and fatigue; and man-machine systems. Prerequisite: Senior standing; consent of instructor. 4 hours or 1 unit.
- 329. Human-Computer Interaction Laboratory.** Same as Psychology 329. See Psychology 329.
- 334. Introduction to Reliability Engineering.** Same as General Engineering 334. An intro-

- duction to concepts in engineering design, testing, and management for highly reliable components and systems. Prerequisite: Industrial Engineering 238 or Mathematics 361, or equivalent with consent of instructor. 3 hours, or $3/4$ or 1 unit.
335. **Industrial Quality Control.** Control charts for attributes and variables; modified control chart techniques; acceptance sampling for attributes and variables; relationship to design, production, and procurement; quality cost analysis; military standards practice; survey and reports of current quality literature; and management of quality programs. Prerequisite: Industrial Engineering 238 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
336. **Design and Analysis of Industrial Experimentation.** Randomized blocks, t-tests, and factorial and fractional factorial designs; concepts of randomization, blocking, screening, and confounding; second-order designs, response surface methodology, and evolutionary operation; and introduction to mechanistic model building and nonlinear estimation. All topics are treated through engineering applications and case studies. Prerequisite: Industrial Engineering 238 or equivalent, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
346. **Human Performance and Engineering Psychology.** Same as Psychology 356. See Psychology 356.
348. **Human Factors in the Design of Complex Systems.** Same as Psychology 398. Principles of design of Human-Machine Systems. Guidelines for the use of human factors databases and source materials. Use of basic research and theories from behavioral science to design human-machine interfaces. Study of parameters of mental workload and their use in predicting required manning levels. Design of standard and emergency operating procedures. Influences of control room personnel organization and management styles as elements of design. Designing to minimize impact of human error and use of reliability theory of the human element in design. Prerequisite: Psychology 258. 3 or 4 hours, or $3/4$ or 1 unit.
350. **Computer-aided Manufacturing Systems.** The application of computer technology and operations research in manufacturing systems; includes the use of minicomputers and microprocessors for direct numeric control of machine tools, adaptive control and optimization, and integrated manufacturing systems, including applications of industrial robots. Prerequisite: Mechanical Engineering 285 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
355. **Numerical Control of Manufacturing Processes.** Study of numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control. Prerequisite: Mechanical Engineering 285 or consent of instructor; background in computer technology. 3 hours, or $3/4$ or 1 unit.
357. **Safety Engineering.** Study of engineering principles applied to industrial accident prevention; safe plant layout; safety in maintenance; boilers and pressure vessels; design and application of machine guards; material handling and storage; hand and power tools; welding hazards; electrical hazards; flammable liquids and fire protection; industrial health engineering; and toxic materials. Prerequisite: Senior standing in engineering or consent of instructor. 3 hours, or $3/4$ or 1 unit.
360. **Analysis of Materials Machining.** An analytical approach to the mechanics and physics of various machining processes; covers the basic phenomena underlying process characteristics, such as wear, plastic flow, surface integrity, friction, and economics. Prerequisite: Mechanical Engineering 231 and 285, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
363. **Facilities Planning and Design.** Reviews the process of facility planning, plant layout design, and materials handling analysis; includes the determination of facilities requirements, site selection, materials flow, use of analytical and computerized techniques, and applications to several areas such as manufacturing, warehousing, and office planning. Prerequisite: Industrial Engineering 238 and 385. 3 hours or $3/4$ unit. Graduate students in industrial engineering may not receive credit for Industrial Engineering 363.
370. **Industrial Engineering Design Laboratory.** Covers basic experiments and computer-based laboratory projects in manufacturing, production planning and facilities management, and human factors, using realistic industrial engineering problem settings; stresses the development of objectives and evaluation criteria as well as methods for design synthesis, analysis, and testing. Prerequisite: Credit or concurrent registration in all

required courses in the industrial engineering curriculum which carry the IE designation. 3 hours or $\frac{3}{4}$ unit.

- 373. Production Planning and Control.** Examines the scope of production systems, and the activities involved in their design, establishment, management, operation, and maintenance; mathematical and computer models for planning and control of facilities, human resources, projects, products, material, and information in production systems. Prerequisite: Industrial Engineering 203 and 385. 3 hours or $\frac{3}{4}$ unit. Graduate students in industrial engineering may not receive credit for Industrial Engineering 373.
- 385. Operations Research, I.** A first course in operations research techniques and their application to systems analysis and design; includes linear programming, linear models, simplex method, transportation methods, assignment algorithms, sensitivity analysis, dynamic programming, and introduction to inventory and queueing theory. May not be used toward fulfillment of the M.S. in industrial engineering degree requirements nor toward the Ph.D. in mechanical engineering degree requirements for industrial engineering majors. Prerequisite: Completion of basic calculus; junior standing. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 386. Operations Research, II.** Continuation of Industrial Engineering 385; includes advanced linear programming, matrix forms, revised simplex method, bounded variables, primal-dual methods, parametric programming, integer programming, stochastic processes, queues, inventories, maintenance, simulation, and modeling; and emphasizes model building and treatment of uncertainty. Prerequisite: Industrial Engineering 238 and 385, or equivalent. 3 or 4 hours, or $\frac{3}{4}$ or 1 unit.
- 389. Optimization of Large-Scale Linear Systems.** Practical methods of optimization of large-scale linear systems including extreme point algorithms, duality theory, parametric linear programming, generalized upper bounding technique, price-directive and resource-directive decomposition techniques, Lagrangean duality, Karmarkar's algorithm, applications in engineering systems, and use of state-of-the-art computer codes. Prerequisite: Math 315 and either Math 383 or Industrial Engineering 385, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 393. Special Problems.** Study of advanced problems related to industrial engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $\frac{1}{2}$ to 1 unit.
- 401. Mathematical Programming, I: Applied Nonlinear Programming.** Optimization of nonlinear systems, including a survey of classical methods and concepts such as the Lagrangian method, the Jacobian method, and Kuhn-Tucker conditions; emphasizes modern algorithms, numerical methods for digital computers, applications in engineering design, and use of state-of-the-art computer codes. Prerequisite: Industrial Engineering 385 or equivalent, or consent of instructor. 1 unit.
- 402. Mathematical Programming, II: Dynamic and Geometric Programming.** The formulation and construction of dynamic programming models and advanced dynamic programming concepts such as treatment of multistate variables, nonserial systems, and Markov processes; geometric programming, including treatment of degree of difficulty, mixed signs, and computational refinements; and emphasis on applications in engineering design. Prerequisite: Statistics 310 and Industrial Engineering 385, or equivalent; or consent of instructor. 1 unit.
- 403. Integer Programming.** Optimization of linear systems involving integer variables and discrete alternatives. Covers: modeling; computational complexity; matroids; branch and bound methods; Langrangean and Surrogate duality; cutting plane methods and polyhedral theory; and special structured problems such as knapsack, set packing and covering, Traveling Salesman, etc. Prerequisite: Industrial Engineering 389 or Mathematics 382 or equivalent; or consent of instructor. 1 unit.
- 416. Systems Analysis, I: Systems Methodology and Network Techniques.** Same as Civil Engineering 416. Basic concepts, theories, and techniques of systems analysis, including modeling of large scale systems, forecasting, planning, control, and information handling; emphasizes the modeling of systems with network techniques, including distance, flow, and project networks; and discusses advanced network topics such as out-of-kilter algorithm and project resource analysis. Prerequisite: Industrial Engineering 373 or Civil Engineering 292, or equivalent, or consent of instructor. 1 unit.

- 417. Systems Analysis, II: Digital Simulation.** Same as Civil Engineering 417. The application of simulation techniques to systems analysis; includes modeling for simulation, design of simulation experiments, random number generation, process generation, simulation of queueing systems, inventory systems, and project networks, analysis of simulation results, and some digital simulation languages and programs in use. Emphasis on objected-oriented C++. Prerequisite: Industrial Engineering 385 or Civil Engineering 293, and some exposure to computer programming. 1 unit.
- 440. Analysis, Modeling, and Design of Man-Machine Systems.** Input-output models of man as an information processor, controller, and decision maker are critically evaluated and applied to the analysis and design of specific man-machine systems. Intended for graduate students working in areas of man-machine systems, engineering psychology, control systems, or operations research. Prerequisite: Mechanical Engineering 240 and Industrial Engineering 238, or equivalent and consent of instructor. 1 unit.
- 442. Skill, Expertise, and Mental Models in Complex Systems.** Same as Psychology 442. Examines how human expertise develops, particularly in the context of complex industrial systems and various types of professional practice (diagnosis, decision-making, etc.). Topics include: cognitive skill acquisition; how expert knowledge is mentally represented; different knowledge elicitation techniques; and ways of supporting the human expert at work, such as decision support systems and expert systems. Prerequisite: At least two of Psychology 258, Psychology 356, Psychology 329, Psychology 224, Psychology 248, and Psychology 324; or consent of instructor. 1 unit.
- 455. Accuracy, Dynamics and Control of Machining Systems.** This course addresses the problem of modeling machining processes and machine tools. Emphasis is on mechanistic modeling of machining processes, machine-tool errors, characterization of machined surfaces, machine-tool system dynamics and stability and topics in motion control. Prerequisites: Mechanical Engineering 240 or equivalent course in dynamics and controls; and Industrial Engineering 360 and graduate standing, or consent of instructor. 1 unit.
- 458. Laboratory Investigations in Industrial Engineering.** Special investigations of such problems as optimization of operations, programming systems, work standards, plant layout, and flow of materials. Prerequisite: Consent of instructor. $1/2$ to $1\frac{1}{2}$ units.

Mechanical Engineering

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 205. Thermodynamics.** Introduction to classical thermodynamics through the second law; system and control volume analyses of thermodynamic processes; irreversibility and availability; relations for ideal gas mixtures. Prerequisite: Mathematics 242 or 245; Physics 107. 3 hours.
- 209. Thermodynamics and Heat Transfer.** Thermodynamic analysis of energy transfer and transformation; properties of simple working substances; analysis of open and closed systems, direct and reversed cycles, and processes involving transfers of mass and energy; and basic laws of heat transfer. Prerequisite: Physics 107 and Mathematics 242; or equivalent. 3 hours.
- 211. Introductory Gas Dynamics.** Introduction to dynamics; special emphasis on the theory and engineering applications of compressible high velocity flows. Prerequisite: Mathematics 285, Physics 107, Theoretical and Applied Mechanics 154, and credit or concurrent registration in Mechanical Engineering 205. 3 hours.
- 213. Heat Transfer.** Principles and application of heat transfer by conduction, convection, and thermal radiation. Prerequisite: Mechanical Engineering 211. 3 hours.
- 220. Mechanics of Machinery.** Fundamentals of linkages, design of cams, kinematics of gearing, analysis of gear trains, velocity, acceleration and force analysis of systems of rigid bodies, and balance of rigid rotors and reciprocating machinery. Prerequisite: Engineering mechanics (statics and dynamics) and Computer Science 101. 3 hours.
- 231. Processing and Structure of Materials.** Atomic and microscopic structure of materials as the basis for their properties; processing to both shape materials and control their

- structure; chemical bonding, crystal defects, forming processes, phases and phase change, heat treatment, solidification processing; metals, polymers, composites, ceramics. Prerequisite: Theoretical and Applied Mechanics 221; either Mechanical Engineering 209 or credit or concurrent registration in Mechanical Engineering 213. 4 hours.
232. **Behavior of Materials in Service.** Introduction to material response to stress, cyclic load, impact, high temperature, corrosive and abrasive conditions; selection of materials for specified service conditions; characteristics of major material classes; projects and case studies; microstructural dependence of performance characteristics. Prerequisite: Mechanical Engineering 231. 2 hours.
240. **Modeling and Analysis of Dynamic Systems.** Dynamic analysis of mechanical systems; modeling of mechanical components and systems; analysis of single and multiple degree of freedom linear systems; simulation of nonlinear systems; introduction to continuous systems and lumping techniques; and introduction to feedback control systems. Prerequisite: Mathematics 285 and Theoretical and Applied Mechanics 154. 4 hours. Credit is not given for both Mechanical Engineering 240 and General Engineering 222.
250. **Thermal Science Laboratory.** Basic experiments in thermodynamics, gas dynamics, and heat transfer and their applications; experiments selected to introduce pertinent instrumentation and experimental techniques, and to further the understanding of fundamentals via physical observations. Prerequisite: Mechanical Engineering 205 and 213, and credit or concurrent registration in Mechanical Engineering 304. 3 hours.
261. **Introduction to Instrumentation, Measurement, and Control Fundamentals.** Basic elements of a measurement system; recording instruments, transducers, and signal conditioning; and data recording and controls, analog and digital devices and control. Prerequisite: Electrical and Computer Engineering 270. 3 hours.
270. **Analysis and Design of Machines.** Applications of mathematics, material science, and engineering mechanics to problems in analysis and design of machine components; considers function, production, and economic factors of design; and includes fasteners, springs, gearing, bearings, shafting, clutches, and lubrication. Prerequisite: Mechanical Engineering 220 and Theoretical and Applied Mechanics 221. 4 hours.
275. **Creativity in Engineering Design.** Study of engineering systems to show the creative use of scientific principles and design procedures; survey of natural laws and examples of their creative application; and introduction to methods for promoting creativity in engineering. Prerequisite: Mechanical Engineering 270. 3 hours.
280. **Senior Mechanical Design.** The creative process and inductive reasoning in engineering design; emphasizes alternative solutions by considering open-ended problems; considers realistic constraints as part of the design process. Prerequisite: Senior standing in Mechanical Engineering. 3 hours.
285. **Analysis of Manufacturing Processes.** Introduction to materials processing methods, including chip formation and deformation processes; analysis of process performance, including forces and energy, surface roughness, tool wear and tool life, and dimension precision; machine tool dynamics and vibrations, process planning, and optimization; nontraditional machining processes; introduction to numerical control of machine tools; and polymer processing and the use of various materials including plastics. Prerequisite: Credit or concurrent registration in Mechanical Engineering 231, or equivalent. 3 hours.
291. **Seminar.** A series of lectures by faculty and invited authorities from the profession concerning the ethics and practices of mechanical engineering in their relationship to other fields of engineering, economics, and the problems of society. Prerequisite: Junior standing in mechanical engineering; must be taken in Spring Semester. 0 hours.
293. **Special Projects.** Experimental and analytical investigation in mechanical engineering research. Prerequisite: Senior standing in mechanical engineering; consent of head of department. 1 to 3 hours. May be repeated; students may register for two different topics in the same semester.
296. **Honors Project.** Special project or reading course for James Scholars in engineering. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.
297. **Honors Seminar.** Special lecture sequence and/or discussion groups arranged each semester to bring James Scholars in engineering into direct contact with the various

aspects of engineering practice and philosophy. Prerequisite: James Scholar in engineering; consent of instructor. 1 to 4 hours.

301. **Intermediate Thermodynamics.** Basic considerations of the three laws of thermodynamics; elementary statistical principles for the prediction of properties of pure substances and mixtures; transport properties; electric, magnetic, and chemical processes. Prerequisite: Mechanical Engineering 205 or first course in thermodynamics. 3 hours, or $\frac{3}{4}$ or 1 unit.
302. **Nuclear Power Engineering.** Same as Nuclear Engineering 302. See Nuclear Engineering 302.
303. **Applied Combustion.** Applies thermodynamics, heat transfer, and chemical reaction rate concepts to combustion and combustion devices; discusses basic combustion phenomena and practical combustion systems, including gas turbine combustor, coal furnaces, and rocket motors. Prerequisite: Mechanical Engineering 213 and 304. 3 hours, or $\frac{3}{4}$ or 1 unit.
304. **Energy Conversion Systems.** Analyzes processes and systems for energy conversion, including power and refrigeration cycles, air conditioning, thermoelectrics, and fuel cells. Prerequisite: Mechanical Engineering 205 or 209; or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May not be taken for credit by graduate students in mechanical engineering.
305. **Intermediate Gas Dynamics.** Solution of internal compressible flow problems by one-dimensional techniques, both steady and unsteady; considers flows with area change (smooth and abrupt), with friction, with heat addition, and with mass addition. Examines flows with weak and strong waves, multiple confined streams, and shock waves. Prerequisite: Mechanical Engineering 205 and 211, or first course in fluid mechanics. 4 hours or 1 unit.
306. **Intermediate Heat Transfer.** Conduction heat transfer, radiation heat transfer, mass transfer, phase change, heat exchangers, and introductory numerical methods. Prerequisite: Undergraduate courses in fluid mechanics and heat transfer, or consent of instructor. 4 hours or 1 unit.
307. **Solar Energy Utilization.** Emphasizes solar thermal processes; considers basic sun-earth geometry, the optics of solar energy collectors, and associated heat transfer mechanisms in detail; and includes flat plate collectors, concentrating collectors, energy storage, modeling and system simulation, and economics. Prerequisite: Mechanical Engineering 213 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
308. **Fluid Mechanics of Convective Heat Transfer.** Same as Theoretical and Applied Mechanics 308. Analyzes viscous flows and heat transfer by convection processes; solution to Navier-Stokes equations for heat conducting laminar and turbulent shear layers; similarity concepts; thermal entry-lengths pipe flows; computer solution techniques. Prerequisite: Mechanical Engineering 211 or first course in fluid mechanics. 4 hours or 1 unit.
312. **Modern Control Theory.** The concept of state; state-space representation of systems; transfer function decomposition and state-variable diagrams; state response of continuous and discrete-data systems; determination of the transition matrix; diagonalization; state response of time-varying systems; controllability and observability; stability and Lyapunov's method; and introduction to optimization and design. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 4 hours or 1 unit.
313. **Computer Control of Mechanical Engineering Systems.** Examines microcomputer control of thermal and mechanical systems: sensing and transducing of variables, transmitting and converting signals, and actuating regulators associated with mechanical engineering systems. Prerequisite: Mechanical Engineering 261 or Agricultural Engineering 311. 3 hours, or $\frac{3}{4}$ or 1 unit.
314. **Introduction to Tribology.** Basic concepts of friction and wear; lubricants and their application; hydrodynamic bearing theory; lubrication requirements and methods; externally pressurized bearings; gas bearings; dynamics and stability of bearings systems; elastohydrodynamic lubrication of rolling element bearings and gears; numerical approaches to lubrication problems. Prerequisite: Mechanical Engineering 211 or equivalent; or consent of instructor. 4 hours or 1 unit.

- 315. Tribology.** Surface interactions; fundamentals of contact mechanics; friction theories; types and measurement of wear; response of materials to surface tractions; plastic deformation; void and crack nucleation; crack propagation; delamination wear; microstructural effects in wear process; mechanics of coated surfaces; solid film and boundary liquid film lubrication; friction and wear of polymers and fiber-reinforced polymeric composites; introduction to metal cutting and tool wear; novel methods of improving tribological behavior of sliding surfaces. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 321. Refrigeration and Cryogenics.** The theory of operation and the design of equipment for the production of low temperatures from below ambient down to near absolute zero; applications to industrial, consumer, aerospace, medical, and various research uses. Prerequisite: Mechanical Engineering 205, 211, and 213, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 323. Design of Thermal Systems.** Selection of components in fluid- and energy-processing systems to meet system performance requirements; computer-aided design; system simulation; optimization techniques; and investment economics and statistical combinations of operating conditions. Prerequisite: Credit or concurrent registration in Mechanical Engineering 213. 3 hours, or $3/4$ or 1 unit.
- 331. Internal Combustion Engines.** Study of the fundamental principles underlying the theory and analysis of reciprocating internal combustion engines, fuels, carburetion, combustion, exhaust emissions, detonation, fuel injection, and factors affecting performance; basic laboratory work involving measurements of effects of variables on performance. Prerequisite: Credit or concurrent registration in Mechanical Engineering 304 or Agricultural Engineering 346, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 332. Theory of Internal Combustion Engines.** Analysis of internal combustion engines, including thermodynamics, combustion and effects of mixtures, chemical equilibrium and dissociation, exhaust emissions and air pollution, flow through valves, breathing, supercharging and turbocharging, lubrication, friction, and combustion chamber design. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 3 hours or 1 unit.
- 335. Power Systems Engineering and Economy.** Application of thermodynamic principles and fluid flow and heat transfer processes to power systems; determination of system characteristics and methods to satisfy these requirements with awareness of economic factors and ecological considerations. Prerequisite: Mechanical Engineering 211, 213, and credit or concurrent registration in Mechanical Engineering 304; or equivalent. 3 hours, or $3/4$ or 1 unit.
- 336. Automotive Vehicle Dynamics.** Introduction to the dynamics and control of automotive multidegree of freedom systems; the development and solution of governing equations for both steady state and transient conditions by computer simulation techniques; investigation of the performance, handling, and safety aspects of vehicles and their interaction with external and internal interfaces; examination of the influence of tires, suspension, steering, and aerodynamic forces; and laboratory experiments and demonstrations. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 or 4 hours, or $3/4$ or 1 unit.
- 341. Engineering Analysis and Design.** Correlation of previously acquired design experience with the creative problem of synthesis and analysis that depend upon design judgment. Prerequisite: Mechanical Engineering 270 or senior standing, or consent of instructor. 3 hours or $3/4$ unit.
- 342. Kinematic Analysis and Synthesis.** Geometry of constrained motion; application of mathematical and other techniques to the kinematic analysis and synthesis of mechanisms. Prerequisite: Undergraduate course in kinematics and senior standing, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 345. Introduction to Finite Element Analysis.** Applies the finite element method to solve problems from various branches of mechanical engineering; topics include stress analysis, vibration, heat transfer, and fluid flow. Prerequisite: Computer Science 101, Mechanical Engineering 213, and Theoretical and Applied Mechanics 221. 3 hours or $3/4$ unit. Credit

is not given for more than one of the following: Aeronautical and Astronautical Engineering 320, Civil Engineering 361, and Mechanical Engineering 345.

- 346. Materials and Design.** Examines the relationship of material properties and mechanics concepts to the design of structures and components; topics include a brief introduction to elasticity, plasticity, viscoelasticity, creep, fatigue, and fracture as they relate to materials selection and design. Prerequisite: Theoretical and Applied Mechanics 221, Mechanical Engineering 232, or Theoretical and Applied Mechanics 224; or consent of instructor. 3 hours or $3/4$ unit.
- 347. Failure Prevention and Reliability of Mechanical Components.** Mechanisms of material deterioration in service, root cause analysis with applications to design, reliability, and residual life assessments; applications of fault tree analysis, Weibull analysis, cause-consequence diagrams to identification of errors and defects in design and production; discussion of probabilistic structural mechanics and its relationship to reliability; human error analysis, reliability of inspection techniques, quality assurance. Prerequisite: Mechanical Engineering 231, 232, and 270. 3 hours, or $3/4$ or 1 unit.
- 355. Polymer Processing.** Analyzes polymer processing operations from engineering fundamentals; fluid and heat flow of non-Newtonian fluids; relationship of processing to material structure and properties; considers conventional processes, such as extrusion and injection molding; uses computer-aided design techniques; synthesis of new processes. Prerequisite: Mechanical Engineering 213 and 231, or consent of instructor. 3 hours or $3/4$ unit.
- 357. Introduction to Laser Materials Processing.** Examines the application of lasers in materials processing: laser/material interaction mechanisms, laser optics, welding, surface alloying, cladding, chemical vapor deposition, heat treatment, cutting and surface glazing processes, mathematical modeling of processes, microstructure and mechanical properties of processed materials, and correlation of process parameters and properties through transport phenomena modeling. Prerequisite: Mechanical Engineering 231 or equivalent, or consent of instructor. 4 hours or 1 unit.
- 375. Introduction to Bionics.** Biological concepts and data aiding in the solution of engineering problems; analysis of mechanisms found in living systems and their application to the design of mechanical devices. Prerequisite: Mechanical Engineering 270 or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 388. Industrial Control Systems.** The study of industrial control techniques by case studies of actual industrial systems; provides competence in the design, selection, and maintenance of industrial control systems; and introduces applications to electromechanical, pneumatic, thermal, and hydraulic systems. Prerequisite: Mechanical Engineering 240 or equivalent, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
- 389. Solidification Processing.** Fundamentals of control of shape, structure, and properties of metals in casting processes; relationships between processing conditions and microstructure and introduction to simulation of processes; examples of processes considered: foundry-, die-, continuous casting, and rapid solidification processes. Prerequisite: Mechanical Engineering 231. 3 hours, or $3/4$ or 1 unit.
- 393. Special Problems.** Study of advanced problems related to mechanical engineering. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours, or $1/2$ to 1 unit.
- 401. Thermodynamics and Transport Properties.** Thermodynamic and microscopic considerations for the prediction of properties; caratheodory principle; relations among properties; microscopic considerations and statistical methods; thermodynamic and transport properties; and fluctuation and nonequilibrium thermodynamics. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.
- 402. Nonequilibrium Multiphase Processes.** Dynamics and thermodynamics of multiphase and multicomponent systems with special relevance to air pollution control and energy conversion; relaxation phenomena; general motion of systems of disparate elemental masses; diffusion in gravitational and electric fields, and boundary layer motion with mass transport; dispersion and collection of particulate matter; and transport with surface reactions. Prerequisite: Mechanical Engineering 301 or consent of instructor. 1 unit.

- 403. Fundamentals of Combustion.** Same as Aeronautical and Astronautical Engineering 438. See Aeronautical and Astronautical Engineering 438.
- 404. Gas Dynamics, I.** Introduction to theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Prerequisite: Mechanical Engineering 305 or equivalent, or consent of instructor. 1 unit.
- 405. Convective Heat Transfer.** Fundamentals of convective heat transfer; calculation of heat transfer within conductor and over submerged objects for laminar and turbulent flow; natural convection; film condensation and boiling; and liquid metals. Prerequisite: Mechanical Engineering 308 or consent of instructor. 1 unit.
- 406. Heat Conduction.** Fundamentals of heat conduction in isotropic and anisotropic materials; methods of solution to steady and transient heat conduction problems in one, two, and three dimensions; internal heat sources; periodic flow of heat; problems involving phase change; approximate analytical techniques; numerical methods; study of current articles on the subject. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
- 409. Laboratory Investigations in Mechanical Engineering.** Special investigation in flow, metering, heat transfer, and heat exchanger performance and design. Prerequisite: Courses in thermodynamics and fluid mechanics. $1/2$ to $1\frac{1}{2}$ units.
- 410. Thermal Radiation.** Fundamentals of radiant energy transport in absorbing and nonabsorbing media; pyrometry; and applications to selected problems involving combined energy transport mechanisms. Prerequisite: Mechanical Engineering 306 or consent of instructor. 1 unit.
- 411. Control of Air Pollution from Stationary Sources.** Same as Civil Engineering 448. See Civil Engineering 448.
- 412. Techniques and Instrumentation in Air Sampling.** Same as Civil Engineering 449 and Environmental Studies 449. See Civil Engineering 449.
- 423. Thermal Systems.** Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: Mechanical Engineering 323. 1 unit.
- 433. Gas Turbine Engines.** Comprehensive description of gas turbine theory and technology; aerothermodynamics of inlet, compressor, combustor, turbine, and nozzle flows; optimization of performance; and applications to aircraft engines and stationary gas turbine power plants. Prerequisite: Mechanical Engineering 305 or equivalent. 1 unit.
- 443. Dynamics of Machinery.** Examines generalized equations of motion for single-degree-of-freedom mechanisms; modeling of mechanical systems; dynamics of flexible cam systems; dynamics of rotor systems; dynamics of clutches and brakes; isolation of mechanical vibration and impact; introduction to impact; balancing of machines. Prerequisite: Theoretical and Applied Mechanics 311 or equivalent; consent of instructor. 1 unit.
- 445. Design of Internal Combustion Engines.** Comprehensive study of the design of internal combustion engines, including gas forces, inertia loads, bearing analysis, torsional vibration, balance, lubrication, valve and cam design, and stress analysis of major parts of the engine. Prerequisite: Mechanical Engineering 331 or equivalent, or consent of instructor. 1 unit.
- 452. Solidification Processing.** Same as Materials Science and Engineering and Metallurgical Engineering 452. Principles of control of structure, properties, and shape in processes involving liquid/solid transformations; stresses heat flow, mass transport, solute redistribution, nucleation and growth kinetics; and the relationship between process variables and structures and properties in the resultant material. Examples are drawn from existing commercial and new developing processes. Prerequisite: Mechanical Engineering 389 or consent of instructor. 1 unit.
- 455. Polymer Rheology and Processing.** Continuum models for non-Newtonian fluids: generalized Newtonian, linear viscoelastic and nonlinear viscoelastic models; examines relationship of rheology to processing; considers advanced problems in polymer processing such as numerical simulations of nonisothermal non-Newtonian flows, reactive processing and processing of composites. Prerequisite: Mechanical Engineering 355 or consent of instructor. 1 unit.

- 456. Fatigue Analysis.** Examines fatigue analysis methods for the design of structures and components; includes stress life, strain life, and crack propagation approaches; considers multiaxial and high temperature fatigue; emphasis is placed on the interrelationship between material properties, geometry, and design methodology appropriate for the wide range of mechanical engineering components. Prerequisite: Mechanical Engineering 346 or consent of instructor. 1 unit.
- 457. Inelastic Design Methods.** Principles of material deformation under combined and thermal loading; constitutive equation applications in engineering design and in inelastic finite element methods; material and structural degradation under fatigue and creep conditions. Prerequisite: Mechanical Engineering 345 and 346, or consent of instructor. 1 unit.
- 458. Fracture Resistant Design.** Application of fracture mechanics and microstructural behavior to material selection for design; practical approximation of linear and inelastic fracture parameters for evaluation of complex components; destructive and nondestructive tests for control of toughness in manufacture; residual life assessment involving time dependent fracture (creep, fatigue, stress, corrosion); case study and design project oriented. Prerequisite: Mechanical Engineering 346 or consent of instructor. 1 unit.
- 468. Modeling and Control of Electro-Mechanical Systems.** Same as Electrical and Computer Engineering 468. See Electrical and Computer Engineering 468.
- 493. Seminar.** Required of all graduate students each semester with the exception of doctoral candidates who have passed their preliminary examination. Presentation and discussion of significant developments in mechanical engineering. 0 units.
- 497. Special Problems in Mechanical Engineering.** Lectures, seminars, and individual investigations or studies in selected areas of mechanical engineering. Prerequisite: Consent of instructor. 0 to 1 unit. May be repeated.
- 499. Thesis Research.** 0 to 4 units.

MEDICAL SCIENCES

Associate Dean of College of Medicine: William E. Sorlie

College Office: 190 Medical Sciences Building, 506 South Mathews Avenue, Urbana

- 300. Medical Sciences.** First-year program in preparation for the M.D. degree involving guided study of gross anatomy, behavioral science, biochemistry, genetics, immunology, microbiology, neuroscience, embryology, histology, introduction to human disease, nutrition, medical statistics, and physiology. Elements of clinical experience are monitored and presented by faculty in the clinical and basic medical sciences. Prerequisite: Enrollment is limited to students accepted by the College of Medicine. 19 hours (summer session, 9 hours).
- 301. Medical Sciences and Preclinical Medicine.** Second-year program in preparation for the M.D. degree involving classroom and clinical instruction in skills required for acquisition of clinical data base: history and physical diagnosis, principals of diagnostic medical imaging, epidemiology, clinical microbiology, clinical laboratory sciences, clinical tutorials, pathology and pharmacology; and pathophysiological bases of clinical problems. Faculty present and monitor learning experiences, which include lecture/discussion, clinical tutorials, and supervised clinical experiences. Prerequisite: Limited to second-year students in the College of Medicine. 19 hours (summer session, 9 hours).
- 302. Supervised Medical Practice.** Third year of preparation for the M.D. degree. Students rotate among affiliated hospitals in internal medicine, surgery, obstetrics and gynecology, psychiatry, pediatrics, and other fields and are assigned to patient care teams. Clinical faculty supervise the student experience. Increases students' understanding of the pathophysiological basis of patient problems and teaches patient management skills. Prerequisite: Third-year standing in the College of Medicine. 19 hours (summer session, 9 hours).

- 303. Medical Electives.** Fourth year of preparation for the M.D. degree. With approval and guidance of their faculty adviser, students select a program of elective courses which will enhance their clinical skills. These elective courses may be in medicine, surgery, obstetrics and gynecology, pediatrics, family practice, urology, dermatology, basic science or clinical research, and other fields. A required course, Medicine and Society, is also presented. Prerequisite: Fourth-year standing in the College of Medicine. 0 or 19 hours (summer session, 0 or 9 hours).
- 374. General Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Veterinary Pathobiology 374. See Health and Safety Studies 374.
- 461. Advanced Clinical Nutrition, I.** Same as Nutritional Sciences 461. See Nutritional Sciences 461.
- 462. Advanced Clinical Nutrition, II.** Same as Nutritional Sciences 462. See Nutritional Sciences 462.
- 463. Statistical Techniques in Epidemiological Research.** Same as Health and Safety Studies 427, Environmental Studies 427, and Veterinary Pathobiology 426. See Health and Safety Studies 427.

METALLURGICAL ENGINEERING

(See Materials Science and Engineering)

MICROBIOLOGY

Head of Department: Charles G. Miller

Department Office: 131 Burrill Hall, 407 South Goodwin Avenue, Urbana

- 100. Introductory Microbiology.** Introduction to the principal activities and properties of microorganisms, including bacteria, yeasts, molds, and viruses; consideration of the role of natural processes, such as photosynthesis; and man's use and control of microorganisms in the production of antibodies and vaccines in industrial fermentations, in sanitation and public health, and in agriculture. There are no prerequisites for Microbiology 100, but some chemistry is recommended. 3 hours. Credit is not given for both Microbiology 100 and 200.
- 101. Introductory Experimental Microbiology.** Laboratory introduction to the techniques employed in the investigation of microbial activities and properties; experiments designed to familiarize the student with the handling, identification, and characterization of microorganisms and their activities, particularly those of interest to man. Prerequisite: Credit or concurrent registration in Microbiology 100. 2 hours. Credit is not given for both Microbiology 101 and 201.
- 200. Microbiology.** Emphasizes fundamental concepts of microbiology, including nutrition, ecology, physiology, genetics and molecular biology of microorganisms, and their role in nature and in infection and immunity. Prerequisite: Credit or concurrent registration in organic chemistry. 3 hours. Credit is not given for both Microbiology 200 and 100. (Counts for advanced hours in LAS.)
- 201. Experimental Microbiology.** Laboratory emphasizing the fundamentals of microbiology. Topics include growth, isolation, and identification of bacteria; restriction endonuclease analysis of DNA, genetic cloning, and gene transfer. Computer methods are used for the identification of microorganisms and for the analysis of recombinant DNA molecules. Prerequisite: Credit or concurrent registration in Microbiology 200. 3 to 5 hours. Credit is not given for both Microbiology 201 and 101. (Counts for advanced hours in LAS.)
- 290. Research and Special Problems.** Prerequisite: Fifteen hours of microbiology; consent of

instructor. 3 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.

292. **Senior Thesis.** Research under the direction of a senior staff member in microbiology. Normally, the student takes two semesters of Microbiology 292 in the senior year. Recommended for all those planning future research and graduate study; prerequisite for graduation with distinction in microbiology. In the semester preceding initial enrollment, interested students should consult with their advisers concerning the procedures for enrollment. A minimum of 2 hours per senior semester is required, and a thesis must be presented for credit to be received, but graduation with distinction is not an automatic result of enrollment in Microbiology 292. Prerequisite: Consent of senior thesis adviser. 2 to 6 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
309. **Biochemical Basis of Microbial Diversity.** Examines the biochemical ecology of diverse microbial groups with emphasis on anaerobic systems. Prerequisite: Biochemistry 350 or equivalent. 3 hours or $\frac{3}{4}$ unit.
311. **Food and Industrial Microbiology.** Same as Food Science 311. See Food Science 311.
312. **Techniques of Applied Microbiology.** Consideration, through experimentation, of properties of bacteria, yeasts, molds, and actinomycetes important to industrial processes; exploration of methods of control of microbial processes in industry and sanitation. Prerequisite: Credit or concurrent registration in Microbiology 311, and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
313. **Genetics of Industrially Important Microorganisms.** Laboratory techniques of genetics and molecular biology as applied to the improvement of industrially important organisms; emphasis on streptomycetes and eucaryotic microorganisms (yeast, *Aspergillus*, and *Neurospora*). Prerequisite: Biology 122 or 210, and Microbiology 200 and 201. 4 hours or 1 unit.
316. **Genetic Analysis of Microorganisms.** Prokaryotic and eucaryotic microbial genetic systems; emphasis on typical data analyses, together with the basic classes of genetic phenomena. Prerequisite: General genetics, Microbiology 200, or Microbiology 330. 3 hours or $\frac{3}{4}$ unit.
317. **Experimental Techniques in Molecular Genetics.** Laboratory emphasizing current molecular genetics techniques in bacteria. Topics include genetic techniques, use of transposons, genetic regulation, nucleic acid hybridization, restriction endonuclease mapping, cloning, and DNA sequencing. Prerequisite: Microbiology 201, and credit or concurrent registration in Microbiology 316 or 330; consent of instructor. 5 hours or 1 unit.
319. **Yeast Cell Biology.** Emphasis on fundamental problems in eukaryotic cell biology with yeast as the focal organism. Topics include: chromosome structure, regulation, mRNA splicing, cell cycle, growth control, organelle biogenesis, and secretion. Prerequisite: Microbiology 200 or Cell and Structural Biology 213; and Biology 122 or 210; and credit or concurrent registration in a biochemistry course. 3 hours or $\frac{3}{4}$ unit.
326. **Biology of Bacterial Pathogens.** Emphasizes prokaryotes that cause important diseases in humans and other animals; host-parasite bacteriology; and chemistry and genetics of mechanisms of pathogenesis. Prerequisite: Microbiology 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
327. **Immunochemistry.** Study of the field of immunology with emphasis on the chemistry of the proteins and cells involved in the immune response. Lectures and laboratory. Prerequisite: Credit or concurrent registration in a biochemistry course, and consent of instructor. 5 hours or 1 unit.
328. **Properties of Bacterial Pathogens.** Laboratory study of methods of recognition and differentiation, diagnostic tests, and mechanisms of pathogenesis; students are voluntary donors of microorganisms used in experiments. Prerequisite: Microbiology 101 or 201;

credit or concurrent registration in Microbiology 326 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.

330. **Molecular Biology of Microorganisms.** Modern contributions to the science of microbiology; emphasizes the structure, function, and synthesis of informational macromolecules and on the role microorganisms have played in molecular biology. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in a biochemistry course. 3 hours or $\frac{3}{4}$ unit.
331. **Microbial Physiology.** Examines bacterial physiology, including discussions of energetics, regulation of metabolism, and cell structure. Prerequisite: Microbiology 200 or equivalent; credit or concurrent registration in a biochemistry course. 3 hours or $\frac{3}{4}$ unit.
332. **Genetic Toxicology.** Same as Agronomy and Environmental Studies 332. See Environmental Studies 332.
340. **Computing in Molecular Biology.** An examination of computational aspects of biology with an emphasis on the relationships between biological questions and their recastings as mathematical or logical problems. Topics are drawn from biochemistry, genetics, molecular sequence analysis, and molecular structure. Prerequisite: Three semesters of college-level biology and calculus (Mathematics 120, 131, 134 or 135); or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
351. **Viruses.** Same as Plant Biology 351. Introduces the molecular basis of virus structure, replication, genetics, infection, and virus-host interactions; discusses also animal viruses as agents of disease and their role in epidemics and persistent infections. Prerequisite: Credit or concurrent registration in Microbiology 330 or Biochemistry 350; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
405. **Molecular Genetics: Gene Action.** Structure, synthesis, and function of molecules and organelles concerned with the intracellular transmission of genetic information (including gene regulation, transcription, and translation). Prerequisite: Microbiology 316 or 330, and a biochemistry course; or consent of instructor. $\frac{3}{4}$ unit.
411. **Molecular Biology of Microbe-Plant Interactions.** Same as Plant Pathology 411. See Plant Pathology 411.
412. **Advances in Microbiology.** Discussions of current research in the following areas of microbiology: (a) general microbiology; (b) microbial physiology and metabolism; (c) immunochemistry; and (d) molecular genetics. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
419. **Animal Virology.** Same as Veterinary Pathobiology 419. See Veterinary Pathobiology 419.
446. **Bacterial Energetics.** Same as Biophysics 446. See Biophysics 446.
485. **Topics in Microbiology and Molecular Biology.** Discussions, reviews, and appraisal of special topics in microbiology and molecular biology; seminar or lecture. Topics do not repeat. Prerequisite: Consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 2 units.
490. **Individual Problems.** Prerequisite: Consent of instructor. $\frac{1}{2}$ to 4 units.
491. **Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. First seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 492. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
492. **Experimental Methods.** Laboratory research methods; familiarization of first-year graduate students with experimental methods used for research in microbiology. Required of all first-year students majoring in microbiology. Second seven weeks of each semester. Prerequisite: First-year graduate status and consent of department; concurrent registration in Microbiology 491. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
495. **Seminar.** Required of all graduate students whose major is microbiology. Prerequisite: 10 hours of microbiology; consent of instructor. 0 or $\frac{1}{4}$ unit.
499. **Thesis Research.** 0 to 4 units.

MILITARY SCIENCE

Head of Department: Denton R. Brown

Department Office: 113 Armory Building, 505 East Armory Avenue, Champaign

NOTE: As of the printing of this catalog, all Military Science leadership laboratory courses are out of compliance with the University's policy on nondiscrimination based on sexual orientation.

111. **Introduction to Military Science.** An introduction to the U.S. Defense Establishment and its significance in modern society; includes the organization, mission, and functions of the Army, as well as an insight into military life and customs. Normally the first Military Science course taken. 1 hour.
112. **Leadership Laboratory.** Introductory practical application of military skills and leadership; includes basic military mountaineering and rappelling, first aid, individual marching and weapons familiarization. Field trip may be required. Prerequisite: Concurrent registration in AROTC Basic Course. 0 hours.
113. **Military Rifle Marksmanship.** Characteristics of small bore rifles, weapons safety, basic military marksmanship techniques and tactics. Prerequisite: Military Science 111 or consent of the instructor. 1 hour.
114. **Leadership Laboratory.** A continuation of Military Science 112 to include actual firing of weapons. Field trip may be required. Prerequisite: Concurrent registration in AROTC Basic Course. 0 hours.
121. **Land Navigation.** Fundamentals of military and USGS map reading including methods such as intersection and resection; includes land navigation and orienteering techniques and their application during a field trip. 1 hour.
122. **Leadership Laboratory.** Intermediate level practical application of military skills and leadership; includes mountaineering and rappelling, first aid, small unit marching, weapons firing, and physical fitness. Field trip required. Prerequisite: Concurrent registration in AROTC Basic Course. 0 hours.
123. **Military Tactics.** Basic concepts of tactical doctrine including Principles of War, the evolution of tactics, combined arms operations, Soviet doctrine and tactics, the affect of technology on modern tactics, and the application of contemporary tactics in small unit offensive and defensive operations. 1 hour.
124. **Leadership Laboratory.** A continuation of Military Science 122 to include military radio communication procedures and small unit tactics. Field trip required. Prerequisite: Concurrent registration in AROTC Basic Course. 0 hours.
231. **Military Operations.** Fundamentals of small unit military operations including operations planning, military orders, troop leading procedures, small unit offensive and defensive operations. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 3 hours.
232. **Leadership Laboratory.** Advanced level practical application of military skills and leadership with emphasis on the student's ability to direct and supervise others; includes advanced land navigation, advanced first aid, platoon and company drill and ceremonies, and advanced communications procedures. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
233. **Military Leadership.** Principles of leadership including management practices and their relationship to leadership, problem solving, decision making, human behavior and motivation, superior-subordinate relations and the problems of leadership in the military environment. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
234. **Leadership Laboratory.** A continuation of Military Science 232 to include small unit tactics and patrolling techniques. Field trip required. Prerequisite: Concurrent registration in the AROTC advanced course. 0 hours.
241. **Military Law.** Fundamentals of military law including the Law of Land Warfare, the application of federal law to the military, and the Military Justice system; includes financial and legal affairs. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.

- 242. Leadership Laboratory.** A unique opportunity for advanced course students to fully plan, execute, and supervise the military training and activities of other military science students. Emphasis is on leadership, organizing and managing activities, decision making, and effective instructional techniques. Prerequisite: Concurrent registration in the AROTC advanced course. Field trip required. 0 hours.
- 243. Military Professionalism and Ethics.** Examines ethics, values and professional standards through military case studies; discusses military administrative skills, written and verbal communications, meeting management, and briefing techniques. Prerequisite: Concurrent registration in the AROTC advanced course, or consent of instructor. 2 hours.
- 244. Leadership Laboratory.** A continuation of Military Science 242. Prerequisite: Concurrent registration in AROTC advanced course. Field trip required. 0 hours.

MUSIC

Director of School: Don V Moses

School Office: 3054 Music Building, 1114 West Nevada Street, Urbana

- 100. Introduction to Theory and Aural Skills.** Remedial course introducing theory and aural skills. Prerequisite: Music major. 2 hours. Credit does not apply to any music degree.
- 101. Music Theory and Practice, I.** Fundamental theory and aural skills including terminology and notation; aural and visual analysis of musical elements, procedures, and forms; written applications in short projects. Prerequisite: Music 100 or placement by examination. 3 hours.
- 102. Music Theory and Practice, II.** Continuation of Music 101 with gradually increased emphasis on aural and visual elements. Designed to be taken with Music 107. Prerequisite: Music 101 or placement by examination. 2 hours.
- 103. Music Theory and Practice, III.** Continuation of Music 102 with gradually increased emphasis on contrapuntal techniques, dissonance in tonal music, and musical form. Designed to be taken with Music 108. Prerequisite: Music 102 and 107 or placement by examination. 2 hours.
- 104. Music Theory and Practice, IV.** Continuation of Music 103; study of twentieth century compositional methods. Designed to be taken with Music 109. Prerequisite: Music 103 and 108 or placement by examination. 3 hours.
- 106. Beginning Composition.** Music composition in its beginning stages; practice in phrase, section, and short form construction, analysis, and writing; instruction in range, characteristics, and idiom of instruments and voices. Prerequisite: Consent of instructor. 2 hours. May be repeated to a maximum of 6 hours.
- 107. Aural Skills, I.** Continuation of aural skills training from Music 101. Development of performance, notational, and listening skills in the areas of rhythm, melody, harmony, counterpoint, and formal aspects of musical structure; emphasizes tonal pitch structures. Designed to be taken with Music 102. Prerequisite: Music 101 or placement by examination. 2 hours.
- 108. Aural Skills, II.** Continuation of Music 107 with emphasis on extensions of tonality by means of changing tonal centers and altered chords. Prerequisite: Music 107 or placement by examination. 2 hours.
- 109. Aural Skills, III.** Continuation of Music 108 with emphasis on atonal pitch structures and complex rhythmic organization. Designed to be taken with Music 104. Prerequisite: Music 108 or placement by examination. 1 hour.
- 110. Basic Music Literature.** Introduction to the standard concert repertory through intensive guided listening. Representative works by major composers are chosen to illustrate the principal forms, styles, and techniques of vocal and instrumental music emphasizing the period since 1700. 2 hours.
- 120. Seminar in Music Education.** Lecture and performance series in music education. Selected topics and performances focus on trends in music and music education. Prerequisite: Registration in music education. 0 hours.

130. **Introduction to the Art of Music.** Provides nonmusic students with basic listening skills, the ability to discuss music intelligently, and an acquaintance with many types of music. 4 hours.
131. **Masterworks of Western Music.** Studies in detail approximately half a dozen works of different eras and types with regard to form, style, performance practice, and historical significance. Prerequisite: Music 130; consent of instructor. 4 hours.
132. **The Varieties of Music.** Appreciation of a major musical type such as the symphony, the concerto, chamber music, opera, jazz, or popular music. 3 hours.
133. **Introduction to World Music.** Survey of the musics of Asia, Africa, and Oceania and the native traditions of the Americas. 3 hours.
134. **The Eras of Music.** Examines major works and composers representative of an era in the history of music such as the baroque, the classical, or the romantic. 3 hours.
135. **Composers' Lives and Works.** Survey of the life and work of specific composers, that will relate the musical and biographical material to pertinent social and historical events. 3 hours.
140. **Introduction to Music Education.** Introduces basic issues and principles of music education and teaching with an emphasis on philosophy and the identification of the exceptional child and learning disabilities; includes 16 hours of early field experience in the teaching of music. 2 hours.
142. **Elements of Conducting.** Fundamentals of conducting, score preparation, and transcription for choral and instrumental ensembles. 2 hours.
143. **Pre-Student Teaching Experience.** Early field experience in teacher education, including a practicum of observation, teacher aide, and teaching experiences in music. 32 hours of early field experience is required for each 1 hour of credit. 1 or 2 hours. May be repeated to a maximum of 4 hours; only 2 hours may be applied toward the degree.
144. **Music Teaching Technique Laboratory.** Class and individual instruction on musical instruments and voice for nonmusic majors; serves as a laboratory for undergraduate music education students to teach in their major applied music field. 2 hours. May be repeated to a maximum of 6 hours.
145. **Unit One Seminar and Instruction in Music.** Experimental seminar courses to introduce nonmusic majors to contemporary ideas in music. 2 hours. May be repeated to a maximum of 4 hours.
150. **Jazz Piano Improvisation, I.** Study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 162 or equivalent; Music 104 and 109, or equivalent; consent of instructor. 2 hours.
151. **Jazz Piano Improvisation, II.** Continuation of Music 150. Study of jazz theory, harmony, and improvisational techniques at the piano; includes experience in solo and ensemble situations, and an historical survey of jazz development from about 1910. Prerequisite: Music 150 or consent of instructor. 2 hours.
158. **Group Instruction in Piano for Nonmusic Majors, I.** Beginning plans for nonmusic majors: fundamentals of reading, technique, and creative activities; includes study and performance of simple solo and ensemble repertoire. 2 hours.
159. **Group Instruction in Piano for Nonmusic Majors, II.** Elementary piano for nonmusic majors. Continuation of basic skills presented in Music 158: reading, technique, creative work, simple solo and ensemble repertoire. Prerequisite: Music 158 or equivalent. 2 hours.
160. **Group Instruction in Piano, I.** Beginning group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; studies simple piano literature and the development of skills in technique, sight reading, harmonization, transposition, improvisation, and analysis. 2 hours.
161. **Group Instruction in Piano, II.** Elementary group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument; continuation of skills introduced in Music 160; easy solos from the main historical periods with appropriate technical development; introduction to piano ensemble literature. Prerequisite: Music 160 or equivalent; consent of instructor. 2 hours.
162. **Group Instruction in Piano, III.** Intermediate group instruction in piano for music majors whose principal main performing medium is voice or an orchestral or band

- instrument. Continuation of skills introduced in Music 161: study of intermediate level solos and ensemble compositions; harmonization with chromatic chords, sight reading, transposition of four-voice works, improvisation, and learning of patriotic songs. Prerequisite: Music 161 or equivalent; consent of instructor. 2 hours.
163. **Group Instruction in Piano, IV.** Moderately advanced group instruction in piano for music majors whose principal performing medium is voice or an orchestral or band instrument. Continuation of Music 162: emphasis on solos, ensemble compositions, technical development, and more advanced work in sight reading, harmonization, improvisation, transposition, and aural skills. 2 hours.
165. **Class Instruction in Voice.** Group instruction in the fundamentals of singing. Places special emphasis upon the vocal skills needed for music teachers in the public schools unique to elementary-general or instrumental specializations. 2 hours.
166. **English Diction.** Phonetics applied to English song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
167. **Italian Diction.** Phonetics applied to Italian song literature; individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Freshman standing in voice or consent of instructor. 1 hour.
168. **German Diction.** German pronunciation as applied to German vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
169. **French Diction.** Principles of French pronunciation applied to French vocal literature; class and individual clinical analysis and practice. To be taken with Music 181. Prerequisite: Sophomore standing in voice or consent of instructor. 1 hour.
170. **String Instruments.** Class instruction in the fundamentals of playing and teaching violin, viola, cello, and string bass. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. 2 hours.
171. **Woodwind Instruments.** Class instruction in the fundamentals of playing and teaching clarinet, flute, saxophone, oboe, and bassoon; double and single reed making. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. $\frac{1}{2}$ or 2 hours. May be repeated to a maximum of $5\frac{1}{2}$ hours. Students may also register in this course more than once in the same semester to a maximum of $5\frac{1}{2}$ hours.
172. **Brass Instruments.** Class instruction in the fundamentals of playing and teaching trumpet, horn, trombone, euphonium, and tuba. Prerequisite: Enrollment in the School of Music; for nonmusic majors, consent of instructor. $\frac{1}{2}$ or 2 hours.
173. **Percussion Instruments.** Class instruction in the fundamentals of playing and teaching percussion instruments. Prerequisite: Enrollment in the School of Music; for non majors, consent of instructor. 2 hours.

NOTE: MUSIC 178 through 198 (applied music) have the following prerequisite: Passing of a performance audition is required prior to the initial registration in any applied music course.

178. **Guitar.** Instruction in guitar at the undergraduate level, predominantly classical. 2 or 4 hours (summer session, 1 or 2 hours).
179. **Harpsichord.** Instruction in harpsichord at the undergraduate level. 2 or 4 hours. (Summer session, 1 to 2 hours).
180. **Piano.** Instruction in piano at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
181. **Voice.** Instruction in voice at the undergraduate level. 2 or 3 hours (summer session, 1 or 2 hours).
182. **Organ.** Instruction in organ at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
183. **Violin.** Instruction in violin at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
184. **Viola.** Instruction in viola at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
185. **Cello.** Instruction in cello at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).

186. **String Bass.** Instruction in string bass at the undergraduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours (summer session, 1 or 2 hours).
187. **Flute.** Instruction in flute at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
188. **Clarinet.** Instruction in clarinet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
189. **Oboe.** Instruction in oboe at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
190. **Bassoon.** Instruction in bassoon at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
191. **Cornet and Trumpet.** Instruction in cornet and trumpet at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
192. **Horn.** Instruction in horn at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
193. **Trombone.** Instruction in trombone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
194. **Euphonium.** Instruction in euphonium at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
195. **Tuba.** Instruction in tuba at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
196. **Percussion.** Instruction in percussion at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
197. **Harp.** Instruction in harp at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
198. **Saxophone.** Instruction in saxophone at the undergraduate level. 2 or 4 hours (summer session, 1 or 2 hours).
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Instrumentation.** Basic instrumentation and scoring for small ensembles. Prerequisite: Music 102 and 107. 2 hours.
201. **Instrumentation, II.** Problems in arranging for all wind instruments. Required of composition majors. Prerequisite: Music 200 or consent of instructor. 2 hours.
202. **Rudiments of Theory, I.** Introduces nonmusic majors to basic terminology, notation, concepts of tonality, and music form. Nonmusic majors only. 3 hours.
203. **Rudiments of Theory, II.** Continuation of Music 202 including study of modulation, chromatic harmony, formal structures, and an introduction in twentieth-century composition. Prerequisite: Music 202 or placement by examination; nonmusic majors only. 3 hours.
204. **Compositional Problems: Serial Techniques.** Study of serial techniques and levels of determinacy through composition and analysis. Prerequisite: Music 104 and 109, or consent of instructor. 2 hours.
205. **Compositional Problems: Technological and Visual Aspects.** Studies electronic and computer applications, visual and gestural elements, and levels of determinacy through composition and analysis. Prerequisite: Consent of composition-theory faculty. 2 hours.
206. **Intermediate Composition.** Music composition at the secondary stages; analysis and writing of shorter musical forms. Prerequisite: Music 106 and consent of composition-theory faculty. 2 hours. May be repeated to a maximum of 6 hours.
209. **Kodaly: Philosophy and Methods.** Introduction to the music education philosophy of Zoltan Kodaly through experiences in relative sol-fa and the expansion of aural awareness. Prerequisite: Consent of instructor. 2 hours.
210. **Computer-Assisted Instruction in Music.** Introduction to computer-assisted instruction (CAI) and its uses in public school, college, and continuing education programs in music; familiarization with visual and audio programming strategies and the research potential of CAI systems. Prerequisite: Consent of instructor. 2 hours.
211. **Practicum in Piano Teaching.** Coordinates lesson planning for teaching precollege piano pupils with extensive teaching experiences; gives close examination to beginning and intermediate teaching literature. Prerequisite: Music 143 or 242. 2 hours.

- 213. The History of Music, I.** Survey of music and its development in Western civilization to about 1750; emphasis on an acquaintance with representative musical works and style, and on understanding musical concepts in the light of their historical background. Prerequisite: Music 110 or consent of instructor. 3 hours.
- 214. The History of Music, II.** Survey of the development of music as an art in Western civilization from about 1750 to the present; emphasizes an acquaintance with formal and stylistic problems through the study of representative works and on understanding specific musical concepts in the light of their historical and general cultural context. Prerequisite: Music 213. 3 hours.
- 229. Thesis and Advanced Undergraduate Honors in Music.** Special individual research projects. Required of seniors in the history of music and composition-theory curricula; open also to advanced undergraduates, including James Scholars, who have achieved university or college honors and who desire to do research in specialized areas of music, including performance. Prerequisite: Senior standing in the history of music and composition-theory, curriculum or consent of instructor. 2 hours. (Counts for advanced hours in LAS.)
- 230. Choral Literature and Conducting, I.** Laboratory course for review and development of conducting skills. Choral repertoire for secondary schools is developed through score analysis and preparation and laboratory conducting assignments. Prerequisite: Music 142; concurrent registration in Music 247 for music education majors. 2 hours.
- 231. Choral Literature and Conducting, II.** Laboratory course emphasizing rehearsal techniques, score preparation, and interpretation. Integration of aural, vocal, keyboard, and conducting skills for the choral teacher/conductor is emphasized. Prerequisite: Music 230; concurrent registration in Music 247 for music education majors. 2 hours.
- 232. Instrumental Literature and Conducting, I.** Survey of concert and training literature for wind ensemble and band; refinement of conducting techniques and methods of teaching through study and performance of selected wind compositions and instructional materials appropriate for public school use. Prerequisite: Music 142. 3 hours.
- 233. Instrumental Literature and Conducting, II.** Survey of concert and training literature for orchestra; continued development and refinement of conducting skills and methods of teaching through detailed study and performance of selected compositions and instrumental materials appropriate for public school use. Prerequisite: Music 232. 3 hours.
- 235. Elementary and Junior High School Instrumental Music.** Examines pedagogical and organizational techniques for teaching elementary and junior high school instrumental music in a laboratory school setting. Prerequisite: Music 232. 2 hours.
- 236. Choral Techniques in Elementary and Junior High School.** Detailed consideration of literature, arranging for elementary and junior high school choruses, and the changing voice. Prerequisite: Advanced undergraduate standing in music or consent of instructor. 3 hours.
- 237. Orff: Philosophy and Methods.** Introduction to the Carl Orff-Schulwerk approach to music for children; techniques include the use of Orff instruments and materials and the adaptation of these materials for classroom use with or without instruments. Prerequisite: Sophomore standing in music education or consent of instructor. 2 hours.
- 239. Principles and Techniques in Music Education.** Comprehensive examination of interrelationships among the various segments of music education; the role of music education at all levels in the total school program, elementary through secondary, with emphasis upon philosophy, learning theory, curriculum design, identification of exceptional children and learning disabilities, administration and current trends; includes 20 hours of early field experience in the teaching of music. Prerequisite: Senior standing in music education or consent of instructor, plus 80 hours of early field experiences in the teaching of music. 3 hours.
- 240. Music for Elementary Teachers, I.** Presentation of music for students preparing to teach in the elementary schools. Prerequisite: Junior standing in elementary education or consent of instructor. 3 hours.
- 241. Music for Elementary Teachers, II.** Continuation of Music 240. A presentation of music for students preparing to teach in the elementary schools. Prerequisite: Music 240 or consent of instructor. 3 hours.

- 242. Teaching Music in the Elementary School.** Techniques of and material suitable for teaching music in the elementary school. 3 hours.
- 243. Teaching Music in the Junior High School.** Detailed consideration of the music program in the junior high school; special emphasis on instructional material and methods of instruction. 3 hours.
- 244. Teaching of Instrumental Music.** Techniques of teaching, publicizing, organizing, and administrating the total school instrument music program, elementary through secondary school. Prerequisite: Music 232; senior standing. 3 hours.
- 246. Teaching of Choral Music.** Methods course providing detailed consideration of organization, development, and maintenance of comprehensive choral program in the secondary schools. Prerequisite: Music 231. 3 hours.
- 247. Repertory for the Secondary School Choral Program.** Exploration of literature appropriate for public school music groups through reading and rehearsal demonstrations. Prerequisite: Music 142 or consent of instructor. 1 or 2 hours. May be repeated to a maximum of 6 hours.
- 249. Music for Early Childhood Teachers.** Development of musical competencies essential for teachers in nursery schools and kindergartens; singing, rhythmic keyboard improvisation, and creative and music reading skills; extensive study of music materials suitable for use in early childhood music. Prerequisite: Music 240 or consent of instructor. 3 hours.
- 250. University Orchestra.** Prerequisite: Consent of instructor. 0 or 1 hour.
- 251. Chamber Orchestra.** Performs literature of all periods written specifically for a chamber-sized orchestra. Prerequisite: Consent of instructor. 1 hour.
- 253. Collegium Musicum.** Performs medieval, renaissance, and baroque music; various small groups formed for the performance of sonatas and cantatas of Bach and Handel, wind serenades of Mozart, etc. Interested students may play on lute, harpsichord, and other instruments from the University's collection. Prerequisite: Consent of instructor. 1 hour.
- 254. String Ensemble.** Participation in various ensemble groups, such as trios, quartets, quintets, etc., for the study of chamber music literature. The course may be repeated or taken during the freshman and sophomore year without credit. Prerequisite: Consent of instructor. 1 hour.
- 255. Woodwind Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 256. Brass Ensemble.** Ensembles of mixed brasses in both small and large forms. Prerequisite: Consent of instructor. 1 hour.
- 257. Percussion Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 258. Piano Ensemble.** Prerequisite: Consent of instructor. 1 hour.
- 259. Organ Keyboard Techniques.** Development of practical keyboard skills related to the work of the church organist; transposition, score-reading, harmonization, modulation, hymn-playing, and solo and anthem accompaniment. Prerequisite: Consent of instructor. 1 hour.
- 260. Oratorio Society.** Performance of oratorios and other major choral works in cooperation with the University Symphony Orchestra; an advanced mixed-voice chorus open to students, faculty, and members of the community. Prerequisite: Consent of instructor. 0 or 1 hour.
- 261. University Chorus.** Performance of cantatas and other choral works; a mixed-voice chorus for average and beginning singers. Open to students, faculty, and members of the community. Prerequisite: Consent of instructor. 0 or 1 hour.
- 262. Women's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all women students. Prerequisite: Consent of instructor. 0 or 1 hour.
- 263. Men's Glee Club.** Practical experience in the rehearsal and public performance of choral music of various periods and styles. Open to all men students. Prerequisite: Consent of instructor. 0 or 1 hour.
- 264. Concert Choir.** Practical experience in mixed-voice singing of accompanied and unaccompanied music of various periods and styles; a highly advanced group of competent student singers. Prerequisite: Consent of instructor. 0 or 1 hour.
- 265. Opera-Musical Theatre.** Preparation and public performance of grand or light opera;

- includes only singing and acting. (Students desiring experience in costuming, stage management, scenery, publicity, etc., should apply to the University Theatre which cooperates in the opera productions). Prerequisite: Consent of instructor. 1 hour.
266. **Jazz Band.** Designed to acquaint proficient instrumentalists with jazz compositions, arrangements, and improvisational procedures, and to promote a high degree of stylistic and technical competence in performance. Prerequisite: Consent of instructor. 0 or 1 hour.
267. **Harp Ensemble.** Ensembles of multiple harps and harp in combination with other instruments. Prerequisite: Consent of instructor, or Music 197 or 397. 1 hour.
268. **Small Choral Ensembles.** Open to a limited number of undergraduate students who desire experience in performance of music specifically written for smaller choral groups. Prerequisite: Consent of instructor. 1 hour.
269. **String Chamber Music, Literature, and Performance.** Extensive study of chamber music literature for or including string instruments (violin, viola, cello, double bass); weekly coaching by members of the string faculty. Requires one performance per semester. Prerequisite: Consent of instructor. 1 hour. May be repeated to a maximum of 8 hours.
270. **Teaching of Stringed Instruments in the Public School.** Organization, materials, and techniques for the teaching of strings in the public school string class. Prerequisite: String major or consent of instructor. 3 hours.

NOTE: MUSIC 280-290 are open to all students who have been accepted by audition, with assignments made according to proficiency and instrumentation. Completion of each course involves, in addition to the regular schedule of rehearsals, participation in the public appearances by the bands.

280. **Wind Ensemble.** Mixed woodwind-brass-percussion ensembles for the study and performance of wind chamber compositions. Prerequisite: Junior standing or consent of instructor. 0 or 1 hour.
281. **Symphonic Band, I.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 0 or 1 hour.
282. **Symphonic Band, II.** Maintains a complete symphonic band instrumentation for the study and performance of all types of band literature. 0 or 1 hour.
283. **First Concert Band.** Maintains the instrumentation of the standard band and serves as a training organization for the symphonic bands. The literature studied and performed is of the highest calibre and technical difficulty. 0 or 1 hour.
284. **Second Concert Band—A.** Training for the Symphonic Bands and the First Concert Band. The high quality band literature is technically less difficult than that of Music 281, 282, and 283. Promotion contingent upon improvement and chair vacancies. 0 or 1 hour.
285. **Second Concert Band—B.** Training for the Symphonic Bands and the First Concert Band. The high quality band literature is technically less difficult than that of Music, 281, 282, and 283. Promotion contingent upon improvement and chair vacancies. 0 or 1 hour.
286. **Marching Band.** Prepares and performs at least six shows per football season; music used is of the highest available quality. 1 hour.
287. **Basketball Band.** Performs for home basketball games. Prerequisite: Band Department audition during early November. 1 hour. Credit is given for spring semester only.
288. **Brass Band.** Maintains a complete British Brass Band instrumentation for the study and performance of all types and styles of brass band literature. Prerequisite: Concurrent registration in Music 281, 282, 283, 284, or 285. 1 hour.
289. **Summer Band.** Maintains the instrumentation of the standard band for the study and performance of all types of band literature. Prerequisite: Consent of instructor. 1 hour.
290. **Clarinet Choir.** Maintains a complete clarinet choir instrumentation for the study and performance of all types and styles of clarinet choir literature. Prerequisite: Concurrent registration in Music 281, 282, 283, 284, or 285. 1 hour.
300. **Counterpoint and Fugue.** The study of contrapuntal writing in the eighteenth century, including fugue, with emphasis on the works of J. S. Bach; involves both writing and analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $1\frac{1}{2}$ unit.
301. **Schenkerian Analysis of Tonal Music.** Studies analytical systems and their application to tonal music; includes a survey of theoretical works by important theorists from Rameau to Schenker. Emphasizes practical application of Schenkerian analysis. Prerequisite: Music 104 or consent of instructor. 3 hours or $3\frac{3}{4}$ unit.

302. **Musical Acoustics.** Theory and application of simple resonators; wave motion; resonances of string and pipes; perception of loudness, pitch and timbre; musical scales; and acoustics of rooms and musical instruments. Prerequisite: Mathematics 112 and Music 101 or equivalent. 3 hours or $\frac{3}{4}$ unit.
303. **Music Formalization.** Surveys the logical tools introduced in the theory and practice of the musical composition by Xenakis, Hiller, and others; intended for musicians with no more than limited familiarity with mathematics. Prerequisite: Music 104 and consent of instructor. 3 hours or $\frac{3}{4}$ unit.
304. **Contemporary Compositional Techniques.** Studies in specialized areas of composition for advanced undergraduates and graduates majoring in composition-theory. May be elected by others with consent of instructor. Prerequisite: Music 104, 106, 109, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.
305. **Analytical Systems for Twentieth Century Music.** Studies analytical techniques developed for music written in the twentieth century not based upon tonal principles from the common practice period. Includes a survey of important theorists; studies set theory and twelve-tone theory; and surveys other specialized analytical systems. Prerequisite: Music 104, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
306. **Composition.** Work in original composition including small and large forms. Prerequisite: for undergraduates, Music 204, 205, and 206 and consent of composition faculty; for graduate students, consent of composition faculty. Students submit scores of their compositions to the composition faculty in order to obtain consent to register; consent is granted on the basis of the quality of the music the student has composed and the level of skill demonstrated in the work submitted. 3 hours or $1\frac{1}{2}$ unit.
308. **Analysis of Musical Form.** Extensive study of the formal structure of representative musical compositions from various historical periods: (a) renaissance and baroque; (b) Viennese classical; (c) nineteenth century; (d) first half of twentieth century; and (e) since World War II. Prerequisite: Music 104 and 109. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 9 hours or $1\frac{1}{2}$ units.
310. **Ancient and Medieval Music.** History of Western music to about 1400. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
311. **Music in the Renaissance.** History of music from about 1400 to 1600. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
312. **Music of the Seventeenth Century.** History of music from about 1600 to 1700. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Music of the Eighteenth Century.** History of music from about 1700 to 1800. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
314. **Music of the Nineteenth Century.** History of music from about 1800 to 1900. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
315. **Music of the Twentieth Century.** History of music from about 1900 to the present. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
316. **Anthropology of Music.** Same as Anthropology 316. Introduction to the anthropological study of music, including the role of music in the world's societies and nonwestern musical systems and cultures. Prerequisite: Anthropology 103 or 110, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
317. **Area Studies in Ethnomusicology.** Same as Anthropology 315. Seminar devoted to intensive study in the music of one specific culture, e.g., Japan, China, Indonesia, India, the Near East, African and New World Negro, European and American folk cultures, or American Indian. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 12 hours or 2 units.
319. **History of Performance Practices, II.** Study of musical performance from 1600 to 1750 A.D.; discussion of musical instruments, ornamentation, basso continuo, etc., supplemented by demonstration performances using the University's collection of instruments. Prerequisite: Senior standing in music theory or music history, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
320. **Proseminar.** Special preparation in specialized fields of musicology, composition-theory, and music education. Prerequisite: Senior or graduate standing in music or music

- education; consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units. Students in open studies may repeat to a maximum of 16 hours.
321. **Electronic Music Techniques, I.** Introduces electro-acoustic music, including historical background, literature, techniques of notation and realization, and compositional application in the areas of musique concrete, classical electronic music, and voltage-controlled electronic music. Prerequisite: Junior standing in music or consent of instructor. 4 hours or 1 unit.
322. **Electronic Music Techniques, II.** Advanced study in the use of voltage-controlled synthesizers in music composition and study of compositional, technical, and performance considerations in combining electronics with traditional instruments and/or voices in music composition. Prerequisite: Music 321 or placement by examination. 2 hours or $\frac{1}{2}$ unit.
323. **Opera Production, I.** Studies the problems of the lyric stage; investigation of and practice with casting methods, program selection, production procedures, stage direction, coaching methods, and opera dramatics. Prerequisite: Music 265 and 381; consent of instructor. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
324. **Opera Production, II.** Continuation of topics introduced in Music 323. Prerequisite: Music 323. 3 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 6 hours or 1 unit.
325. **Introduction to Musicology, I.** Survey of the discipline of musicology, its scope, and its history with bibliographical studies and sample problems for investigation. Prerequisite: Graduate standing in musicology or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit).
326. **Introduction to Musicology, II.** Continuation of a survey of the discipline of musicology; special attention to class projects in systematic musicology and to the philosophy of music history. Prerequisite: Music 325 or consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit).
327. **Urban Popular Music.** Introduction to the world's popular music; emphasis on its role in society, based on American, European, Latin American, and non-Western repertoires. Prerequisite: Music 130 or equivalent, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
328. **Composer-Choreographer Workshop.** Same as Dance 328. See Dance 328.
330. **Applied Music Pedagogy.** Survey of techniques, practices, and materials; presentation of group and individual instruction; an approach to teaching problems, tone production, musical styles, and interpretation for various age levels; actual teaching experience under faculty supervision. Required of applied music majors in voice and string instruments. Prerequisite: Junior standing in music or consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
331. **Piano Pedagogy, I.** Objectives, techniques, literature, and materials for teaching the child from about ages five through ten (elementary level); observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
332. **Piano Pedagogy, II.** Objectives, techniques, literature, and materials for teaching the young pianist from about ages eleven through eighteen (middle school to precollege level); teaching the adult beginner; observation of lessons and supervised student teaching experience. Prerequisite: Senior standing in music or music education, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
333. **The History of Opera.** Surveys opera and related forms from the end of the 16th century to the present; studies representative works in some detail. Prerequisite: Music 131 or 214, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
334. **The Music of America, I.** Study of folk, popular, and art music in America from the time of the first European settlers through the middle of the nineteenth century; psalmody, early opera and concert life, African and European folk music, the singing school, music of European immigrants, and the roots of jazz. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
335. **The Music of America, II.** Study of chamber, choral, and orchestral music written by American composers from about 1850 to the present; jazz and its offshoots; folk and

- popular music; and experimental music in America. Prerequisite: Senior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
336. **Music in Latin America.** History of music in Latin America from colonial times to the present, including its cultural and social background. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
337. **National and Regional Studies in European Music History.** Studies in the history of music of individual nations and regions of Europe. Each semester is devoted to one area, such as Great Britain, Spain and Portugal, Russia, Scandinavia, or eastern Europe. Prerequisite: Junior standing in music or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.
339. **Functional Music for Exceptional Children and Youth.** Techniques and methods to aid exceptional children and youth in acquiring and improving self-concept, socialization skills, attention span, listening skills, language acquisition, and academic readiness; considers the use of music techniques and methods in acquiring these skills in the mainstreamed classroom. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
340. **Marching Band Procedures.** Detailed consideration of principles and procedures for preparing a marching band to participate in parades, ceremonies, and shows for sports events. Prerequisite: Junior standing in instrumental music education. 2 hours or $\frac{1}{2}$ unit.
341. **Seminar in Instrumental Music Education.** Intensive study of musical, scientific, and educational concepts and principles related to the teaching of heterogeneous combinations of instruments. Prerequisite: Completion of student teaching or graduate standing in music education. 2 hours or $\frac{1}{2}$ unit.
342. **Band Arranging.** Development of basic scoring and arranging skills for various small instrumental ensembles and marching band. Prerequisite: Music 104 or equivalent. 2 hours or $\frac{1}{2}$ unit.
343. **Tests and Measurement in Music Education.** Construction, design, appraisal, and use of measurement devices for music teaching and research. Prerequisite: Consent of instructor. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
344. **Jazz Ensemble Rehearsal Techniques.** Emphasizes principles of interpretation and techniques for conducting the school jazz ensemble through detailed study, with practicum experience in a laboratory setting. Prerequisite: Music 232 or consent of instructor. Credit: 2 hours or $\frac{1}{2}$ unit. Graduate credit requires written project.
345. **Teaching Techniques of Music Theory.** Discussion and analysis of teaching materials, methods, texts, and pedagogical sequence, including an intensive survey of the structural materials normally covered during the first two years of collegiate study. Prerequisite: Music 300 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
346. **Workshop in Music Education.** Development of essential facts, attitudes, and principles through a consideration of problems encountered in music education. Parallel with this study is the preparation of resource materials for music programs in elementary and secondary schools. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units. Offered in the summer session only.
347. **Teaching of Woodwind Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
348. **Teaching of Brass Instruments.** Designed primarily for teachers of instrumental music in the public schools. Prerequisite: Senior or graduate standing in music education or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Offered in the summer session only.
349. **Music in Early Childhood.** Same as Human Development and Family Ecology 349. Detailed consideration of the music program in nursery schools, kindergarten, and the primary grades; topics include the nature of early musical responses, objectives, experience levels of the program, methods of teaching, and materials. Observation of music teaching at the Child Development Laboratory is included in the course work. Prerequisite: Senior or graduate standing in music or human resources and family studies, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
350. **Advanced Ensemble Music.** Selected projects in the study and performance of ensemble literature, including the areas of operatic, instrumental, and vocal-choral music and accompanying. Prerequisite: Consent of instructor. 0 to 2 hours, or 0 to $\frac{1}{2}$ unit.

355. **School/Community Musical Theatre Production.** Problems and techniques involved with technical and artistic production of musicals in the junior and senior high schools and in the community. Prerequisite: Advanced undergraduate or graduate standing in music education or performance curricula, or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
360. **Advanced Group Instruction in Piano, I.** Comprehensive keyboard musicianship course for advanced pianists emphasizing the development of the following skills: sight reading, harmonization, transposition, improvisation, playing by ear, and vocal and instrumental score reading. Ensemble piano music is performed. Prerequisite: Music 180 (12 hours completed) or Music 163; and Music 104 and 109, or equivalent; and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
361. **Advanced Group Instruction in Piano, II.** Continuation of the topics introduced in Music 360. Prerequisite: Music 180 (12 hours completed) or Music 163; Music 104 and 109 or equivalent; Music 360 or equivalent and consent of instructor. 2 hours or $\frac{1}{2}$ unit.
362. **Advanced Jazz Piano Improvisation.** Study of solo jazz piano improvisation on an advanced level. Includes practical experience in traditional, modern, and abstract solo performance, as well as theoretical, stylistic, and historical background. Prerequisite: Music 151 or equivalent. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
364. **Jazz Pedagogy at the Keyboard.** Designed for future piano teachers and involves evaluating and designing of teaching strategies for significant repertoire in the jazz idiom at elementary, intermediate and advanced levels of instruction. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
366. **Vocal Repertoire, I.** Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his/her special field. Prerequisite: Junior standing in voice or consent of instructor and concurrent registration in Music 381. 1 hour.
367. **Vocal Repertoire, II.** To be taken with Music 381. Study of the standard solo literature, including solo excerpts from larger works, i.e., cantata, oratorio, and opera; supplements the student's knowledge of the literature in his/her special field. Prerequisite: Junior standing in voice or consent of instructor and concurrent registration in Music 381. 1 hour.
369. **Accompaniment for Dance.** Same as Dance 369. See Dance 369.
377. **Principles of Accompanying.** Fundamental principles of accompanying singers and instrumentalists; practical experience in accompanying; and facility in sight reading for keyboard performers. Prerequisite: Advanced undergraduate or graduate standing in music or music education and consent of instructor. 4 hours or 1 unit (summer session, 2 hours or $\frac{1}{2}$ unit). May be repeated to a maximum of 16 hours or 4 units.

NOTE: MUSIC 378 through 398 (applied music) have the following prerequisite: For students in the Bachelor of Music programs for the curricula in Vocal and Instrumental Music, junior standing in the major applied music subject as approved by the faculty of the appropriate applied music division; for students in music education, completion of the curricular requirement in the major applied music subject; and for students in other colleges of the University, completion of four semesters in the comparable applied music course at the 100-level.

378. **Guitar.** Instruction in guitar at the advanced undergraduate and graduate levels, predominantly classical. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
379. **Harpsichord.** Instruction in harpsichord at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
380. **Piano.** Instruction in piano at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
381. **Voice.** Instruction in voice at the advanced undergraduate and graduate level. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
382. **Organ.** Instruction in organ at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
383. **Violin.** Instruction in violin at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).

384. **Viola.** Instruction in viola at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
385. **Cello.** Instruction in cello at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
386. **String Bass.** Instruction in string bass at the advanced undergraduate and graduate level. Prerequisite: Concurrent registration in Music 250. 2 or 3 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
387. **Flute.** Instruction in flute at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
388. **Clarinet.** Instruction in clarinet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
389. **Oboe.** Instruction in oboe at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
390. **Bassoon.** Instruction in bassoon at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
391. **Cornet and Trumpet.** Instruction in cornet and trumpet at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
392. **Horn.** Instruction in horn at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
393. **Trombone.** Instruction in trombone at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
394. **Euphonium.** Instruction in euphonium at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
395. **Tuba.** Instruction in tuba at the advanced undergraduate and graduate level. 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
396. **Percussion.** Instruction in percussion at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
397. **Harp.** Instruction in harp at the advanced undergraduate and graduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
398. **Saxophone.** Instruction in saxophone at the advanced undergraduate level. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit (summer session, 1 or 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit).
400. **Advanced Instrumentation: Chamber and Symphonic.** Orchestration for chamber and symphony orchestras; works of classical, romantic, and modern composers. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
401. **Advanced Instrumentation: Band.** Arrangement for the concert band of works from orchestra, organ, and chamber music by composers of the classical, romantic, and modern periods. Prerequisite: Undergraduate instrumentation. $\frac{1}{2}$ or 1 unit.
402. **Analysis in Relation to Performance and Interpretation, I.** Unifying course in the structure of music, in which analysis is related to the performance and understanding of music; course material drawn from standard literature from the Renaissance to the present day with emphasis on the smaller forms. Prerequisite: Music 104 or equivalent; consent of instructor. $\frac{1}{2}$ or 1 unit.
403. **Computer-Assisted Composition.** A critical evaluation of the ways in which computers have been used to write music, followed by a detailed presentation of a program for Computer-Assisted Composition. Prerequisite: Music 303 and elementary knowledge of computer programming or consent of instructor. 4 hours or 1 unit.
405. **Individual Topics in Music Theory.** Studies in specialized areas of analysis, theory systems, and aesthetics for composition-theory majors. Prerequisite: Graduate standing in music; consent of instructor. $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 3 units.
406. **Composition.** Advanced study of contrapuntal forms; study of contemporary melodic and harmonic practices; and original work in advanced composition. $\frac{1}{2}$ to $1\frac{1}{2}$ units.
407. **Readings in Music Education.** Independent study of topics not treated by regularly scheduled courses. Prerequisite: Graduate standing in music education. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.

409. **Principles of Curriculum in Music Education.** Examination of issues related to curriculum and program development and instructional and evaluative practice as influenced by contemporary philosophical and psychological views. Consideration will be given to effect on administrative and supervisory responsibilities. Prerequisite: Acceptance into the MS Program in Music Education or consent of instructor. $\frac{1}{2}$ to 1 unit.
410. **History of Music Theory.** Prerequisite: Graduate standing in musicology or composition, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
411. **Introduction to Ethnomusicology.** Comprehensive survey of concepts, problems, and methods of research in non-Western and folk music. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
412. **History of Musical Aesthetics, I.** Survey of the principal philosophies of music from Pythagoreanism to the humanistic period, their historical backgrounds, and their relation to musical styles. Prerequisite: Graduate standing in music. $\frac{1}{2}$ or 1 unit.
414. **Notation, I.** History of notation from its beginning to 1400. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
415. **Notation, II.** History of notation from 1400 to 1600, including instrumental tablatures. Prerequisite: Music 414 or consent of instructor. $\frac{1}{2}$ unit.
417. **History of Instrumental Music from 1600 to 1750.** Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
418. **Topics in Opera History.** Intensive study of a period or school of opera composition or of a particular aspect of the history of opera. Wide reading in the social and intellectual climate of the period concerned; literary, dramatic, and musical analysis; and work with primary sources whenever possible. Prerequisite: Music 428, graduate standing in musicology, or consent of instructor. 1 unit (summer session, $\frac{1}{2}$ unit).
419. **Orchestral Literature, I.** Study of orchestral and symphonic literature from 1700 to 1850. Prerequisite: Graduate standing in music and consent of instructor. $\frac{1}{2}$ unit.
420. **Orchestral Literature, II.** Study of orchestral and symphonic literature from 1850 to the present. Prerequisite: Graduate standing in music and consent of instructor. $\frac{1}{2}$ unit.
421. **Research in Music Education.** Introduction to problems and methods of research in music education. Required of all candidates for the Doctor of Education in music education. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
422. **Seminar in Theory of Music.** Intensive study of selected topics in the fields of music theory, history of theory, and history of musical materials. Prerequisite: Graduate standing in music theory or consent of instructor. $\frac{1}{2}$ or 1 unit.
423. **Seminar in Musicology.** Problems in historical and systematic musicology or ethnomusicology; discussions of special problems and reports on individual research. Prerequisite: Graduate standing in musicology or consent of instructor. 1 unit.
424. **Seminar in the Works of a Selected Composer.** Intensive historical and analytical study of the works of important composers; each semester devoted to one composer, e.g., Bach, Beethoven, Handel, Haydn, Mozart, or Wagner. Prerequisite: Music 213 and 214; two of the following: Music 310, 311, 312, 313, or 315, or equivalent. 1 unit (summer session, $\frac{1}{2}$ or 1 unit). May be repeated for a maximum of 2 units.
425. **Readings in Musicology and Music Theory.** Individual guidance in intensive readings in the literature of musicology or music theory, selected in consultation with the instructor and in accordance with the needs and interests of the student. Prerequisite: Graduate standing in musicology or music theory. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit).
426. **Choral Literature, I.** Survey of choral and vocal ensemble repertoire from the Middle Ages to 1750. Prerequisite: Graduate standing in music, consent of instructor. $\frac{1}{2}$ unit.
427. **Choral Literature, II.** Survey of choral repertoire from 1750 to the present. Prerequisite: Graduate standing in music, consent of instructor. $\frac{1}{2}$ unit.
428. **Problems and Methods.** Introduction to methods in research and stylistic criticism and to bibliographic aids, editions, and editing of music, as related to the work of the musician and composer. Reports of bibliographic problems and on individual projects are presented orally and in writing. Required of all students in the Master of Music program, except those majoring in musicology. 1 unit.
429. **Historical Studies in Twentieth-Century Music.** Seminar in contemporary music, with

- emphasis on the historical foundations of current trends in musical composition. Prerequisite: Music 315 or 422, or equivalent. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ unit). May be repeated to a maximum of 2 units.
430. **Advanced Orchestra Conducting and Literature.** Intensive study of conducting techniques and problems related to standard orchestral literature; survey of materials for school and community orchestras. Prerequisite: Music 233 or equivalent, and consent of instructor. $\frac{1}{2}$ or 1 unit.
431. **Advanced Band Conducting and Literature.** Study of problems and techniques of band conducting; survey of literature for the concert band. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
432. **Advanced Choral Techniques, I.** Intensive laboratory approach to the development of advanced techniques necessary for working effectively with choral ensembles. Choral majors must enroll each semester in residence. Prerequisite: Graduate standing in choral music or consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
433. **Advanced Choral Techniques, II.** Intensive survey of choral literature with laboratory organization for reading, conducting, and interpreting choral music of all periods, styles, and voice arrangements. Prerequisite: Graduate standing in choral music, Music 432 or equivalent, or consent of instructor. $\frac{1}{2}$ or 1 unit.
434. **Piano Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
435. **Vocal Literature.** Study of solo song in larger works and solo art song. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
436. **Organ Literature.** Intensive study of organ literature from Bach to the present; includes the music itself, recordings, and collateral readings. Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
437. **String Instrument Literature.** Prerequisite: Bachelor of Music or Bachelor of Science in Music Education, or consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
438. **Wind Instrument Literature.** Survey of solo and ensemble wind literature; includes analysis and performance (when possible) of the music itself, recordings, and collateral readings. 1 unit. May be repeated to a maximum of 2 units.
439. **Percussion Instruments Literature.** Survey and analysis of the field of solo and ensemble percussion literature; includes analysis and performance (when possible) of the music itself, recordings, and collateral readings. Prerequisite: Graduate standing in music; consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
440. **Foundations and Principles of Music Education, I.** Consideration of the historical and philosophical foundations of music education and their application to the process of program development in music education. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
441. **Foundations and Principles of Music Education, II.** Consideration of the psychological foundations of music education and their application to the processes of instruction, administration, supervision, and evaluation of music education programs. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit.
442. **The General Music Program in Secondary Schools.** Detailed consideration of the secondary general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
443. **Administration and Supervision of Music Education.** Studies the functions of supervisors and directors of music education in administering music programs in elementary and secondary schools. $\frac{1}{2}$ or 1 unit.
444. **The General Music Program in Elementary Schools.** Detailed consideration of the elementary general music program, its objectives, organization, and operation; special attention to materials and methods of teaching. $\frac{1}{2}$ or 1 unit.
445. **Music in Higher Education.** Orientation to the organization, teaching, and administration of music in the college and university. Prerequisite: Graduate standing in music education or music. $\frac{1}{2}$ or 1 unit. Offered in summer session only.

446. **Seminar in Experimental Music, I.** Survey of contemporary electronic music, computer music, and related types of music; discussion of relevant music theory. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit.
447. **Seminar in Experimental Music, II.** Continuation of Music 446. Prerequisite: Music 446 or consent of instructor. $\frac{1}{2}$ unit.
448. **Computer Music.** Representation of sound signals in a digital computer; methods for input and output of sounds to and from a computer; sound synthesis programs; synthesis of simple musical structures; use of graphics; processing of live sounds by computer; editing and retrieval; fidelity of computer-produced sounds; and hybrid analog/digital computers. Prerequisite: Graduate standing in composition-theory or consent of instructor. 1 unit.
449. **Problems in Band Conducting.** Examination of techniques of rehearsal, conducting, and preparation of band organizations for concert performance; emphasizes discussion, analysis, and preparation of selected scores and the problems they present. Prerequisite: Graduate standing or experience as a band conductor. $\frac{1}{2}$ or 1 unit.
450. **History of Vocal Ensemble and Choral Music.** Critical and analytical study of vocal ensemble and choral music from the Middle Ages to the present. Prerequisite: Music 426 and 427, or equivalent, or consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
452. **Choral Conducting Project.** Participation in a graduate choral conducting laboratory and preparation of a choral ensemble for public performance. [Required during the final semester in residence for Master of Music with choral music option candidates.] Prerequisite: Music 432 and consent of instructor. $\frac{1}{2}$ unit.
454. **Advanced Choral Performance Techniques.** Study of performance problems and musical analysis of choral music with techniques of preparation and rehearsal from the various style periods: renaissance, baroque, classic-romantic, and contemporary. Prerequisite: Admission into the Doctor of Musical Arts choral music program, or the equivalent background in other doctoral degree programs. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
455. **The Choral Program in Secondary Schools.** In-depth study of the methods and materials appropriate for teaching choral music in the secondary schools. Prerequisite: Graduate standing in music or music education. $\frac{1}{2}$ or 1 unit.
456. **Advanced Computer Music.** Compositional approaches to computer music; advanced digital computer sound synthesis using the computer programs MUSIC 360 and MUSIC 4BF; compositional algorithms; user-written sound generation routines; new concepts of timbre in digital sound synthesis; digital/analog and analog/digital conversion; and installation of computer music programs. Prerequisite: Music 448 or consent of instructor. 1 unit.
460. **Practicum in Piano Teaching: Children and Teenagers.** Student teaching of group piano and musicianship classes for elementary, middle, and high school students; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 331 or equivalent. 1 unit.
461. **Practicum in Piano Teaching: Adults.** Student teaching of group piano for adults in the private studio, community college, and university; weekly seminar devoted to evaluation and improvement of teaching techniques. Prerequisite: Graduate standing in music; Music 332 or equivalent. 1 unit.
477. **Advanced Accompanying.** Fundamental principles of accompanying singers and instrumentalists, practical experience in accompanying, and facility in sight reading for keyboard performers. Prerequisite: Graduate standing in music or music education or consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
480. **Piano.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the piano faculty. $\frac{1}{2}$ or 1 unit.
481. **Voice.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the voice faculty. $\frac{1}{2}$ or 1 unit.
482. **Organ.** Selected studies from the masterworks of organ literature. Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the organ faculty. $\frac{1}{2}$ or 1 unit.

- 483. String Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying for the appropriate applied music faculty; concurrent registration in Music 250 or 350, section K, for students working toward the Master of Music. $\frac{1}{2}$ or 1 unit.
- 484. Wind Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the appropriate applied music faculty. $\frac{1}{2}$ or 1 unit.
- 485. Percussion Instruments.** Prerequisite: Bachelor of Music degree; successful completion of a qualifying audition for the percussion faculty. $\frac{1}{2}$ or 1 unit.
- 489. Doctoral Projects.** Special projects for candidates for the Doctor of Musical Arts degree. Open only to students in the Doctor of Musical Arts program. Prerequisite: Consent of instructor. 0 to 4 units (summer session, 0 to 2 units).
- 490. Seminar in Music Teacher Education.** A course intended for prospective university teachers of undergraduate music education majors, which covers educational philosophy, curriculum design, methods of teaching and evaluation, and student teaching and observational experiences as they relate to undergraduate music teacher preparation. Prerequisite: Graduate standing in music education; at least three years of public school music teaching experience is highly recommended. $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** Research in special projects. Prerequisite: Consent of instructor. 0 to 4 units.

NAVAL SCIENCE

Head of Department: D. S. Gladman, USN

Department Office: 236 Armory Building, 505 East Armory Avenue, Champaign

- 100. Naval Science Laboratory.** A noncredit course designed to give the Naval ROTC student, through practical application, a better grasp of the naval science subjects taught in the classroom and a working knowledge of close order drill. 0 hours.
- 111. Introduction to Naval Science.** Naval organization and management practices examined within the context of the naval service; command and control, organization for logistics, service and support, functions and services of major components of the Navy and Marine Corps, and shipboard organization; and emphasis on management and leadership functions. Prerequisite: Consent of instructor. 2 hours.
- 112. Naval Ships Systems, I.** Studies ship compartmentation, propulsion systems, auxiliary power systems, interior communications, and ship control; types, structure, and purpose of naval ships; and examination of elements of ship design and ship stability. Prerequisite: Naval Science 111 or consent of instructor. 3 hours.
- 121. Naval Ships Systems, II.** Introduction to concepts of naval weapons systems, their capabilities and limitations, and their individual and complementary roles in a wide variety of offensive and defensive situations. Prerequisite: Consent of instructor. 3 hours.
- 124. Sea Power and Maritime Affairs.** Investigates the characteristics of sea power and their impact on the affairs of our nation; discusses those characteristics with historical and modern applications to the United States and other world powers. 2 hours.
- 231. Navigation and Naval Operations, I.** Provides the student with an understanding of the theory and techniques of the three types of marine (nautical) navigation: piloting, electronic, and celestial. Prerequisite: Consent of instructor. 3 hours.
- 232. Navigation and Naval Operations, II.** Designed to give an understanding of the concepts and use of relative motion principles, international maritime law and the rules of the nautical road, and the fundamentals of U.S. fleet organization, communication, and operations. Prerequisite: Junior standing in NROTC Program or consent of instructor. 3 hours.
- 242. Naval Leadership and Management, II.** Continuation of B ADM 210. Examines Navy organization, personnel administration procedures, human resource management programs, and military justice in terms of current management theory. Prerequisite: B ADM 210, or consent of instructor. 2 hours.

- 291. Evolution of Warfare.** Survey of the evolution of warfare emphasizing the philosophies and trends which have been significant in land warfare. 3 hours.
- 293. History of Amphibious Warfare.** Studies amphibious operations and the evolution of amphibious warfare doctrine and development. Prerequisite: Advanced undergraduate standing or consent of instructor. 3 hours.

NUCLEAR ENGINEERING

Head of Department: Barclay G. Jones

Department Office: 214 Nuclear Engineering Laboratory, 103 South Goodwin Avenue, Urbana

- 101. Introduction to Energy Sources.** Explains energy technologies using an elementary approach which presupposes no prior scientific or technical background. Examines all present and potential future energy sources including fossil fueled, solar, hydro and nuclear power. Demonstrations, a tour of the University's power plant, and a tour of the reactor on campus are integral parts of the course. Energy related incidents will be discussed as well, including their environmental, economic, social impact, technologies, and physical principles. 3 hours.
- 197. Nuclear Energy and Its Uses.** Discussions and lectures to orient freshmen and sophomores to the role of nuclear engineering in society and technology. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 241. Introduction to Radiation Protection.** Same as Environmental Studies 241. An introductory course in the elements of radiation protection and health physics, emphasizing practical applications. Prerequisite: Mathematics 120 or equivalent; and one semester of biology, chemistry, or physics, or consent of instructor. 2 hours. Seniors in nuclear engineering may not receive credit for Nuclear Engineering 241.
- 243. Radiation Protection Laboratory.** A laboratory course designed to provide an understanding of radiation and to introduce various radiation detection instruments and devices used in radiation protection. Prerequisite: Credit or concurrent registration in Nuclear Engineering 241 or consent of instructor. 1 hour.
- 290. Special Topics.** Considers selected areas which are of current interest to undergraduates in nuclear engineering but which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours.
- 295. Special Problems.** Individual investigations or studies of any phase of nuclear engineering selected by the student and approved by the department. Prerequisite: Senior standing or consent of instructor. 1 to 4 hours. May be repeated.
- 302. Nuclear Power Engineering.** Same as Mechanical Engineering 302. Principles of release and utilization of fission energy in nuclear power engineering; includes such topics as fission processes and controlled chain reactions; nuclear reactor types, design principles, and operational characteristics; power reactor design criteria; radiation hazards and radioactive waste treatment; economics; and other applications such as propulsion and research reactors. Students who plan to take more extensive training in nuclear technology are advised to take the Physics 346 - Nuclear Engineering 347 sequence. Prerequisite: Consent of instructor. 3 hours or 1 unit. Credit for both Nuclear Engineering 302 and Nuclear Engineering 347 cannot be given toward the same degree.
- 312. Nuclear Power Economics and Fuel Management.** A quantitative analysis of the economic impact of the nuclear power industry; nuclear fuel cycle and capital costs for thermal and fast reactors; optimization of the use of nuclear fuels to provide the lowest energy costs and highest system performance; and comparison between fossil fuel systems, fission systems, and controlled thermonuclear systems. Prerequisite: Junior standing; Mechanical Engineering 302, or Nuclear Engineering 302 or 347, or consent of instructor. 3 hours or 1 unit.
- 321. Introduction to Controlled Thermonuclear Fusion.** Same as Electrical and Computer Engineering 321. Review of Maxwell's equations and introduction to plasma physics as

it applies to controlled thermonuclear fusion problems; energy balance; plasma confinement and stability; and recent approaches to the fusion reactor. Prerequisite: Senior or graduate standing, or consent of instructor. 4 hours or 1 unit.

331. **Materials in Nuclear Engineering.** Develops a materials engineering background applied to nuclear systems; relates structure of metals, ceramics, glasses, and concretes to their physical and mechanical properties; develops phase formation and reaction kinetics from basic thermodynamics principles; and discusses materials performance in nuclear systems, including irradiation damage and effects. Prerequisite: Junior standing in engineering or the physical sciences. 3 hours or $3/4$ unit.
341. **Principles of Radiation Protection.** Sources of nuclear radiation; ionization and energy deposition in physical and biological media; principles of dosimetry; determination of protection limits for external and internal emitters; and basic shielding analysis. Prerequisite: Physics 346 or Chemistry 397, or consent of instructor. 4 hours or 1 unit.
342. **Radioactive Waste Management.** Sources and characteristics of radioactive wastes; methods of treatment; monitoring techniques; methods of hazard evaluation; special aspects of solid, liquid, and gaseous wastes; and disposal, both temporary and permanent. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 2 hours or $1/2$ unit.
346. **Modern Physics for Nuclear Engineers.** Same as Physics 346. See Physics 346.
347. **Introduction to Nuclear Engineering.** Energy resources and nuclear power systems; basic operational principles of fission and fusion reactors; fission reactor control and heat removal; radiation protection; shielding of reactors; safeguards, licensing, and environmental considerations. Prerequisite: Credit or concurrent registration in Physics 346, or equivalent. 4 hours or 1 unit. Credit for both Nuclear Engineering 347 and Nuclear Engineering 302 cannot be given toward the same degree.
351. **Nuclear Engineering Laboratory.** Radiation detection and instrumentation; radiation dosimetry and shielding; basic measurements in nuclear engineering; engineering applications; and micro computer data acquisition and experimental control. Prerequisite: Physics 346 or equivalent. 3 hours or $3/4$ unit.
352. **Advanced Nuclear Engineering Laboratory.** Students can choose experiments from the following areas: reactor experiments, fusion experiments, subcritical assemblies, and nuclear engineering applications. Three experiments and five weeks per credit hour or $1/4$ unit. Prerequisite: Nuclear Engineering 347 and 351 or equivalents; or consent of instructor. 1 to 3 hours, or $1/4$ to $3/4$ unit. May be repeated to a maximum of 5 hours or $1 1/4$ units.
355. **Reactor Statics and Dynamics.** Intermediate-level analysis of thermal and fast reactor assemblies; reactor statics, reactor dynamics, and introductory transport theory; homogeneous and heterogeneous reactors; and multigroup diffusion theory, perturbation theory, reactivity coefficients, and control rod analysis. Prerequisite: Nuclear Engineering 347 or equivalent, or consent of instructor. 4 hours or 1 unit.
357. **Safety Analysis of Nuclear Reactor Systems.** Basic safety philosophy in nuclear reactor systems; brief review of nuclear reactor systems; regulatory processes; siting considerations; safety problems related to reactor dynamics; evaluation of postulated accidents; risks associated with nuclear fuel cycle; and methods of systems safety analysis. Prerequisite: Nuclear Engineering 302 or 347, or equivalent, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
358. **Design in Nuclear Engineering.** Introduction to design in nuclear engineering systems; basic principles of definition, organization, constraints, modeling, and optimization of system design; case studies; and class design projects applying these basic principles. Prerequisite: Nuclear Engineering 347. 3 hours or $3/4$ unit.
390. **Intermediate Special Topics.** Considers selected areas of current interest in nuclear engineering which are not adequately covered in other formal courses. Prerequisite: Consent of instructor. 1 to 4 hours, or $1/4$ to 1 unit.
397. **Radiochemistry.** Same as Chemistry 397. See Chemistry 397.
401. **Fundamentals of Nuclear Engineering.** A lecture and problem course to provide background for further work in nuclear engineering; problems in materials, heat transfer, and fluid flow; and special emphasis on basic ideas and the mathematical similarity of

problems in heat transfer, fluid flow, and neutron diffusion. Prerequisite: Mathematics 345 or equivalent; credit or concurrent registration in Chemistry 397 or Physics 382, or equivalent. 1 unit.

- 411. Nuclear Reactor Heat Transfer.** Selected topics in nuclear reactor heat transfer: thermal analysis of fuel elements under steady and transient operation; convective energy transport from reactor cores; two-phase flow and boiling in reactor cores; and liquid metal coolant systems. Prerequisite: Nuclear Engineering 401 or consent of instructor. 1 unit.
- 421. Interaction of Radiation with Matter.** Topics in the interaction of radiation with matter of interest to the nuclear engineering field: the kinematics, kinetics, and cross sections involved in the interaction of charged particles, electromagnetic radiation, and neutrons. Prerequisite: Physics 346 or Chemistry 397, or equivalent. 1 unit.
- 422. Controlled Fusion Systems, I.** Same as Electrical and Computer Engineering 422. Development of plasma models for fusion analysis; treatment of plasma heating and confinement with applications to current experiments; energy balances; and energy extraction. Prerequisite: Nuclear Engineering 321 or consent of instructor. 1 unit.
- 423. Controlled Fusion Systems, II.** Development of plasma models for high-beta pulsed-fusion systems and for pellet fusion systems; heating and confinement mechanisms; energy balances and energy extraction; and applications to current experiments. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
- 424. Stability Problems in Fusion Systems.** Survey of instabilities of interest in controlled thermonuclear fusion; overall system instabilities in fusion power reactors and applications; macro-instabilities and micro-instabilities of interest in CTR devices, and practical implications for proposed fusion reactor designs; and instabilities resulting from refueling and heating. Prerequisite: Nuclear Engineering 422 or consent of instructor. 1 unit.
- 425. Nuclear-Electrical Energy Conversion.** Same as Electrical and Computer Engineering 425. Advanced concepts in nuclear radiation energy conversion of importance in both power production and radiation detection; analysis and applications of direct collection of charged particles; and theory and applications of radiation-induced ionization and excitation. 1 unit.
- 431. Nuclear Metallurgy.** Metallurgical principles applied to materials problems in nuclear engineering; includes topics in production of uranium, corrosion, radiation damage, fuel element fabrication, and fuel reprocessing. Prerequisite: Consent of instructor. 1 unit.
- 441. Nuclear Radiation Shielding.** Basic concepts, radiation sources, elementary gamma ray and neutron shielding, geometry factors in shielding, advanced techniques (such as Monte Carlo and discrete ordinates), special topics (such as shield heating, duct streaming, and albedo theory), and practical aspects. Prerequisite: Nuclear Engineering 341 or consent of instructor. 1 unit.
- 454. Nuclear Engineering Laboratory Investigations.** Individual investigation in nuclear engineering. Prerequisite: Consent of instructor. $1/4$ to 2 units.
- 455. Reactor Theory, I.** Same as Physics 455. Advanced development of neutron transport theory; neutron slowing-down and resonance absorption; approximations to the transport equation; direct numerical methods and other techniques of approximation theory applied to the neutron transport equation; and advanced topics. Prerequisite: Nuclear Engineering 355, graduate standing in physics, or consent of instructor. 1 unit.
- 456. Reactor Theory, II.** Same as Physics 456. Advanced treatment of the theory of slow-neutron scattering, neutron thermalization, Doppler broadening, fuel depletion and fuel loadings, properties of neutron migration operators, and mathematical neutron transport theory; interpretation of related experiments; and advanced topics. Prerequisite: Nuclear Engineering 421 or 455, graduate standing in physics, or consent of instructor. 1 unit.
- 457. Advanced Reactor Analysis.** Forms of the multigroup neutron transport and diffusion equations; analysis of heterogeneous reactors; direct numerical solution of the transport and diffusion equations; integral and coarse mesh methods; iterative solutions, convergence, and acceleration; synthesis methods; Monte Carlo methods for particle transport; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.

- 458. Advanced Nuclear Engineering Design.** A classroom exercise in the conceptual design of a nuclear engineering system involving a synthesis of previous learning in the field of nuclear engineering and related disciplines; the design includes all necessary ingredients for the system, such as core, thermal-hydraulics, shielding, material selection, and control. Prerequisite: Five 300- and/or 400-level nuclear engineering courses including Nuclear Engineering 347 and 401, or equivalent; or consent of instructor. 1 unit.
- 459. Asymptotics and Singular** Perturbations in Engineering and Physics. Same as Mathematics, Physics, and Theoretical and Applied Mechanics 459. See Mathematics 459.
- 460. Reactor Kinetics and Dynamics.** Diffusion and transport neutron balances with delayed neutrons; formal development of the point reactor kinetics equations; analytic and numerical solutions of the point reactor kinetics equations; space-dependent, multigroup reactor kinetics; reactivity measurements; reactor noise analysis; and advanced topics. Prerequisite: Nuclear Engineering 455 or consent of instructor. 1 unit.
- 490. Special Topics.** Considers selected areas of current interest in research which are not adequately covered in other courses. Prerequisite: Consent of instructor. $\frac{1}{2}$ or 1 unit.
- 495. Nuclear Engineering Problems.** Individual study in areas of nuclear engineering and closely related fields not covered by regular course offerings. The work is carried out under the supervision of a member of the faculty. Prerequisite: At least 3 units of graduate work; consent of instructor. $\frac{1}{4}$ to 2 units.
- 497. Seminar in Nuclear Science and Engineering.** Lectures and discussions on current work in research and development in nuclear engineering and related fields by staff, advanced students, and visiting lecturers. 0 or $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

NURSING

(Including Nursing Sciences, Maternal-Child Nursing, Medical- Surgical Nursing, Psychiatric Nursing, Public Health Nursing, and Administrative Studies)

Director: Nori I. Komorita

Office: 408 South Goodwin Avenue, Urbana

The following courses are offered in the College of Nursing R.N. Baccalaureate Completion Program and Adult Health Nursing and Family Nurse Practitioner Graduate Programs on the Urbana-Champaign campus. Although these courses are part of the undergraduate and graduate offerings of the College of Nursing at the Chicago campus, which has ultimate responsibility for them, under a cooperative arrangement they are being offered on the Urbana-Champaign campus as well. The graduate offerings are a part of the Graduate College at the Chicago campus.

NOTE: In the following courses with the exception of NUSC 200, enrollment is limited to students who have senior standing in the College of Nursing R.N. Baccalaureate Completion Program, or who are admitted to the Graduate College of the Health Sciences Center. NUSC 200 is open to non-nursing and nursing students.

Nursing Sciences

- 200. Introduction of Professional Nursing.** Examination of current issues and trends in relation to historical events, future of nursing, ethics; emphasis on professionalism, role development, and theories of nursing. 2 hours.
- 293. Seminar in Nursing.** Exploration, reporting, and discussion of issues in nursing and related fields; effect of contemporary concepts and values on nursing today and on future development of the profession. Enrollment limited to students in College of Nursing RN Baccalaureate Completion program; senior standing. 3 hours.

- 303. Professional Basis of Nursing Practice.** Conceptual basis of nursing and its relationship to the nursing process used to develop comprehensive care plans and explore emerging issues in practice. Prerequisite: Consent of instructor. 6 hours.
- 313. Nursing Care of the Family in the Community.** Application of primary health care to families, emphasizing childbearing. Epidemiology health promotion, community diagnosis, and family case management applied to nursing in multiple settings. Prerequisite: Nursing Sciences 303, 310, 311, and 312. 10 hours.
- 314. Nursing Research.** Principles of scientific investigation emphasizing relationships between research design, nursing theory, and problems of nursing practice. Includes ethical and legal issues. Prerequisite: Introductory statistics course. 2 hours.
- 317. Long-Term Nursing Care.** Nursing care of clients with/at risk for chronic, recurring, long-term health problems; promotion, maintenance and adaptation in a variety of settings. Prerequisite: Nursing Sciences 313 and 315. 3 hours.
- 330. Nursing Management and Leadership in Health Care Systems.** Theoretical principles and issues relevant to the role of the nurse manager in relation to delivery of nursing care including leadership, management, and external influential policy issues. Prerequisite: Nursing Sciences 313 and 315. 4 hours.
- 394. Special Topics: Undergraduate.** Discusses selected topics of current interest. Offered according to sufficient student demand and instructor availability. Prerequisite: Completion of Level II courses and consent of instructor. 1 to 4 hours. May be repeated for credit and may register for more than one section per term.
- 399. Independent Study: Undergraduate.** Individually arranged study of student selected topic under guidance of individual instructor. Prerequisite: Completion of Level II courses and consent of instructor. 1 to 4 hours. May be repeated for credit and may register for more than one section per term. 0 to 5 hours.
- 429. Methods of Management in Clinical Nursing.** Guided experience in planning, organizing, and managing a division of nursing service in the student's clinical specialty; includes opportunity to observe and participate in the supervisory role, planning a supervisory program, and designing strategy for effective change and for evaluating outcomes. Offered if sufficient student demand and instructor availability. Prerequisite: Graduate standing in nursing, General Nursing 300, or consent of instructor. 3 or 4 hours.
- 494. Special Topics: Masters.** Discusses selected topics of current interest. Offered according to sufficient student demand and instructor availability. Prerequisite: Consent of instructor. 1 to 3 hours.
- 500. Conceptual Basis for Nursing.** Explanation, application, and evaluation of selected theories and frameworks used in nursing. Prerequisite: Consent of instructor. 3 hours.
- 501. Theoretical Basis of Adult Health Nursing.** Examines selected adult development theories, interaction of postulates of those theories, and other variables with adult's health status and relevance to nursing process. Prerequisite: Consent of instructor. 4 hours.
- 502. Concept Seminar in Adult Health Nursing.** Critical analysis of selected theories and concepts in the practice of adult health nursing; Nursing intervention behaviors evaluated; emphasis on current research. Prerequisite: Consent of instructor. 4 hours.
- 504. Nursing Research Design.** Application of the scientific research method to professional nursing practice. Research methods appropriate to the investigation of nursing phenomena. Prerequisite: Consent of instructor. 3 hours.
- 520. Field Experience in Adult Health Nursing.** Concentrated field experience in Adult Health Nursing in a variety of health care agencies, based on student need. Prerequisite: Consent of instructor. 1 to 6 hours.
- 546. Practicum for Teaching Nursing.** Field experience in teaching nursing in classroom and clinical settings. student experience in supervising, counseling, and evaluating students in clinical practice in selected settings. Prerequisite: Consent of instructor. 4 hours.
- 595. Seminar in Nursing.** Identifies and analyzes a broad range of issues related to modern nursing and nursing research. Topics will vary according to student interests and instructor availability. Prerequisite: Consent of instructor. 1 to 3 hours.

596. **Independent Study: Graduate.** Selected problems in nursing are investigated under the direction of a graduate faculty member. Modes of investigation are determined by the nature of the nursing problem selected. Prerequisite: Consent of instructor. 0 to 4 hours.
597. **Project Research: Masters.** Master's student project research. Prerequisite: Consent of instructor. 0 to 16 hours.
598. **Thesis Research: Masters.** Master's student thesis research. Prerequisite: Consent of instructor. 0 to 16 hours.

Maternal-Child Nursing

322. **Selected Focus: Maternal-Child Nursing.** Selected focus in maternal-child nursing including application of management principles in a clinical setting. Topics announced in *Timetable*. Prerequisite: Level II and Level III courses; credit or concurrent registration in Nursing Sciences 330; and consent of instructor. 5 hours.
353. **Nursing Dimensions of Human Sexuality.** Human sexuality across the life cycle; exploration of physiological, psychological, and sociocultural factors influencing sexuality; and health/illness behaviors. Prerequisite: Nursing Sciences 301 and 303. 2 hours.

Medical-Surgical Nursing

322. **Selected Focus: Medical-Surgical Nursing.** Selected focus in medical-surgical nursing practice including application of management principles in a clinical setting. Topics announced in *Timetable*. Prerequisite: Completion of Level II and Level III courses; credit or concurrent registration in Nursing Sciences 330; and consent of instructor. 5 hours.
350. **History of Nursing.** Trends in nursing education and practice in terms of historical development of nursing. Focus on social, cultural, religious, political and education forces influencing the evolution of nursing. Prerequisite: Level II courses. 2 hours.
356. **Nursing Care of the Patient with Pain.** Pain theory, assessment and treatment strategies; physical, psychological, and spiritual dimensions of the pain experience. The nursing implications and current research of pain theory. Prerequisite: Nursing Sciences 311 or 303. 2 hours.
400. **Advanced Clinical Physiology for Health Care Providers.** Physiological principles and their application to nursing clinical practice. Prerequisite: Undergraduate physiology course or consent of instructor. 4 hours.

Psychiatric Nursing

322. **Selected Focus: Psychiatric-Mental Health Nursing.** Selected focus in psychiatric mental health nursing practice including application of management principles in a clinical setting. Topics announced in *Timetable*. Prerequisite: Completion of Level II and Level III courses; credit or concurrent registration in Nursing Sciences 330; and consent of instructor. 5 hours.
351. **Research Experience in Nursing.** Provides opportunity for students to have a guided experience in conducting nursing research, by participating in on-going faculty research. Prerequisite: Nursing Sciences 314. 2 to 4 hours.
352. **Conceptual Models for Nursing Assessment of the Family.** Comprehensive family assessment model consisting of structural, developmental and functional components. Students conduct an in-depth analysis of a family. Prerequisite: Nursing Sciences 315. 2 hours.

Public Health Nursing

230. **Family and Community Centered Nursing.** Nursing and public health concepts related to care of individuals, families, and aggregates: epidemiology, health promotion, community diagnosis, and family case management. Prerequisite: Nursing Administrative Studies 210 and Medical-Surgical Nursing 225. 6 hours.
322. **Selected Focus: Public Health Nursing.** Selected focus in Public Health nursing including application of management principles in a clinical setting. Topics announced in *Timetable*. Prerequisite: Completion of Level II and Level III courses: credit or concurrent registration in Nursing Sciences 330; and consent of instructor. 5 hours.
354. **Care of High-Risk Groups in the Community.** Explores nursing interventions, community resources, and continuity of care for high-risk groups throughout the life cycle, such as preterm infants, substance abusers, persons with AIDS, and cardiovascular risk groups. Prerequisite: Nursing Sciences 313. 2 hours.
355. **Nursing Practice and the Human-Animal Bond.** The roles of companion animals in nursing practice to promote health. Demonstration projects on animal-facilitate therapy are presented. Prerequisite: Completion of Level II courses. 2 hours.
500. **Health Maintenance and Promotion in Primary Care Nursing.** The first of a three course sequence to prepare nurse practitioners to provide primary care to well families and individuals. Prerequisite: Proficiency in health assessment and consent of instructor. 2 hours.
520. **Community Assessment and Program Planning in Public Health Nursing.** Explores theoretical and substantive issues related to the concepts of community assessment and health planning. Focuses on application of theories to community nursing services. Prerequisite: Concurrent registration in Epidemiology 400 or consent of instructor. 3 hours.
521. **Implementation and Evaluation of Public Health Nursing Services.** Explores the implementation of health programs, conducts evaluation research and implications for nursing practice. Emphasizes application of the nursing process to community health programs. Prerequisite: Public Health Nursing 520. 3 hours.
524. **Primary Care Nursing of Acute and Chronic Disorders I.** The first of two course sequence designed to prepare nurse practitioners to assess, diagnose, and manage stable chronic conditions and acute episodic illnesses. Prerequisite: Public Health Nursing 500. 5 hours.
525. **Primary Care Nursing of Acute and Chronic Disorders, II.** The second of a two course sequence designed to prepare nurse practitioners to assess, diagnose, and manage stable chronic conditions and acute episodic illnesses. Prerequisite: Public Health Nursing 524. 3 hours.

Administrative Studies

322. **Selected Focus: Administrative Studies in Nursing.** Selected focus in nursing management emphasizing a specific specialized aspect of management/leadership of health care delivery in an organizational context. Topics announced in *Timetable*. Prerequisite: Completion of Level II and Level III courses and credit or concurrent registration in Nursing Sciences 330 or consent of instructor. 5 hours.
340. **Public Policy: Nursing and Health Care.** Major policy issues relevant to the health care delivery system emphasizing the interrelationship between the policy process, the role of the nurse, and the delivery of health care. 3 hours.
400. **Nursing Management in Health Care Systems.** Overview of the principles, objectives, and methods of managing nursing services and the application of these in a division of a health and services institution or agency. Prerequisite: Consent of instructor. 2 hours.

NUTRITIONAL SCIENCES

Director: J. W. Erdman, Jr.

Program Office: 451 Bevier Hall, 905 South Goodwin Avenue, Urbana

- 320. Nutritional Aspects of Disease.** Same as Foods and Nutrition 320. See Foods and Nutrition 320.
- 324. Biochemical Aspects of Human Nutrition.** Same as Food Science 324 and Foods and Nutrition 324. See Food Science 324.
- 328. Community Nutrition.** Same as Foods and Nutrition 328. See Foods and Nutrition 328.
- 400. Nutritional Sciences Seminar.** Discussions of current problems in nutritional sciences. Required of all graduate students in the nutritional sciences program. Prerequisite: Nutritional Sciences 410 and consent of instructor. 0 or $\frac{1}{4}$ unit.
- 410. Current Topics in Nutritional Research.** Same as Animal Sciences 410 and Food Science 410. Discussion of current research problems in experimental nutrition. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. $\frac{3}{4}$ unit.
- 411. Chemistry of Nutritional Processes.** Same as Animal Sciences 411 and Food Science 411. Biochemical aspects of nutrition with emphasis on the function, regulation, and metabolism of nutrients in man. Prerequisite: Biochemistry 350 or 352; an upper-level course in nutrition. 1 unit.
- 450. Problems in Clinical Nutrition.** Students meet weekly with University faculty and hospital clinical staff for rounds and tutorial-type discussions which evaluate the nutritional status of hospitalized patients and suggest appropriate nutritional management. Students write research proposals on specific problems or, by arrangement with the instructor, term papers on the nutritional management of a clinical problem. Prerequisite: Nutritional Sciences 410 and 411, or consent of instructor. $\frac{1}{2}$ unit.
- 461. Advanced Clinical Nutrition, I.** Same as Medical Sciences 461. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; reviews the theory behind nutritional treatment of disease states. Prerequisite: Credit or concurrent registration in Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 461.
- 462. Advanced Clinical Nutrition, II.** Same as Medical Sciences 462. Students meet weekly with faculty and hospital clinical staff to discuss specific needs for nutritional support of hospitalized patients. Physicians present case studies, representative of clinical problems encountered in practice, which serve as the basis for student presentations relating disease processes to nutritional management; incorporates the nutritional assessment and treatments learned in the first semester into nutritional care of hospitalized patients. Prerequisite: Nutritional Sciences 450, or consent of instructor. 2 hours or $\frac{1}{2}$ unit. Hourly credit only applicable to Medical Sciences 462.
- 493. Individual Topics in Nutrition.** For students majoring in nutritional sciences who wish to undertake individual studies of a nonthesis nature in problems or topics not covered in other courses; may be taken under the direction of any member of the nutritional sciences faculty, with the exception of the student's own thesis adviser. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

PAINTING

(See Art and Design)

PHILOSOPHY

Chair of Department: Professor T. McCarthy

Department Office: 105 Gregory Hall, 810 South Wright Street, Urbana

NOTE: Students are urged to consult the detailed descriptions of all philosophy courses to be offered in particular semesters. These descriptions may be obtained in the department office at any time beginning one week prior to advance enrollment.

101. **Introduction to Philosophy.** Consideration of some main problems of philosophy concerning, for example, knowledge, God, mind and body, and human freedom. 3 hours.
102. **Logic and Reasoning.** A practical study of logical reasoning; techniques for analyzing and criticizing arguments, with emphasis on assessing the logical coherence of what we read and write. 3 hours.
103. **Scientific Reasoning.** Practical study of scientific reasoning; methods for evaluating scientific evidence and for using scientific information in making decisions. 3 hours.
105. **Introduction to Ethics.** Some basic questions of ethics, discussed in the light of influential ethical theories and with reference to specific moral problems, such as: what makes an action morally right? are moral standards absolute or relative? what is the relation between personal morality and social morality, and between social morality and law? 3 hours. Credit is not given for both Philosophy 105 and 106.
106. **Ethics and Social Policy.** An examination of the moral aspects of social problems, and a survey of ethical principles formulated to validate social policy. 3 hours. Credit is not given for both Philosophy 106 and 105.
107. **Introduction to Political Philosophy.** An examination of the philosophical bases of democracy and some alternative political forms. 3 hours.
110. **World Religions.** Same as Religious Studies 110. Survey of the leading living religions, including Hinduism, Buddhism, Taoism, Mohammedanism, Judaism, and Christianity; examination of basic texts and of philosophic theological elaborations of each religion. 3 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
198. **Freshman Seminar.** Investigation of selected fundamental topics of philosophical inquiry. See *Timetable* for current topics. Prerequisite: Freshman James Scholar. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Philosophy in Literature.** A consideration of the philosophical themes implicit in a variety of important literary works, both classical and modern; includes such authors as Sophocles, Shakespeare, Goethe, Dostoevsky, and Sartre. 3 hours.
202. **Symbolic Logic.** An introduction to the techniques of formal logic, dealing primarily with truth-functional logic and quantification theory. 3 hours.
203. **Ancient Philosophy.** An introduction to ancient philosophy, concentrating on Plato and Aristotle, dealing with such topics as metaphysics, ethics, and the theory of knowledge. 4 hours.
206. **Early Modern Philosophy.** The history of philosophy from Descartes to Kant. 4 hours.
207. **Early Modern Philosophy, I.** Bacon, Hobbes, Locke, Berkeley, and Hume. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
208. **Early Modern Philosophy, II.** Descartes, Spinoza, Leibniz, and Kant. Philosophy 207 and 208 taken concurrently in the summer session are the equivalent of Philosophy 206. 2 hours. Offered in the summer session only.
210. **Ethics.** Problems in ethical theory; the nature of right and wrong, justice, conscience, moral feelings, etc. 3 hours.
214. **Moral Problems in Medicine and Biology.** A philosophical study of selected moral and social problems concerning medicine and biology, such as euthanasia, abortion, allocation of scarce medical resources, health care and rights, and genetic engineering. 3 hours.

225. **Recent European Philosophy.** Introduction to the major recent philosophical movements in Europe, such as phenomenology, existentialism, philosophical anthropology, and neo-Marxism. 3 hours.
230. **Philosophy of Religion: Introduction.** Same as Religious Studies 230. Introduction to philosophical analysis of religious thought and experience. 3 hours.
250. **Conceptions of Human Nature.** A comparative examination of important historical and contemporary conceptions of human nature. 3 hours.
270. **Philosophy of Science.** Investigation of the nature of scientific knowledge by examining archetypal examples from physical science (e.g., Ptolemaic and Copernican astronomy); nature of scientific truth, validation of theories, nature of scientific theories, evolution of theories, experimental procedure, role of presuppositions, scientific revolutions, etc. 3 hours.
280. **Current Controversies.** Philosophical examination of positions taken on some issue of current concern, e.g., human sexuality, death and dying, feminism, race, intelligence, war, and sociobiology. See *Timetable* for current topics. 3 hours. May be repeated with consent of department chair.
290. **Individual Study.** Readings in selected philosophical topics. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to juniors and seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the department chair. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
292. **Thesis.** Special training in philosophical investigation. This course may be taken by honors students in partial fulfillment of department honors requirements. Prerequisite: Open to seniors with a grade-point average of 4.0 only by prior arrangement with a regular member of the staff and with consent of the department chair. 2 to 4 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
298. **Advanced Undergraduate Seminar.** Seminar on selected philosophical topics; intended primarily for advanced undergraduate philosophy majors. Prerequisite: A grade-point average of 4.0 and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
301. **Philosophy and Film.** Study of procedures for interpreting narrative films and evaluating specific interpretations, as well as an examination of philosophical issues raised in selected films. Prerequisite: One course in philosophy or in cinema studies. 4 hours or 1 unit.
304. **Medieval Philosophy.** The history of philosophy from St. Augustine to William of Ockham. Prerequisite: Philosophy 101 or 203. 3 hours, or $\frac{3}{4}$ or 1 unit.
310. **Classical Ancient Philosophers.** An intensive study of one ancient philosopher or the intensive study of a major philosophical problem through the consideration of a number of ancient philosophers; chief emphasis on Plato and/or Aristotle. Prerequisite: One course in philosophy, preferably Philosophy 203. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit with the consent of the department chair. Students may register for this course more than once in the same term.
311. **Nineteenth Century Philosophy.** Examination of the thought of such major figures as Hegel, Marx, and Nietzsche. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
312. **Classical Modern Philosophers.** Intensive study of one, or in special cases, two major philosophers of the period 1600-1900, e.g., Descartes, Hume, Kant, or Hegel. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated. Students may register for this course more than once in the same term.
313. **American Philosophy.** Examination of American philosophers from colonial to recent times, for example, Edwards, Peirce, James, Dewey. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
314. **Major Recent Philosophers.** Intensive study of one or two important philosophers of the present century, e.g., Wittgenstein, Dewey, Heidegger, or Quine. Topic varies; see *Timetable*. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit. May be

repeated for credit with consent of the department chair. Students may register for this course more than once in the same term.

316. **Anglo-American Philosophy Since 1900.** Introduction to the major philosophical developments in England and America in the present century, focusing on such writers as G. E. Moore, Bertrand Russell, A. J. Ayer, Ludwig Wittgenstein, and W. V. Quine. Prerequisite: One course in philosophy. 3 hours or 1 unit.
317. **Scientific Thought, I.** Same as History 339 and Sociology 305. A historical and critical survey of the development of science and its philosophical interpretation to the death of Newton. 3 hours or 1 unit.
318. **Scientific Thought, II.** Same as History 340 and Sociology 306. A historical and critical survey of the development of science and its philosophical interpretation from the death of Newton to the early twentieth century. Prerequisite: Philosophy 317. 3 hours or 1 unit.
319. **Space, Time, and Matter.** Same as Physics 319. See Physics 319.
321. **Ethics and Value Theory.** A systematic study of selected classics in moral philosophy by such philosophers as Aristotle, Hume, and Kant. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
322. **Recent Developments in Ethics.** Intensive treatment of issues in contemporary ethical theory. Prerequisite: One course in ethics. 3 hours, or $\frac{3}{4}$ or 1 unit. May be repeated for credit once with consent of the department chair.
323. **Philosophy of Art.** Examination of philosophical interpretations of art and aesthetic experience by influential classical and recent writers. 3 hours, or $\frac{3}{4}$ or 1 unit.
324. **Philosophy of Religion.** Same as Religious Studies 362. Considers central issues in the philosophy of religion, e.g., the justification of religious belief, the nature of God, religious experience, etc. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
325. **Philosophy of Mind.** Philosophical problems arising in connection with mental phenomena; the relation of mind and body; free will and determinism; our knowledge of other minds; and the self and personal identity. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
326. **Metaphysics.** Investigation of various metaphysical issues concerning, for example, existence, substance, particulars and universals, and space and time. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
330. **Theory of Knowledge.** Investigation of issues concerning, for example, the nature and possibility of knowledge; its forms and limits; its relation to belief, truth, and justification; and the nature of truth. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
331. **Analytic Philosophy.** Intensive study of works of important analytic philosophers, such as Wittgenstein, Austin, and Quine, on problems of knowledge, method, and other selected topics. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
335. **Social Philosophy.** Selected topics from the nature of social organization, nature and convention, utility, justice, equality, liberty, rights, and duties. Prerequisite: Philosophy 105, 106, or 321, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
336. **Philosophy of Law and of the State.** Examination of issues in the philosophy of law, such as the nature of law, law and morality, justice, liberty and authority, punishment, and legal responsibility. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
337. **Semantics.** A study of semantical concepts such as meaning, truth, reference, and denotation; the relation of meaning, verification, and truth; and semantical paradoxes. Prerequisite: A course in logic. 3 hours, or $\frac{3}{4}$ or 1 unit.
338. **Philosophy of Language.** Same as Linguistics 338. A historical or comparative study of the philosophy of language. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
339. **Philosophy of Mathematics.** Same as Mathematics 339. Introduction to some of the main philosophical problems and contemporary viewpoints concerning mathematical concepts, mathematical methods, and the nature of mathematical truth. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
341. **Existential Philosophy.** Study of a selection of the major writings of the more important existential philosophers, e.g., Heidegger, Jaspers, and Sartre. Prerequisite: One course in philosophy (preferably Philosophy 225 or 311), or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

343. **Phenomenology.** Study of the development of phenomenology from Husserl to the present. Prerequisite: One course in philosophy. 3 hours, or $\frac{3}{4}$ or 1 unit.
344. **Topics in Recent European Philosophy.** Examines the continental treatments of selected issues, such as interpersonal relationships, human nature, perception or interpretation; see *Timetable* for current topics. Prerequisite: Philosophy 225, 311, 341, 343, 345, or 347; or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Marxist Philosophy.** Examination of the philosophical writings of a number of Marxist writers, from Marx himself to such neo-Marxists as Schaff, Petrovic, Sartre, and Marcuse. 3 hours, or $\frac{3}{4}$ or 1 unit.
347. **Post-Structuralist French Philosophy.** Intensive study of a selection of the major writings of recent French philosophers, such as Foucault and Derrida. Prerequisite: Philosophy 225, 341, or 343, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
353. **Formal Logic and Philosophy.** Techniques and results of symbolic logic, with special attention to topics of philosophical importance. Prerequisite: Philosophy 202, graduate standing, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
354. **Advanced Symbolic Logic.** Completeness, compactness, and Lowenheim-Skolem theorems for first-order logic; incompleteness and undecidability of formal systems; and additional material on proof theory, model theory, or axiomatic set theory as time permits. Prerequisite: Philosophy 202 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
371. **Philosophy of Science: Contemporary Issues.** Examines important developments and controversies in recent philosophy of science. Prerequisite: Philosophy 270 or consent of instructor. 3 hours or 1 unit.
375. **The Philosophy of Social Science.** Same as Anthropology 329 and Sociology 325. A survey of philosophical problems encountered in the disciplines concerned with man and society, with particular emphasis on the extent to which questions and subject matter in these fields are amenable to scientific treatment. 3 hours or 1 unit.
377. **Philosophy of Psychology.** A philosophical examination of the aims, methods, and structure of psychology, with special attention to such issues as the nature of explanations of behavior, the adequacy of behaviorism as a philosophy of psychology, and the place of the mind in psychological investigation. Prerequisite: Two courses in psychology, or consent of instructor. 3 hours or 1 unit.
401. **Seminar in the History of Philosophy.** Study of selected major philosophers, movements, problems, or topics in the history of philosophy; see *Timetable* for current topics. 1 unit. May be repeated. Students may register for this course more than once in the same term.
411. **Seminar in Ethical Theory.** Intensive study of problems in ethical theory. 1 unit. May be repeated as topics vary. Students may register for this course more than once in the same term.
412. **Seminar in Social Philosophy.** A seminar designed to study special problems in social philosophy. See *Timetable* for current topics. 1 unit. May be repeated.
413. **Seminar in the Philosophy of Logic.** Selected topics in contemporary logical theory. Prerequisite: A course in logic or consent of instructor. 1 unit. May be repeated.
417. **Seminar in the Philosophy of Science.** Various problems arising from specific studies in philosophy pertaining to science and vice versa. To be offered with varying topics. 1 unit. May be repeated.
420. **Seminar in Semantics.** Same as Communications 420. Intensive study of important contemporary contributions in the fields of semantics, analytic philosophy, and the philosophy of language. Prerequisite: Graduate standing in philosophy or equivalent. 1 unit. May be repeated.
421. **Seminar in Contemporary Problems.** Intensive study of selected problems or topics in contemporary philosophy. 1 unit. May be repeated. Students may register for this course more than once in the same term.
423. **Seminar in the Theory of Knowledge.** Selected topics and writings of major importance in the contemporary philosophy of knowledge. 1 unit. May be repeated.
425. **Seminar in the Philosophy of Mind.** Selected topics from major writings in the philosophy of mind. 1 unit. May be repeated.

483. **Individual Topics.** Individual study and oral and written reports on topics not covered in other courses. Topics and plan of study must be approved by the candidate's adviser and by the staff member who directs the work. $\frac{1}{2}$ or 1 unit (summer session, $\frac{1}{2}$ to 2 units).
490. **Directed Research.** Restricted to students satisfying requirements for the master's degree by writing a substantial essay. 0 to 3 units. Normally taken for 2 units credit but may be taken for 3 units credit with consent of department chair.
499. **Thesis Research.** 0 to 4 units.

PHOTOGRAPHY

(See Art and Design)

PHYSICS

Head of Department: D. K. Campbell

Department Office: 211 Loomis Laboratory of Physics, 1110 West Green Street, Urbana

101. **General Physics (Mechanics, Heat, and Sound).** Noncalculus-based course for students in the life sciences, preprofessional health programs, agriculture, and veterinary medicine. Prerequisite: Trigonometry. 5 hours.
102. **General Physics (Light, Electricity, Magnetism, and Modern Physics).** Noncalculus-based course for students in life sciences, preprofessional health programs, agriculture, and veterinary medicine. Prerequisite: Physics 101. 5 hours.
106. **General Physics (Mechanics).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Mathematics 120; credit or concurrent registration in Mathematics 132. 4 hours.
107. **General Physics (Heat, Electricity, and Magnetism).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 106; credit or concurrent registration in Mathematics 242. 4 hours.
108. **General Physics (Light, Sound, and the Structure of Matter).** Lectures with demonstrations, recitations, and laboratory. For students in engineering, mathematics, physics, and chemistry. Prerequisite: Physics 107; credit or concurrent registration in Mathematics 242. 4 hours.
140. **Practical Physics: How Things Work—A Course for Nonscientists.** A nonmathematical lecture-demonstration course for nonscience students, underscoring the generality and ubiquity of basic physical laws in understanding commonplace phenomena: musical instruments, photography, electric and electronic circuits, television, motors, engines, etc. 3 hours. No credit for students in the College of Engineering.
141. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 140. Prerequisite: Credit or concurrent registration in Physics 140. 1 hour.
150. **Physics and the Modern World: A Course for Nonscientists.** A nonmathematical lecture course attempting to bridge the two-culture gap; takes examples from modern physics: relativity, elementary particles, quantum theory, statistics, etc., and covers basic philosophical concepts in physics which pervade all human disciplines: model-making, dynamics, ensemble behavior, and symmetry. 3 hours.
151. **Special Problems.** Special problems in physics: discussions and independent study. Supplement to Physics 150. Prerequisite: Credit or concurrent registration in Physics 150. 1 hour.
180. **Nuclear Weapons, Nuclear War, and Arms Control.** A beginner's course on the physics of nuclear weapons, nuclear weapon effects, delivery systems, and defenses against

nuclear attack; nontechnical, but about technology. Designed to assist students in making informed judgments about nuclear armaments and arms control; includes presentation of current issues. 3 hours.

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.

210. Introductory Relativity. Examines the consequences of Einstein's postulates for space and time; relativistic momentum and energy: $E=mc^2$; the equivalence principle, gravity, and the spacetime viewpoint of general relativity; the relativistic unity of electric and magnetic fields. Prerequisite: Concurrent registration in Physics 102 or 107. 2 hours.

302. Principles of Atmospheric Dynamics. Same as Atmospheric Sciences 302. See Atmospheric Sciences 302.

303. Modern Experimental Physics. Techniques and experiments in the physics of atoms, atomic nuclei, molecules, the solid state, and other areas of modern physical research. Prerequisite: Physics 333; concurrent registration in Physics 386. 3 to 5 hours, or $\frac{1}{2}$ to 1 unit. Students taking the course for the first time must register for 5 hours or 1 unit. Those repeating the course may do so for variable credit of 3 to 5 hours, or $\frac{1}{2}$ to 1 unit.

319. Space, Time, and Matter. Same as Philosophy 319. A philosophical examination of some fundamental concepts and theories of the physical world, such as time, matter, causation, space, and geometry; interpretation of quantum theory. Graduate students write an additional paper. Prerequisite: Junior standing, one physical science course, and one of the following: Physics 108 or Philosophy 101, 270, or 317; or consent of instructor. 3 hours or 1 unit. (Offered Fall semester only.)

331. Intermediate Electricity and Mechanics. Studies linear systems: electrostatics, electric circuits, mechanical oscillators; free and driven motion, a-c and transient behavior, linear response theory; filters, one-dimensional lattices, transition from discrete to continuous systems, strings, and transmission lines. Involves lectures, problems, and laboratory. Prerequisite: Two semesters of general physics, concurrent registration in Mathematics 341 or 285, and in Physics 108; or consent of instructor. 5 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without laboratory). No graduate credit given to physics majors.

332. Classical Mechanics. Examines particle motion in two and three dimensions including planets and satellites, conservation laws for systems of particles, accelerated reference frames, rigid bodies in three dimensions, Newtonian gravitation, fluid flow, generalized coordinates, Lagrange's equations, normal modes, and phase space. Prerequisite: Physics 331, Mathematics 341 or 285, and concurrent registration in Mathematics 280; or consent of instructor. 4 hours or 1 unit.

333. Electromagnetic Fields. Electrostatics, magnetostatics (including slowly varying currents); electromagnetic induction; energy and forces; Maxwell's equations; electromagnetic wave propagation, reflection and transmission; waveguides and cavities; radiation from dipoles and slow particles. Lectures, problems and laboratory. Prerequisite: Physics 331, Mathematics 341 or 285, and Mathematics 280. 5 hours, or $\frac{3}{4}$ or 1 unit ($\frac{3}{4}$ unit without laboratory).

343. Electronic Circuits, I. The physics of semiconductor devices; theory and application of discrete and integrated devices in linear circuits; use of operational amplifiers and feedback; regulation, oscillators, and modulation; emphasizes practical experience. Lectures, problems, and laboratory. Prerequisite: Physics 331 or consent of instructor. 5 hours or 1 unit. (Offered Spring semester only.)

344. Electronic Circuits, II. Continuation of Physics 343 with particular emphasis on nonlinear devices, switching circuits, digital logic, analog to digital and digital to analog conversion, and individual projects. Lectures, problems, and laboratory. Prerequisite: Physics 343 or consent of instructor. 5 hours or 1 unit. (Offered Fall semester only.)

346. Modern Physics for Nuclear Engineers. Same as Nuclear Engineering 346. Those fundamentals of quantum theory, atomic structure, and nuclear behavior needed by students before taking advanced courses in nuclear engineering; basic information on radiation types, properties, and interactions. Prerequisite: Physics 108; and Mathematics 341 or 285; or equivalents. 3 hours or $\frac{3}{4}$ unit. Not available for graduate credit to nuclear engineering students.

- 361. Thermodynamics and Statistical Mechanics.** A course in statistical and thermal physics designed primarily for advanced undergraduates; topics include equilibrium thermodynamics, statistical mechanics, and kinetic theory of gases. A unified treatment is used in that the principles of heat and thermodynamics are discussed along with statistical postulates and the microscopic approach of introductory quantum mechanics. Prerequisite: Two 300-level courses in physics or consent of instructor. 4 hours or 1 unit. Credit is not given for both Physics 361 and any of the following: Mechanical Engineering 301, Chemistry 342 and 344, and Materials Science and Engineering 400.
- 365. Introduction to Plasma Physics.** Physical concepts underlying the description of ionized gases; individual particle and continuum models; collision processes in plasmas; charged particle motion in electromagnetic fields; waves in cold plasmas; elementary treatment of collective plasma behavior; simple plasma instabilities; selected topics of current interest. Prerequisite: Electrical Engineering 350 or Physics 333, or consent of instructor. 4 hours or 1 unit. (Offered Spring semester only.)
- 371. Light.** Wave kinematics; geometrical optics: basic concepts, ray-tracing and matrix formalism, Gaussian imaging by thick lenses, stops, and apertures, and intensity relations; interference; interference spectroscopy and coherence; diffraction: Fresnel-Kirchhoff formulation, Fraunhofer case, Fresnel case, and holography; polarized light. Lectures, laboratory, and problems. Prerequisite: Physics 101 and 102, or Physics 106, 107, and 108; Mathematics 285; or consent of instructor. 4 hours, or $3/4$ or 1 unit ($3/4$ unit without lab).
- 382. Subatomic Physics.** A lecture and problem course surveying subatomic physics; includes the nature and properties of nuclei and elementary particles, symmetries, interactions, nuclear models, tools and techniques of experimental subatomic physics, and applications to power generation, astrophysics, chemistry, medicine, and biology. Prerequisite: Physics 383 or 386, or consent of instructor. 4 hours or 1 unit. (Offered Spring semester only.)
- 383. Atomic Physics and Quantum Theory.** Introduction to the basic concepts of quantum theory which underlie modern theories of the properties of materials; topics covered include elements of atomic and nuclear theory; kinetic theory and statistical mechanics; quantum theory and simple applications; atomic spectra and atomic structure; molecular structure and chemical binding. Lectures and problems. Prerequisite: General physics; general chemistry; Mathematics 285 or equivalent. 3 hours or $3/4$ unit.
- 386. Atomic Physics and Quantum Mechanics, I.** Studies atomic phenomena integrated with an introduction to quantum theory; discussion of topics includes evidence for the atomic nature of matter and the properties of the Schrodinger equation, single particle solutions in one dimension, the hydrogen atom, perturbation theory, external fields, and atomic spectroscopy of outer electrons. Prerequisite: General physics; Mathematics 285, credit or concurrent registration in Mathematics 315, or consent of instructor. 4 hours or 1 unit.
- 387. Atomic Physics and Quantum Mechanics, II.** Continuation of Physics 386. Topics treated include identical particles, spectral hyperfine structure, magnetic properties of matter, atomic spectroscopy of inner electrons, high-energy photon effects, molecular binding and spectra, emission and absorption of light, and symmetry principles. Prerequisite: Physics 386. 4 hours or 1 unit.
- 389. Introduction to Solid State Physics.** Bonding and structure of crystals; energy bands in insulators, semiconductors, and metals; electrical conductivity; optical properties; lattice vibrations; elasticity; point defects; dislocations. Prerequisite: Junior standing in science or engineering, or equivalent. 4 hours or 1 unit. (Offered Fall semester only.)
- 397. Individual Study.** Individual study at an advanced level in a subject not covered by course offerings. Prerequisite: Upperclassman; consent of adviser and staff member who supervises the work. 1 to 4 hours, or $1/4$ to 1 unit.
- 398. Seminar on Special Topics in Modern Physics.** Lecture course on topics of current interest in physics. For advanced undergraduates or graduates. Subjects and prerequisites to be announced in the *Timetable*. 1 to 4 hours, or $1/4$ to 1 unit.
- 402. Theoretical Astrophysics.** Same as Astronomy 402. Application of physical principles to a broad selection of topics in astrophysics: fluid dynamics in an astrophysical context; equilibria and collapse of interstellar clouds; star formation; shock waves, ionization

fronts, winds, and accretion and jets; stellar structure, evolution, and nucleosynthesis; white dwarfs, neutron stars, pulsars, and compact x-ray sources; dynamics of stellar systems and spiral structure; cosmic electrodynamics, including continuum radiation mechanisms, cosmic rays, and radio galaxies; cosmology; galaxy formation; and quasars. Emphasis on the underlying physics rather than on detailed factual description. Prerequisite: Physics 332, 333, 361, and 386; or consent of instructor. 1 unit.

- 404. Stellar Structure and Evolution.** Same as Astronomy 404. See Astronomy 404.
- 405. Diffuse Matter Astrophysics.** Same as Astronomy 405. See Astronomy 405.
- 406. High Energy Astrophysics.** Same as Astronomy 406. See Astronomy 406.
- 411. Special Functions and Boundary Value Problems in Physics.** Use of special functions in solving homogeneous partial differential equations of physics; emphasis on applications to topics such as electrostatics, wave guides and resonant cavities, vibrations of membranes, heat flow, and potential flow in fluids. Prerequisite: Mathematics 280 and 285, or equivalent. This course may be taken concurrently with Physics 413 or 414. $\frac{1}{2}$ unit.
- 412. Additional Techniques of Mathematical Physics.** Solution of inhomogeneous differential equations with particular emphasis on problems in electromagnetism; additional topics such as perturbation theory, variational methods, and integral equations; emphasis on application of the techniques to nonquantum physics problems. Prerequisite: Physics 411 or equivalent. This course may be taken concurrently with Physics 413 or Physics 414. $\frac{1}{2}$ unit.
- 413. Uses of Complex Variables in Physics.** A review of complex variable theory, with emphasis on calculations useful to physicists; integration, conformal mapping, Laplace and Fourier transforms, and additional topics of use in theoretical physics. Prerequisite: Undergraduate mathematics at the level of Mathematics 280 and 285; some previous exposure to complex variables helpful, but not required. $\frac{1}{2}$ unit.
- 414. Basics of Advanced Mechanics.** Fundamentals of classical Lagrangian and Hamiltonian mechanics, with emphasis on the relation between dynamical symmetries and constants of the motion; use of conservation laws to derive basic equations of fluid dynamics; discussion of some applications. Prerequisite: Mechanics course at the level of Physics 332 or consent of instructor. $\frac{1}{2}$ unit.
- 415. Introduction to Continuum Mechanics.** Basic information on stress, strain, and waves in an elastic solid, the Euler and Navier Stokes equations, potential flow, vortex theory, viscous flows, gas dynamics, characteristics, and shock waves. Prerequisite: Concurrent registration in Physics 411 and 412, or equivalent. $\frac{1}{2}$ unit.
- 417. Lie Groups and Their Physical Applications.** Introduces Lie groups with emphasis on concepts and applications to physics problems; includes finite groups, three dimensional rotation groups, classification and representation of Lie groups, integrations, and applications to particle, nuclear, and condensed matter physics. Prerequisite: Physics 480 or consent of instructor. $\frac{1}{2}$ unit.
- 420. Nonlinear Dynamics.** A broad introduction to nonlinear dynamics of physical systems with varying degrees of complexity; surveys a variety of concepts associated with bifurcation phenomena, mappings, nonlinear oscillations, chaotic behavior, strange attractors, solitons, and topics of current interest. Prerequisite: Mathematics 280 or 285 or equivalent; Physics 332 or equivalent; or consent of instructor. 1 unit.
- 421. Advanced Nonlinear Dynamics.** Analysis of the dynamics of spatially extended and other complex physical systems using analytical, experimental, computational, topological, and symbolic methods; examples may involve mechanical, electrical, optical, solid state, fluid, chemical, biological, and network systems. Prerequisite: Physics 420. 1 unit.
- 424. General Relativity and Cosmology.** Same as Astronomy 424 and Mathematics 460. Foundations of general relativity and applications to problems of astrophysics; includes gravitation as geometry, mathematical tools, Einstein's equations, relativistic stellar structure, black holes and gravitational collapse, cosmology, gravitational radiation, and experimental tests. Prerequisite: Physics 332, 411, 412, and 442, or equivalent; or consent of instructor. 1 unit.
- 430. Surface Physics.** Same as Materials Science and Engineering 482. See Materials Science and Engineering 482.

- 435. Theory of Semiconductors and Semiconductor Devices.** Same as Electrical and Computer Engineering 435. See Electrical and Computer Engineering 435.
- 442. Classical Electromagnetic Radiation.** A review of Maxwell's equations followed by a relativistic formulation of the electromagnetic field and the motion of charged particles; plane and guided waves; retarded potentials; radiation from simple antennas; radiation from accelerated charged particles; synchrotron radiation, bremsstrahlung, scattering, and further topics. Prerequisite: Physics 411 and 412, or equivalent; electromagnetism at the level of Physics 333; special relativity at the level of Physics 210. 1 unit.
- 450. Biomolecular Physics.** Same as Biochemistry 450 and Biophysics 450. Physical concepts governing the structure and function of biological macromolecules; general properties, spatial structure, energy levels, dynamics and functions, and relation to other complex physical systems such as glasses; recent research in biomolecular physics; physical techniques and concepts from theoretical physics emphasized. Designed for students without appreciable background in biology and chemistry. Prerequisite: Chemistry 102 or equivalent, Physics 383 or 387 or equivalent, or consent of instructor. 1 unit.
- 455. Reactor Theory, I.** Same as Nuclear Engineering 455. See Nuclear Engineering 455.
- 456. Reactor Theory, II.** Same as Nuclear Engineering 456. See Nuclear Engineering 456.
- 459. Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics, Nuclear Engineering, and Theoretical and Applied Mechanics 459. See Mathematics 459.
- 462. Statistical Mechanics and Kinetic Theory.** Single-particle distribution functions; classical and quantum mechanical systems, Boltzmann equation, virial theorem, and equations of state for gases; formal theory: ensembles, identical particles, thermodynamics of simple systems, and distribution functions; nonequilibrium problems; conservation laws and hydrodynamic equations, sound waves, and transport coefficients; plasmas, normal Fermi fluid, superfluids, and systems with internal degrees of freedom. Prerequisite: Physics 361 and elementary quantum mechanics, or consent of instructor. 1 unit.
- 463. Liquid Helium and Superconductivity.** Emphasizes fundamental physical phenomena rather than detailed microscopic theory; normal Fermi liquids and normal liquid ^3He : equilibrium properties, kinetic equation, collective modes, and finite temperature effects; superfluid ^4He : equilibrium properties, two fluid model, Bogoliubov's microscopic model, condensates, and vortex lines; superconductivity: electrodynamic properties, Landau-Ginzburg theory, BCS theory, tunneling, Josephson effect, and superfluid ^3He . Prerequisite: Physics 462 and 481, or consent of instructor. 1 unit.
- 464. Phase Transitions.** Phenomenology of phase transitions, scaling, critical behavior, and multi-criticality; Landau theory of phase transitions; renormalization group methods, including lattice models and epsilon-expansion; numerical methods; critical dynamics; and selected additional topics. Prerequisite: Physics 462 or consent of instructor. 1 unit.
- 465. Plasma Physics.** Survey of plasma phenomena in nature and in the laboratory; physical description of plasma phenomena by the independent particle model, one- and two-fluid models, magnetohydrodynamic equations, and kinetic equations; applications to quantum plasmas; nonlinear effects and turbulence in plasmas; astrophysical and thermonuclear plasmas. Prerequisite: Physics 333 or equivalent, or consent of instructor. 1 unit.
- 470. Introduction to Nuclear and Particle Physics.** Nuclear systematics, nucleon-nucleon interaction, shell model, and single particle and collective excitations; hadron spectroscopy, hadronic quantum numbers, quark-parton model, and hadron dynamics; weak interactions. Prerequisite: Physics 480 and concurrent registration in Physics 481. 1 unit.
- 471. Nuclear Reactions and Structure.** Experimental information on nuclear forces; the basis of the independent-particle model; the nuclear shell model; the nuclear ground state; nuclear giant resonances; deformed nuclei; direct nuclear reactions; large-amplitude nuclear motion; statistical description of the nucleus. Prerequisite: Physics 470. 1 unit.
- 472. Special Topics in Nuclear Physics.** Current research in nuclear physics; topics include one or more of: photon physics, electron-nucleus scattering and nucleon structure, Few-nucleon systems and nuclear and neutron matter, nuclear astrophysics, Meson physics, Relativistic nuclear physics, heavy-ion physics, Quarks in the nucleon and in nuclei. Prerequisite: Physics 471 or consent of instructor. 1 unit. May be repeated for credit.

- 475. Particle Physics, I.** Basic calculations in elementary particle theory. Quantum electrodynamics, quantum chromodynamics, and the Glashow-Weinberg-Salam theory of weak and electromagnetic interactions as applied to the phenomenology of particle decays and high energy reactions. (Offered fall semester only.) Prerequisite: Physics 470; credit or concurrent registration in Physics 483 strongly recommended. In exceptional circumstances, Physics 470 may be taken concurrently. 1 unit.
- 476. Particle Physics, II.** Continuation of Physics 475. Current topics in particle theory; topics change from year to year. Typically treats three or four different subjects in depth. (Offered spring semester only.) Prerequisite: Physics 475, or consent of instructor. 1 unit. May be repeated as topics vary.
- 480. Quantum Mechanics, I.** A second course in quantum mechanics for students with a good background in wave mechanics and atomic and molecular structure. Operators, state vectors, and the formal structure of quantum theory; operator treatments of simple systems; angular momentum and vector addition coefficients; stationary state perturbation theory; introduction to scattering theory for particles without spin, partial wave analysis, and Born approximation; examples taken from atomic, nuclear, and elementary particle physics. Prerequisite: Senior-level atomic physics and quantum mechanics, or consent of instructor. 1 unit.
- 481. Quantum Mechanics, II.** Spin and identical particles, simple many-particle systems and elements of second-quantization theory; time-dependent processes, radiative transitions, and quantization of the electromagnetic field; scattering of particles with spin; polarization; introduction to the Klein-Gordon and Dirac equations, and properties of simple relativistic systems. Prerequisite: Physics 480 or consent of instructor. 1 unit.
- 483. General Field Theory.** Covers standard techniques of field theory as used by experimenters and theorists; relativistic quantum mechanics of a single particle; Lagrangian field theories, perturbation theory, and calculation of lowest-order processes; introduction to Feynman diagrams and higher order processes; examples taken from quantum electrodynamics, solid-state and elementary particle physics, and many-body theory. Prerequisite: Physics 481 or consent of instructor. 1 unit.
- 485. Advanced Field Theory.** Quantization and Feynman path integral; gauge theories and renormalization; renormalization group with applications to particle physics and critical phenomena; approximation methods and recent developments. Prerequisite: Physics 483 or consent of instructor. 1 unit.
- 486. The Constitution and Behavior of the Upper Atmosphere.** Same as Electrical Engineering 486. See Electrical Engineering 486.
- 489. Solid State Physics, I.** Crystalline perfection, free electron gas, screening, plasma oscillations, and dielectric response; Bloch electrons, Brillouin zones, and band structure; semiconductors, intrinsic and extrinsic, with applications; phonons, elasticity, and anharmonicity; ferromagnetism and second-order phase transitions; superconductivity. Prerequisite: Physics 361 or consent of instructor; and Physics 480. 1 unit.
- 490. Solid State Physics, II.** Hartree-Fock theory and electron-electron interactions; electron-phonon interactions; electron dynamics and transport; BCS theory of superconductivity; elastic properties; thermal properties due to anharmonicity; defects in solids. Prerequisite: Physics 481 and 489. 1 unit.
- 497. Individual Study.** Individual study in a subject not covered in course offerings may be arranged for credit by registration under this number. $\frac{1}{2}$ to 4 units for full semester; $\frac{1}{4}$ to 2 units for half-semester.
- 498. Seminar on Special Topics in Modern Physics.** Lecture course in topics of current interest. Several subjects are announced in each *Timetable*. Among them are semiconductor physics, magnetic resonance, surface physics, lattice dynamics, band theory of solids, crystal imperfections, nuclear structure, field theory, elementary particle physics, advanced statistical mechanics, plasma theory, astrophysics, atmospheric physics, group theory and applications. Prerequisite: Determined for each offering. See *Timetable*. $\frac{1}{4}$ to 1 unit.
- 499. Thesis Research.** 0 to 4 units.

PHYSIOLOGY AND BIOPHYSICS

Head of Department: Albert S.-H. Feng

Department Office: 524 Burrill Hall, 407 South Goodwin Avenue, Urbana

Biophysics

199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Reading and Individual Topics.** Reading or laboratory work chosen in consultation with a departmental faculty sponsor. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
301. **Introduction to Biophysics.** Review of the field of biophysics designed to introduce the student to types of biological problems currently under investigation. Prerequisite: 8 hours of physics. 3 hours or $3/4$ unit.
312. **Introduction to Radiobiology.** Nature and mechanisms of the biological consequences of low dose and chronic irradiation. Intended primarily for students in engineering and physical sciences. Prerequisite: Mathematics 242 or 245; 8 hours of physics; consent of instructor. 2 hours or $1/2$ unit.
320. **Molecular Biophysics.** Same as Biochemistry 320. Examines structure and function of biological macromolecules and supramolecular assemblies; uses various display techniques to describe the three dimensional nature of biological structure. Specific topics include: diffraction methods, protein structure and the molecular basis of enzyme catalysis, antibody structure and function, virus structure and assembly; membrane proteins, microtubules and other supramolecular assemblies, nucleic acid structure, protein-nucleic acid interactions. Prerequisite: Biochemistry 352 or Chemistry 346, or equivalent; or consent of instructor. 3 hours or $3/4$ unit.
332. **Photosynthesis.** Same as Plant Biology 332. A comprehensive description of photosynthesis; topics include: the photosynthetic membranes, light absorption, electron and proton transfer, photophosphorylation, water oxidation, RUBP carboxylase/oxygenase, photorespiration, whole plant photosynthesis, translocation and herbicide action. Prerequisite: Plant Biology 330, Biochemistry 350, Biophysics 301, or equivalent; or consent of instructor. 3 hours or $3/4$ unit.
354. **Biological Energy Conversion.** Introduces and explores the major mechanisms of energy conversion in biology, with particular emphasis on respiratory and photosynthetic bioenergetics, and the physico-chemical tools required to describe these processes. Prerequisite: Biochemistry 350, and Chemistry 340 or equivalent; or consent of instructor. 3 hours or $3/4$ unit.
404. **Physiological Measurements.** Same as Physiology 404. See Physiology 404.
406. **Principles of Biophysical Measurements.** Lecture course designed to acquaint the student with physical methods useful in the solution of biological problems; topics covered include bioelectric measurements, including basic electronics; optical methods, including microscopy, spectrophotometry, and measurement of action spectra; use of high-energy radiations; tracer techniques; and acoustical techniques. Prerequisite: Consent of instructor. $1/2$ unit.
410. **Special Topics in Biophysics.** Advanced course/tutorials on topics of interest in biophysics, such as electrophysiology, radiation biology, bioenergetics, bioacoustics, protein structure, or the physics of muscular contraction. Prerequisite: Consent of instructor. $1/4$ to 1 unit.
411. **Seminar.** Survey of literature in one area of biophysics, with special emphasis on student reports. Prerequisite: Enrollment in the biophysics program or consent of instructor. $1/4$ or $1/2$ unit.

- 414. Sensory Biophysics.** Advanced treatment of sensory systems which are approachable in detailed quantitative terms, with emphasis on the visual system; lectures scheduled during the first quarter of the spring semester. Normally carries $1/4$ unit credit; however, students may develop a particular topic introduced in the lectures into a term paper for an extra $1/4$ unit credit. Prerequisite: Biophysics 301, Physiology 301 or 403, or consent of instructor. $1/4$ or $1/2$ unit. Students must consult the instructor before enrolling for $1/2$ unit.
- 415. Radiation Biophysics.** Consideration in quantitative terms of the mechanisms of the responses of molecules and cells to ionizing radiation; meets during the second quarter of the spring semester. Prerequisite: Graduate standing in biophysics, one year of physics beyond introductory physics, and Biophysics 301 or 312, or consent of instructor. $1/4$ unit.
- 424. Ultrasonic Biophysics.** Same as Bioengineering 424. Ultrasonic propagation in, and interaction with, biological media at macromolecular, cellular, and organismic levels of structure; meets during the first quarter of the spring semester in alternate years. Prerequisite: Graduate standing in biophysics or consent of instructor. $1/4$ unit.
- 428. Cell Membranes.** Isolation and biochemical analysis; experimental membrane models Gouy-Chapman-Stern layers; equations of transport (diffusional, mediated, and active); phospholipid bilayers and protein subunits; and cell membrane synthesis (in vivo and in vitro). Meets during the second half of the spring semester in alternate years. Prerequisite: Biophysics 301 or Physiology 402; Biochemistry 350 or equivalent. $1/2$ unit.
- 438. Bioenergetics of Photosynthesis.** Same as Plant Biology 438. Biophysical and biochemical mechanisms of green plant and/or bacterial photosynthesis; includes the role of membranes; and emphasizes energetic aspects of photosynthesis. Meets during the last half of the fall semester in alternate years. Prerequisite: One year each of college-level physics, chemistry, and biology; Biochemistry 350 or Biophysics 301; or consent of instructor. $1/2$ unit.
- 440. Research Topics in Biophysical Chemistry.** Same as Biochemistry and Chemistry 440. See Chemistry 440.
- 442. Biomedical Magnetic Resonance.** Principles of magnetic resonance and its application to biology and medicine; includes discussion of magnetic resonance imaging and spectroscopy of living systems. Meets in the fall semester of alternate years. Prerequisites: Introductory biology and physical chemistry. $3/4$ unit.
- 446. Bacterial Energetics.** Same as Microbiology 446. Describes and analyzes the principles of biological energy transduction using diverse examples from prokaryotic metabolism; includes fermentations, aerobic and anaerobic respiration, photosynthesis. Meets during the last half of the spring semester. Prerequisite: Biochemistry 350 or Chemistry 340, or equivalent; or consent of instructor. $1/2$ unit.
- 450. Biomolecular Physics.** Same as Biochemistry 450 and Physics 450. See Physics 450.
- 463. Radioisotopes in Biological Research: Principles and Practice.** Same as Veterinary Biosciences and Animal Sciences 463. See Veterinary Biosciences 463.
- 475. Biophysics of Muscle.** Description and analysis of the fundamental physical processes underlying motility and contraction in living systems; surveys recent advances and assesses current status of relevant problems; meets during the second quarter of the spring semester in alternate years. Prerequisite: Chemistry 340 or 342, and Biochemistry 350. $1/4$ unit.
- 490. Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Topics covered include bioacoustics, electrophysiology, bioenergetics, cellular biophysics, dynamics of macromolecules, fluorescence spectroscopy, kinetics, mathematical biophysics, membrane biophysics, molecular biophysics, muscle biophysics, nervous activity, photosynthesis, protein-lipid interactions, radiation biophysics and oncology, senescence, thermoregulation, vision, macromolecular structure, cerebral energy metabolism. Prerequisite: Consent of department. $1/2$ to 2 units.
- 499. Thesis Research.** Research may be conducted in one of the areas listed below, subject to approval of the staff member concerned and the department in which the research is to be done: (a) bioacoustics; (b) electrophysiology; (c) bioenergetics; (d) cellular biophysics; (e) dynamics of macromolecules; (f) fluorescence spectroscopy; (g) kinetics; (h) math-

ematal biophysics; (i) membrane biophysics; (j) molecular biophysics; (k) muscle biophysics; (l) nervous activity; (m) photosynthesis; (n) protein-lipid interactions; (n) radiation biophysics and oncology; (o) senescence; (p) thermoregulation; (q) vision; (r) macromolecular structure; (s) cerebral energy metabolism. 0 to 4 units.

Physiology

101. **Introduction to Human Physiology: Physical and Chemical Bases of Cell Function, Principles of Physiological Control Systems, Coordinated Body Functions.** Emphasizes those aspects especially illustrative of general principles of biology; designed for biological sciences general education requirement; especially suitable for coupling with an anthropology or psychology course. Prerequisite: High school chemistry strongly recommended. 3 hours. Credit will not be given for both Physiology 101 and 103.
103. **Introduction to Human Physiology: The Physical and Chemical Bases of Cellular Function, Principles of Physiological Control Systems, Coordinated Body Functions, Physiological Bases of Behavior.** Prerequisite: High school chemistry strongly recommended. 4 hours. Credit will not be given for both Physiology 103 and Physiology 101.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
290. **Reading and Individual Topics Course.** Readings or laboratory work in fields chosen in consultation with a departmental faculty sponsor. Prerequisite: A course in physiology; consent of instructor. 2 to 4 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
292. **Senior Thesis.** Research in physiology under the direction of a faculty sponsor in the Department of Physiology and Biophysics. A thesis, based on the research, must be submitted by the student and approved by the Physiology Undergraduate Honors Committee in order for him/her to be considered a candidate for graduation with distinction in physiology. Prerequisite: Consent of instructor. 2 to 4 hours. May be repeated to a maximum of 8 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
295. **Special Topics in General Physiology.** Selected topics in general physiology. Prerequisite: Credit or concurrent registration in Physiology 301; consent of instructor. 2 hours.
296. **Special Topics in Animal Physiology.** Selected topics in animal physiology. Prerequisite: Credit or concurrent registration in Physiology 302; consent of instructor. 2 hours.
301. **Cell and Membrane Physiology.** The cellular and molecular basis of physiological processes; emphasis on chemical, physical, and mathematical principles of membrane structure and permeability, nerve conduction, and cell motility. Prerequisite: Biology 122 or 251, or equivalent; one year each of college-level mathematics and physics; chemistry through organic with laboratory. 3 hours or $\frac{3}{4}$ unit.
302. **Systems and Integrative Physiology.** Examines organ physiology of animals; primary emphasis is on the control systems underlying regulation of homeostasis in mammals, including human beings. Prerequisite: Biology 122 or 251, or equivalent; one year college physics; Mathematics 120 or equivalent; chemistry through organic. 3 hours or $\frac{3}{4}$ unit.
303. **Cell and Membrane Physiology Laboratory.** An introduction to experimentation with cellular functions common to most eukaryotic cells; emphasis on biochemical, radioactive tracer, electrical, and mechanical recording techniques. Prerequisite: Credit or concurrent registration in Physiology 301. 2 hours or $\frac{1}{4}$ unit.
304. **Systems and Integrative Physiology Laboratory.** Introduction to problems and techniques for studying the physiology of organ systems. Prerequisite: Credit or concurrent registration in Physiology 302. 2 hours or $\frac{1}{4}$ unit.

305. **Principles of Ergonomics.** Same as Industrial Engineering and Kinesiology 305. See Industrial Engineering 305.
312. **Endocrinology.** Physiology and biochemistry of the endocrine system and its hormones with special reference to vertebrates and to human endocrine disorders. Prerequisite: Physiology 301, Biology 122 or 251, or a course in biochemistry, or consent of instructor. 3 hours or $3/4$ unit.
315. **Structure and Function of the Nervous System.** Same as Cell and Structural Biology 307. See Cell and Structural Biology 307.
316. **Integrative Neurophysiology.** Advanced studies of mechanisms of neuron network function in behavior; topics include: neural coding, motor pattern generation, mechanisms of plasticity in neural function, epilepsy, and neural models of motivation, habituation and arousal, choice, and learning. Prerequisite: Physiology 302, or Biology 303; or consent of instructor. 3 hours or $3/4$ unit.
331. **General Radiobiology.** Response of multicellular organisms, cells, and macromolecules to ionizing radiations. Lectures, student reports, and discussions. Prerequisite: One year each of mathematics, physics, chemistry, and biology. 4 hours or 1 unit.
341. **Comparative Physiology of Animals.** Emphasizes comparative aspects of the nervous system and nervous integration; ionic and osmotic regulation in fresh water and marine environments; gas exchange mechanisms; temperature adaptation and endocrine systems in both invertebrates and vertebrates. Prerequisite: Biology 122 or 251, or equivalent; one year of college-level physics; Mathematics 120 or 121; chemistry through organic with laboratory. 3 hours or $3/4$ unit.
401. **Physiology of Systems and Organs.** Analysis of organization and function of vertebrate systems, which combines the viewpoints of traditional cellular, comparative, mammalian, and human physiology; nervous, circulatory, digestive, and excretory systems; and gross metabolism. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
402. **Comparative and Adaptational Physiology.** The first half of the course deals with comparative mechanisms of adaptation to the environment, including homeostatic theory, osmotic and ionic regulation, respiration and metabolism, nutrition and digestion, and temperature relations; the second half concerns comparative behavioral physiology, including sense organs, mechanisms of motility (especially muscles), and central nervous integration. Prerequisite: One year of college-level physics; chemistry through organic; an upper-division course in physiology; physical chemistry and biochemistry recommended; knowledge of calculus presumed. 1 unit.
403. **Cellular and Molecular Physiology.** Physicochemical and molecular analysis of cellular function and structure; consideration of the implications of the properties of cells for the physiology of multicellular animals. Students may enroll for the lecture series on physiology of cytoplasm and the nucleus, and cellular regulatory mechanisms, and/or for the lecture series on physiology of cell membranes, bioelectrics, and motility. Prerequisite: One year of college-level physics; chemistry including biochemistry; an upper-division course in physiology; physical chemistry recommended for lectures on membranes, etc; knowledge of calculus presumed. $1/2$ or 1 unit.
404. **Physiological Measurements.** Same as Biophysics 404. Laboratories concerned with introducing at a graduate level current research techniques in the physiological and biophysical sciences; problem-oriented laboratories; students select up to four special topics representing different areas of physiology and biophysics, such as mammalian and human, molecular, cellular and radiation biology, comparative physiology, and biophysical measurements. Emphasis placed on ability to work independently, and students give written reports of their experiments. Prerequisite: Consent of instructor. $1/4$ to 1 unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
405. **Neurochemistry.** Same as Psychology 405. See Psychology 405.
409. **Faculty Research Topics.** Advanced seminars by the faculty on their current research activities. Prerequisite: Consent of instructor. $1/2$ unit. May not be repeated for credit.
410. **Special Topics in Physiology.** Advanced seminars on current topics of interest in

- physiology. Prerequisite: Consent of instructor. 0 or $1/4$ unit. May be repeated to a maximum of 2 units.
- 412. Advanced Endocrinology.** Same as Animal Sciences and Veterinary Biosciences 412. Seminar, lectures, student reports, and discussions of recent advances in endocrinology. Prerequisite: Physiology 312; consent of instructor. $1/2$ unit. May be repeated to a maximum of 2 units.
- 413. Cardiovascular Physiology.** Same as Veterinary Biosciences 413. See Veterinary Biosciences 413.
- 416. Neurophysiology Laboratory.** Neurophysiological techniques and experiments illustrating nerve membrane properties, synaptic action and plasticity, organization and pattern generation in motor systems, and sensory coding in visual and acoustic systems. Prerequisite: Credit or concurrent registration in Physiology 316 or consent of instructor. $1/2$ unit.
- 418. Neuroendocrinology.** Advanced studies on central nervous system/hormone interaction in vertebrates. Neuroanatomy and maturation of neuroendocrine control systems; production, biochemistry, and physiological effects of neurohormones; and neuroendocrine techniques. Prerequisite: Physiology 312 and one of the following: Physiology 316, 401, or 402; consent of instructor. $3/4$ unit.
- 419. Neural Control of Cardiorespiratory and Autonomic Function.** Same as Veterinary Biosciences 419. See Veterinary Biosciences 419.
- 420. Mammalian Physiology Seminar.** Current trends in mammalian physiology. Prerequisite: Physiology 401 and 402, or equivalent; consent of instructor. $1/2$ unit.
- 430. Reproductive Physiology Seminar.** Presentation and discussion of current literature as well as graduate student and staff research proposals and findings in reproductive physiology. Prerequisite: Consent of instructor. $1/4$ unit. May be repeated to a maximum of 1 unit.
- 431. Advanced Reproductive Endocrinology.** Same as Animal Sciences 431 and Veterinary Biosciences 431. See Animal Sciences 431.
- 433. Laboratory Methods in Reproductive Physiology.** Same as Animal Sciences 433 and Veterinary Biosciences 433. See Animal Sciences 433.
- 441. Advanced Comparative Physiology.** Seminar, lectures, student reports, and discussions. Topics rotate in three-year cycle: adaptational physiology, comparative neurophysiology, and comparative physiology of motile mechanisms. Prerequisite: Consent of instructor. $1/2$ unit.
- 451. Advanced Cellular Physiology.** Seminar, lectures, student reports, and discussions. Prerequisite: Consent of instructor. $1/2$ unit.
- 460. Human Pharmacology, I.** Studies the general principles of drug action and analyzes the actions of the major drug groups on biochemical and physiological processes. Prerequisite: Physiology 401; Biochemistry 350; consent of instructor. 1 unit.
- 461. Human Pharmacology, II.** Continuation of Physiology 460. Prerequisite: Physiology 460. 1 unit.
- 490. Individual Topics.** For graduate students wishing to study individual problems or topics not assigned in other courses. Prerequisite: Approval of department. $1/2$ to 2 units.
- 499. Thesis Research.** Research may be conducted under supervision of the thesis adviser in the following areas: (a) cellular and molecular physiology; (b) comparative physiology; (c) mammalian physiology; (d) human physiology; (e) endocrinology; (f) neurophysiology; (g) radiobiology; and (h) environmental and stress physiology. 0 to 4 units.

PLANT BIOLOGY

Head of Department: David S. Seigler

Department Office: 265 Morrill Hall, 505 South Goodwin Avenue, Urbana

- 100. Plant Biology.** Basic principles of growth and form, physiology, genetics, evolution, and ecology in plant biology. 4 hours. Students may not receive credit for both Plant Biology 100 and 102.

- 102. Plants, Environment, and Man.** Designed primarily to give the nonscience student an introduction to plants, their role in the environment, and their relation to man. Discussions and demonstrations emphasize practical aspects of plant biology and science as they relate to man. 3 hours. Students may not receive credit for both Plant Biology 100 and 102.
- 234. Form and Function in Flowering Plants.** Lecture course on the physiological and morphological attributes that underlie the biosynthesis, growth, and reproduction of flowering plants in relation to the environment. Prerequisite: Plant Biology 100 or 102, or a year of biology; Chemistry 102. 3 hours. (Counts for advanced hours in LAS.)
- 260. Systematics of Flowering Plants.** Introduces the principles and methods of the identification, naming, classification, systematics, and evolution of flowering plants; includes a survey of selected flowering plant families with information on their interrelationships. Field trips are given as part of the laboratories. Prerequisite: Plant Biology 100; or Biology 100, 101, or 121; or consent of the instructor. 4 hours. (Counts for advanced hours in LAS.)
- 263. Plants and Their Uses by Man.** A consideration of the plants which are useful or harmful to man: their origins and history, botanical relationships, chemical constituents which make them economically important, and their roles in prehistoric and modern cultures and civilizations. Prerequisite: Plant Biology 100 or 102, or Biology 121. 3 hours.
- 290. Individual Topics.** For juniors and seniors who wish to study individual problems and topics not assigned in other courses. Prerequisite: Ten hours of advanced work in plant biology or another biological science; junior or senior standing. 2 to 5 hours. May be repeated to a maximum of 5 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
- 292. Senior Thesis.** Independent research for seniors in plant biology; prerequisite for graduation with distinction in plant biology and recommended for students intending graduate study. A thesis must be submitted for credit to be received, but graduation with distinction is not an automatic result of enrollment in Plant Biology 292. Will substitute for Plant Biology 290 in fulfilling independent study requirement. Prerequisite: Candidacy for degree with distinction in plant biology. 2 to 5 hours. May be repeated to a maximum of 10 hours. Majors in any School of Life Sciences option may count toward graduation no more than a combined maximum of 10 hours of 290, 292, and 294 credit offered by: Biophysics; Cell and Structural Biology; Ecology, Ethology, and Evolution; Entomology; Microbiology; Physiology; and Plant Biology. These hours will not be counted as advanced hours in the option.
- 304. Evolutionary Survey of the Plant Kingdom.** Lecture and laboratory course dealing with the structure, reproduction, and evolution of representative algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. Prerequisite: Plant Biology 100; or Biology 101, 121, or 251; or consent of instructor. 4 hours or 1 unit.
- 320. The Biology of Bryophytes.** Study of mosses, liverworts, and hornworts with emphasis on problems unique to bryophytes and the use of bryophytes as experimental systems for broader botanical problems; topics include the systematics, anatomy, development, physiology, genetics, ecology, and evolution of bryophytes; and lecture, laboratory, and two or three field trips. Offered in alternate years. Prerequisite: One year of plant biology, or one year of biology plus consent of instructor. 4 hours or 1 unit.
- 325. Paleobotany.** Same as Geology 325. Structure, phylogeny, and geological distribution of representative fossil plants. Two or three field trips. Prerequisite: Plant Biology 100, or Biology 100 or 101; Geology 101 or 107; or consent of instructor. 5 hours or 1 unit.
- 330. Plant Physiology.** Same as Agronomy 330. General course concerned with plant functions, including water relations, mineral nutrition, metabolism, growth, and reproduction. Prerequisite: Chemistry 131; Plant Biology 100 or Biology 122 or 251. 3 hours or $3/4$ unit.
- 332. Photosynthesis.** Same as Biophysics 332. See Biophysics 332.
- 333. Plant Physiology Laboratory.** Same as Agronomy 333 and Horticulture 333. A laboratory course in plant physiology; a supplement to Plant Biology 330 which serves the needs

of those interested in acquiring familiarity with techniques of experimental plant physiology. Prerequisite: Credit or concurrent registration in Plant Biology 330 or equivalent. 4 hours or 1 unit.

- 335. Plant Development.** Mechanisms underlying plant development: cytodifferentiation and the cell cycle, regulation of gene expression, induction, determination, morphogenesis, and pattern formation. Prerequisite: Introductory courses in biochemistry, biology, or plant biology, and calculus. 4 hours or 1 unit. Offered in alternate years.
- 338. Plant Molecular Biology.** Same as Biochemistry 338. Presents the basic concepts of plant gene expression, the structure and expression of the three plant genomes, and special topics on plant vectors, plant viruses, and transposable elements. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit. Offered in alternate years.
- 339. Experimental Techniques in Plant Molecular Biology.** A laboratory course in plant molecular biology supplementing Plant Biology 338 with techniques of plant organelle isolation, DNA extraction, cell culture and recombinant DNA techniques. Prerequisite: Plant Biology 338 or equivalent; or consent of instructor. 4 hours or 1 unit.
- 341. Field Ecology.** Study of plant communities in various sections of North America during spring vacation or intersession. Trips rotate on a three- to five-year basis. Outdoor cooking and camping; transportation in University cars. Prerequisite: One of the following: Plant Biology 260, 366, or 381; consent of instructor. 1 hour or $\frac{1}{4}$ unit. May be repeated to a maximum of 3 hours or $\frac{3}{4}$ unit.
- 345. Plant Anatomy.** Lecture and laboratory course dealing with the structural characteristics of mature and developing cells, tissues, and organs of vascular plants, with special emphasis on the vegetative part of flowering plants. Prerequisite: One year of plant biology or equivalent, or consent of instructor. 4 hours or 1 unit.
- 351. Viruses.** Same as Microbiology 351. See Microbiology 351.
- 363. Plant Products.** Lectures on the natural products of plants, with emphasis on relevant compounds of ecological, pharmacological, toxicological, and economic interest. Prerequisite: Biochemistry 350 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 366. Field Botany.** Identification and classification of native and naturalized flowering plants of eastern North America. Prerequisite: Plant Biology 100 or consent of instructor. 5 hours or 1 unit. Offered in the summer session only.
- 372. General Mycology.** Structure, classification, and identification of fungi, including those of economic importance. Prerequisite: One year of plant biology, entomology, microbiology, or biology; or consent of instructor. 4 hours or 1 unit.
- 381. Plant Ecology.** Principles of ecology exemplified by vegetation and environments of Illinois. Prerequisite: Plant Biology 260 or equivalent. 5 hours or 1 unit.
- 410. Discussions in Plant Biology.** All graduate students in plant biology, except those with conflicting teaching assignments, are required to register in and attend the general seminar. 0 or $\frac{1}{4}$ unit. No credit given except to those students presenting the results of their Ph.D. thesis research.
- 413. Discussions in Plant Physiology.** $\frac{1}{4}$ unit.
- 414. Discussions in Plant Morphology and Taxonomy.** $\frac{1}{4}$ unit.
- 418. Discussions in Plant Ecology and Plant Geography.** Developments in ecology and plant geography, with emphasis on one special division. Prerequisite: Graduate standing in plant biology, entomology, geography, or biology. $\frac{1}{4}$ unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
- 419. Discussions in Photosynthesis and Related Topics.** Prerequisite: Consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
- 424. Plant Biochemistry.** Same as Agronomy and Horticulture 424. See Agronomy 424.
- 425. Membrane Transport and Mineral Nutrition in Plants.** Same as Agronomy and Horticulture 425. See Agronomy 425.
- 438. Bioenergetics of Photosynthesis.** Same as Biophysics 438. See Biophysics 438.
- 442. Environmental Plant Physiology.** Same as Agronomy 442. Lecture course dealing with the interaction of plants and environment at the level of the whole organism, extending to the cell and the community; emphasis on heat and mass transfer, plant and soil potentials, and effects of light on growth. Prerequisite: Chemistry 131; general physics; general or plant physiology; consent of instructor. 1 unit.

471. **Advanced Mycology: Special Groups.** The several classes of fungi and their activities are considered in successive semesters. Special groups within these classes may be selected for concentrated study, depending upon the student's interest in mycology. Prerequisite: Plant Biology 372 or consent of instructor. $\frac{1}{2}$ unit.
472. **Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Pathology 472. See Plant Pathology 472.
488. **Plant Pigments.** Same as Horticulture 488. See Horticulture 488.
490. **Advanced Studies in Plant Biology.** Not more than 2 units may be applied toward the Graduate College master's degree requirement of 3 units of course work at the 400-level. Work may be taken in the following areas: (a) ecology; (b) evolution and systematics; (c) molecular biology and genetics; (d) physiology; and (e) ultrastructure. $\frac{1}{2}$ to 2 units.
499. **Thesis Research.** Individual work under supervision of members of the staff in their respective fields. 0 to 4 units.

PLANT PATHOLOGY

Head of Department: R. E. Ford

Department Office: N-519 Turner Hall, 1102 South Goodwin Avenue, Urbana

204. **Introductory Plant Pathology.** Concepts relating to causal agents of representative plant diseases, symptoms, and diagnosis, modes of infection and spread, effects of environment on disease development, and methods of control; designed for students in other departments which require or recommend an introductory plant pathology course; lecture and laboratory- discussion. Prerequisite: Plant Biology 100 or equivalent. 3 hours.
300. **Special Problems.** For students desiring to study specific problems not assigned in other courses. Prerequisite: For undergraduates only, a minimum grade-point average of 3.5; not open to students on probation; senior standing; consent of instructor and head of department. Specific approval of the associate dean in advance of registration is required for a second and / or third special problems course. The honors section is open to James Scholars and other students having a minimum grade-point average of 4.0 and may be taken in conjunction with other courses in this department subject to approval of the instructor. 1 to 4 hours, or $\frac{1}{4}$ to 1 unit.
301. **Biology and Ecology of Plant Pathogens.** Principles of the biology, ecology and pathogenesis of microorganisms that cause plant disease are studied in lectures, laboratories and discussions. Review and discussion of current literature and computer enhanced instruction are offered. Designed primarily for advanced students in the biological sciences. Prerequisite: Plant Pathology 204, Biology 251, or Plant Biology 372; or equivalent. 4 hours or 1 unit.
305. **Principles of Plant Disease Control.** Basic concepts of chemical, cultural, physical, regulatory, and biological methods for the management of plant diseases. Prerequisite: Plant Pathology 204 or 301; a course in organic chemistry. 3 hours or $\frac{3}{4}$ unit.
308. **Plant Disease Diagnosis.** Field and laboratory techniques in plant disease diagnosis and appraisal; identification of diseases of small grains, turf, corn, soybeans, forage crops, vegetables, fruit, forest and shade trees, and ornamentals, both on field trips and in laboratory exercises. Prerequisite: Plant Pathology 204, or equivalent. 2 hours or $\frac{1}{2}$ unit. Offered during summer session only.
377. **Diseases of Field Crops.** Same as Agronomy 377. Studies the symptoms of major field crop diseases, life histories of causal organisms, and methods of control. Lecture and laboratory. Prerequisite: Plant Pathology 204 or 301. 3 hours or $\frac{3}{4}$ unit.
401. **Plant Pathogenic Fungi.** Studies pathogenic fungi and their roles in disease cycles in vascular plants, morphology, classification, life histories, ecology and evolution; methods for identification. Prerequisite: Plant Biology 372. 1 unit. Offered in alternate years.
402. **Phytopathology.** Studies pathogenic bacteria and their role in plant disease; history, morphology, reproduction, identification, and classification; emphasizes arrival, inva-

- sion, symptoms, and control. Prerequisite: Plant Pathology 301. ³/₄ unit. Offered in alternate years.
403. **Plant Nematology.** Comprehensive study of plant-feeding nematodes with emphasis on economically important groups, nematode morphology, identification, classification, developmental biology, ecology, and host-parasite relationships, interaction with fungi, bacteria, and viruses in plant disease development; experimental and diagnostic techniques; symptomatology and control. Prerequisite: Plant Pathology 204 or 301; an introductory course in animal biology. 1 unit. Offered in alternate years.
404. **Plant Virology.** Comprehensive study of plant viruses and virus diseases; includes symptomatology, structure, transmission, characterization, purification, classification, assay methods, replication, genome organization and expression, epidemiology, and control. Prerequisite: Plant Pathology 301 and Biochemistry 350. 1 unit. Offered in alternate years.
406. **Genetics of Plant-Pathogen Interactions.** The genetics and expression of resistance in plants to fungi, bacteria, viruses, nematodes, and other pathogens; variation and genetic systems in pathogens with particular emphasis on pathogenicity, complementary genetic systems; and theory and practice of breeding disease-resistant plants. Lecture and discussion. Prerequisite: Plant Pathology 204 or 301, and Agronomy 323 or Biology 122 or 210; or equivalent. 1 unit. Offered in alternate years.
407. **Physiology and Biochemistry of Plant-Microorganism Interactions.** Current concepts on physiological and biochemical bases of plant-microorganism interactions; mechanisms of infection, disease and nodule development; theories of resistance and susceptibility, and interrelationships of physiological and biochemical activities that occur during the interaction of plants and microorganisms. Prerequisite: One course each in plant pathology, biochemistry, and plant physiology, or consent of instructor. ¹/₂ unit. Offered in alternate years.
408. **Plant Disease Epidemiology.** Fundamental concepts and principles of plant disease epidemics, includes pathometry, crop loss assessment, pathogen and host dynamics, quantification of pathosystem components, pathosystem management, disease forecasting, and decision analysis. Prerequisite: Plant Pathology 301 and Agronomy 440, or equivalent. 1 unit. Offered in alternate years.
411. **Molecular Biology of Microbe-Plant Interactions.** Same as Microbiology 411. Detailed analysis of the microbe-plant interaction at the molecular level. Covers commensal, symbiotic, and pathogenic interactions from viewpoint of both plant and microbe. Emphasizes microbial and plant genes involved in the interactions, their organization, regulation of expression, and the nature and function of the encoded gene products. Prerequisite: Plant Pathology 402 or equivalent; Microbiology 316, or 330, equivalent; and Biochemistry 350 or equivalent. ³/₄ unit.
417. **Plant Pathology Seminar.** Current research literature and other topics pertaining to plant pathology and related fields. ¹/₄ unit.
431. **Plant Cell Metabolism.** Same as Agronomy, Biology, Forestry, and Horticulture 431. See Biology 431.
433. **Environmental Regulation of Plant Growth.** Same as Agronomy, Biology, Forestry, and Horticulture 433. See Biology 433.
472. **Systematics of Ascomycetes and Fungi Imperfecti.** Same as Plant Biology 472. Identifies and classifies ascomycetes and fungi imperfecti emphasizing relationships between sexual and asexual forms; laboratory provides experience in collection, culturing and isolation, and identification. Prerequisite: Plant Biology 372 or equivalent. ¹/₂ unit.
499. **Thesis Research.** Individual study and basic and/or applied research related to plant disease; required of all students working toward the Master of Science or Doctor of Philosophy in plant pathology. 0 to 4 units.

POLITICAL SCIENCE

Head of Department: George T. Yu

Department Office: 361 Lincoln Hall, 702 South Wright Street, Urbana

- 100. Introduction to Political Science.** Survey of major concepts and approaches employed in political science. 3 hours.
- 150. American Government: Organization and Powers.** Historical development and organization of national, state, and local governments; the federal system; national and state constitutions; civil and political rights; party system; and nature, structure, powers, and procedure of legislative, executive, and judicial departments in state and nation. 3 hours.
- 198. Freshman Seminar.** Current topics in political science in the context of the scope and method of political science. Participants are required to do independent library research and present a report on a topic of their choice which is related to the subject of the seminar. Prerequisite: Consent of instructor. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Sociology 222. See African Studies 222.
- 235. Women in Politics.** Same as Women's Studies 235. An introduction to the political status and roles of women. Topics include women's political socialization, voting behavior, and political participation; feminist and anti-feminist politics; and contemporary legislative and public policy issues, such as educational equity, equal rights legislation, and health care delivery for women. 3 hours.
- 240. Introduction to Comparative Politics.** Basic concepts and principles of political analysis from a comparative perspective. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 241. The Emerging Nations.** An introductory comparative consideration of the patterns of political development and of the policies and problems of the emerging nations of Asia, Africa, and Latin America; emphasis on the special characteristics of countries beginning their independent nationhood and the effects of these characteristics on the political systems of these lands and their role in the community of nations. Prerequisite: 3 hours of political science or consent of instructor. 3 hours.
- 250. Introduction to Public Policy.** Surveys the policy process including adoption, implementation, and evaluation; each student prepares a research paper: topics include reviews of substantive policy issues such as crime, energy, environment, poverty, foreign policy, civil liberties, or economic regulation. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 260. Introduction to Political Theory.** The nature, structure, and purposes of political theory; uses major works on the problems of political order, obedience, justice, liberty, and representation to distinguish and clarify different theoretical approaches; designed to be an introduction to ideas, not a historical survey. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 270. Introduction to Political Research.** Principles of empirical research in political science; emphasizes definition of research problems, principles and practices of measurement, use of data as evidence, and data analysis; data-based analysis is conducted in the Social Science Quantitative Laboratory. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 280. Introduction to International Relations.** The structure and processes of international relations, trends in international politics, and the future of the international system in a setting of conflict and crisis. Prerequisite: Political Science 100 or 150, or consent of instructor. 3 hours.
- 281. Introduction to International Security and Arms Control.** An introduction designed for all students to major issues of arms control, disarmament and international security. The military, socio-economic, and political effects of nuclear and conventional weapons, military strategy, the ethics of modern warfare, nuclear proliferation, and regional security issues will be studied. 3 hours.

290. **Individual Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of faculty member supervising the work; and approval of the department head. 1 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
292. **Senior Thesis in International Relations.** Prerequisite: Written consent of instructor; senior standing; major in Political Science, studying international relations. 3 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Prerequisite: Written consent of instructor; open only to seniors whose major is political science and who have a general University average of at least 4.0. 2 to 5 hours. May be repeated. (Counts for advanced hours in LAS.)
295. **Special Topics in Contemporary Issues and Problems.** Study of a contemporary problem in public policy, domestic or international. See *Timetable* for current topics. Prerequisite: Sophomore standing, 3 hours of political science, or consent of instructor. 3 hours. May be repeated for credit.
296. **Special Topics in Political Science.** Selected reading and research in political science. See *Timetable* for current topics. Prerequisite: Junior or senior standing; 6 hours of political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 297. (Counts for advanced hours in LAS.)
297. **Honors Seminar.** Research, reading, and discussion in selected topics and works in literature of political science. Prerequisite: Senior standing; 18 hours of political science; 4.5 grade-point average in political science; consent of instructor. 3 hours. No more than 6 hours of credit may be earned by registration in this course and in Political Science 296. (Counts for advanced hours in LAS.)
299. **Government Internship.** Selected Government Internship participants together with faculty sponsor develop a program of study and research related to internship assignment. Consult departmental undergraduate adviser. Prerequisite: Junior standing; 4.0 grade average for most internships; Political Science 150 and one 300-level political science course appropriate to internship program; acceptance by faculty sponsor. 0 to 6 hours. May be repeated to a maximum of 12 hours.
300. **Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Social Science 300. Examination of performance-oriented approaches to administration of public sector organizations; private sector accountability principles applied to governmental agencies; means of improving the performance of governmental agencies; corporate social responsibility; public policy implications of computer usage and individual privacy; and actual cases reviewed and discussed. Prerequisite: Consent of instructor. 3 hours or 1 unit.
305. **Municipal Government.** Growth of cities; their legal status; and municipal politics and organization in the United States. 3 hours, or $1/2$ or 1 unit.
306. **Municipal Problems.** Municipal administration in the United States; administrative organization; personnel problems; financial problems; city planning and housing; police and fire administration; public health; and public utilities. Prerequisite: Senior standing, or junior standing with Political Science 305 or Economics 101, or 6 hours of political science. 3 hours, or $1/2$ or 1 unit. Graduate credit is not given for Political Science 306 and 454.
312. **State Government.** The states in the federal system; state constitutions and problems of revision; organization, powers, and functions of the legislative, administrative, and judicial branches of state government; state functions; reorganization problems in the states; state-local relations; and state finance, trends, and prospects. Prerequisite: Political Science 150. 3 hours, or $1/2$ or 1 unit. Graduate credit is not given for both Political Science 312 and 454.
314. **The Presidency.** Determinants and growth of presidential influence; presidential decision making; the president's role in the formulation and implementation of public policy; the president and constituencies; and the president's roles as legislator, party leader, and chief executive. Prerequisite: Political Science 100 or 150. 3 hours, or $1/2$ or 1 unit. Graduate credit is not given for both Political Science 314 and 451.

- 315. Legislatures and Legislation.** The legislative function in government; structure and organization of American legislatures (national, state, and local); party organization in legislatures; legislative procedure; pressure groups and lobbying; relation of legislature to other branches of government; and problems of legislative reorganization. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Political Science 315 and 452.
- 317. The American Federal System.** The nature, justification, and problems of federalism; coordination of governmental efforts by contract, subsidies, and grants; and comparison of federal systems. Prerequisite: Political Science 150. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Political Science 317 and 454.
- 322. Politics and the Media.** Same as Communications 322. See Communications 322.
- 326. American Political Parties.** Organization and operation of the American party system; relations between national, state, and local organizations; state and national committees; the convention systems; the primary; and campaign methods and finance. Prerequisite: Political Science 150 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Political Science 326 and 455 or 457.
- 327. Black Political Participation in the American Political Process.** Same as Afro-American Studies 327. The role of race is stimulating change in American political life; types of strategies employed in the civil rights struggle; how race affects Black electoral participation and the broader political and economic conditions of Black Americans. Prerequisite: Political Science 150, or 6 hours of social science, or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit.
- 328. An Introduction to the Study of Political Behavior.** An analysis of the interrelations of political attitudes and public formation; special attention to the substantive areas of voting behavior, political leadership, and the rise of political mass movements; and also a review of the literature on democratic and authoritarian personality types. Prerequisite: Political Science 150 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Political Science 328 and 456.
- 329. Electoral Behavior.** Study of the social and psychological motivations behind the individual voting decision, with special emphasis on the relationships between the voting decision and social stability. Prerequisite: 6 hours of political science. 3 hours, or $\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Political Science 329 and 455 or 456.
- 331. British Government.** Nature of the British Constitution; the Crown, Ministry, and Cabinet; Parliament and elections; the party system; law and the courts; local government; and the British Commonwealth. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 332. African Independence and Underdevelopment: 1945 to the Present.** Same as History 385. See History 385.
- 333. Southern Africa: Race and Power.** Same as African Studies 325 and History 325. See African Studies 325.
- 335. Government and Politics of the Soviet Union.** Evolution, structure, and functioning of the Soviet system of government; the theories, structure, and functioning of the Communist party of the Soviet Union. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Governments and Politics in Western Continental Europe.** An analysis of the major governmental systems of continental Europe; the evolution, structure, and functioning of the political institutions of France, Germany, Italy, Spain, Switzerland, and the Scandinavian countries. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 337. Government and Politics of China.** Same as East Asian Languages and Cultures 337. An introduction to the government and politics of modern China. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 338. Governments and Politics in the Near East.** Same as Asian Studies 338. An analysis of the transformation of Middle Eastern society from Morocco to Iran, as case studies in political modernization; study of politics of the area with special reference to causes and

- character of modernization, role of leadership, ideologies and institutions, methods and theories for analyzing political systems undergoing fundamental transformation, and implications for U.S. policy. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
339. **Islam and Society in the Modern Middle East and North Africa.** Same as Religious Studies 308. See Religious Studies 308.
340. **The German Political System.** Structures and processes of postwar German politics, with primary emphasis on West Germany; special attention to foreign policy formulation and problems (particularly defense), the Berlin issue, reunification, and relations with Eastern Europe. Knowledge of German helpful but not necessary. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
342. **Government and Politics in Latin America.** A survey of the origin and development of Latin American political institutions; systems of government; public administrative systems; party government; and international policies of Latin American governments. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
343. **Political Systems and Structures of Latin American Countries.** The political process, generally of selected Latin American countries at different levels of political development; stress on the interaction between political infrastructure and more formal agencies of government; and may include cross-national comparison of the function of such factors as political culture, party system, bureaucracy, or the military establishment. Prerequisite: Political Science 342 or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
345. **Government and Politics in Sub-Saharan Africa.** Examines contemporary economic, social, and political processes focusing on three basic explanatory themes: historical patterns of development; emerging patterns of class and interest; and leadership strategies. Prerequisite: Political Science 222 or 6 hours of political science or consent of instructor. 3 hours or $1\frac{1}{2}$ to 1 unit.
346. **Comparative Communist Systems: Eastern Europe.** Analysis of the origins of modern communism and the development of its doctrines; applications of these doctrines in the practices of ruling Communist parties; emphasis on alternates between European and non-European Communist systems, depending on course instructor. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
347. **Governments and Politics of Southeast Asia.** Same as Asian Studies 347. Comparative analysis of the political development of the countries of Southeast Asia, the lands to the east of India and south of China; emphasis on differing approaches to the governance and formation of public policy in these countries; and consideration of economic, social, historical, and cultural influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
348. **Government and Politics of Japan.** Same as East Asian Languages and Cultures 348. Introduction to the government and politics of modern Japan. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
349. **Governments and Politics of South Asia.** Same as Asian Studies 349. A comparative analysis of the political development of India, Pakistan, Sri Lanka, and the lesser lands of South Asia; emphasis on the differing approaches to governance and formation of public policy in these countries; and consideration of economic, social, historical, geographical and cultural influences on political development. Prerequisite: Political Science 240 or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
350. **Law and Society.** An introductory study from a social science perspective of the nature of law, law makers, and law appliers; the causes or inputs determining law; and the effects or outputs which law in general produces. Prerequisite: Junior standing. 3 hours, or $1\frac{1}{2}$ or 1 unit.
351. **American Constitutional System.** Judicial interpretation of constitution; separation of governmental powers; relation of state and national governments; control of interstate commerce; and jurisdiction of courts. Prerequisite: Political Science 150. 3 hours, or $1\frac{1}{2}$ or 1 unit. Graduate credit is not given for both Political Science 351 and 453.
354. **The Judicial Process.** A systematic analysis of legal, evidentiary, environmental, and personal factors that influence judicial decision making, with particular emphasis on the

- application of the scientific method to the study of judicial behavior. Prerequisite: Political Science 150. 3 hours, or $1/2$ or 1 unit. Graduate credit is not given for both Political Science 354 and 453.
355. **The Constitution and Civil Liberties.** Study of free speech, loyalty in a democratic state, citizenship, freedom of religion, rights of persons accused of crime, and government's responsibility to protect persons from racial and religious discrimination; and special attention to the role of law and judges. Prerequisite: Political Science 150. 3 hours, or $1/2$ or 1 unit.
357. **Human Rights.** Same as Sociology 357. See Sociology 357.
359. **Contemporary Supreme Court Policy Making.** Studies how the modern Supreme Court has resolved major issues in American constitutional politics. Prerequisite: Consent of instructor; Political Science 351 or 355 or Sociology 358. 3 hours or 1 unit.
361. **Introduction to Public Administration.** Development of administrative organization; administration and the executive, legislature, and judiciary; principles of organization, including line and staff relationships; the staff services of finance and personnel; and formal and informal control. Prerequisite: Political Science 150. 3 hours, or $1/2$ or 1 unit.
362. **Administrative Organization and Policy Development.** Dynamics of policy formulation in public administrative agencies; current developments in organizational theory and their significance for public administration; origin of public administrative organizations; interpersonal behavior; large-scale organizations and centralization; external support and opposition; and policy formation and problems of compliance. Prerequisite: 6 hours of political science or consent of instructor. 3 hours, or $1/2$ or 1 unit.
370. **Selected Topics on Women and Politics.** Same as Women's Studies 370. Variable topics relating to the political roles and status of women, emphasizing the areas of comparative politics, political theory, political behavior, and international politics. See *Timetable* for current topics. Prerequisite: Political Science 235 or consent of instructor. 3 hours or 1 unit. May be repeated once for credit.
371. **World International Organization.** General development and basic principles of world organization; principles, structure, methods, and actual operation of international governmental institutions; and special attention to the United Nations and related agencies and to their evolution from the League of Nations system. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
375. **Politics of the Global Economy.** Examines the interaction between politics and economics; locates ideologies and practices in the context of international economic relations. Considers such topics as international trade, the global monetary order, multinational corporations, economic aid relationships, and food and energy politics. Prerequisite: Political Science 240 or 280. 3 hours or 1 unit.
377. **International Communications.** Same as Communications 377. An interdisciplinary approach to international communications; its structure and content; the role of international communications in conflict and conflict resolution; the semantics of international communication; the technical and economic aspects of international mass communications; and government-industry relations in communications. Prerequisite: Political Science 280 or 6 hours of social science, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
380. **Comparative Foreign Policies.** An analysis of the formulation and substance of the foreign policies of select nations of the world. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
381. **American Foreign Relations.** Participation in international affairs; presidential initiative; development and organization of the Department of State; diplomatic intercourse; consular service; treaty-making power; and development of foreign policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
382. **Contemporary American Foreign Policies.** Study of the major foreign policy decisions currently confronting the United States government: analysis of background, principal issues, and alternative actions; formulation of policies. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
383. **Soviet Foreign Policy.** Survey of Soviet foreign policy from 1917 to the present, with emphasis upon the forces shaping this policy; special attention to the interplay of ideology and national interest in policy formulation. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.

- 384. International Relations.** Examination of contemporary international systems in terms of the types of actors and their goals, various structures of power, and the mechanisms of allocating resources and containing conflict. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 385. International Law.** Analyzes the concepts and bases of public international law; topics include sources and subjects of international law, as well as issues of jurisdiction, territory, law of the sea, and use of military force. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 386. International War and Peace.** An examination of the conditions that promote war and peace between states. General topics covered are: historical patterns in warfare; causes of war, including arms races and power distributions; outcomes of war; and approaches to peace. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 387. National Security Policy.** Examination of the organization and formulation of current American defense policy; the theory and practice of deterrence, with special reference to American and Soviet military strategy; and the problems of disarmament and arms control. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 389. Chinese Foreign Policy.** Same as East Asian Languages and Cultures 385. An analysis of the formulation, substance, and conduct of Chinese foreign policy, with emphasis on the period since 1949; special attention to the forces shaping Chinese policy. Prerequisite: Political Science 280 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 390. Methods of Political Analysis.** Presentation of the analytic processes in the development of concepts, hypotheses, and theories; discussion of the derivation, formulation, and specification of research problems to be related to basic methodologies and modes of analysis; and applications to political science. Prerequisite: Political Science 270, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 391. Topics in non-Western Political Thought.** Considers political thought outside of the Greco-Roman, European, and North American tradition; each semester focuses on the political thought of a specific region. 3 hours or 1 unit. May be repeated as topics vary.
- 392. Socialist Political Theory.** Origins, development, and recent modifications of socialist theory from the late eighteenth century to the present; examination of each contribution in terms of its goals, efficacy, and subsequent influence; and discussion including Rousseau, Hegel, the Utopians, Marx and Engels, Anarcho-syndicalists, Lenin, Luxemburg, Trotsky, Mao, Guevara, and Garaudy. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 393. Classical Political Theory.** A consideration of major works of Greek and Roman political theory, and especially of their relevance to modern political analysis and action. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 395. Modern Political Theory.** A critical analysis of political theories from the sixteenth century to the present; focus on the development of conceptions of human nature the role of the state, justice, legitimacy, obligation, individual rights, equality, and mechanisms of maintenance and change. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 396. Contemporary Political Theory.** Major tendencies in Western political theory since 1850; conservatism and constitutionalism; the religious interpretation of the state and economic institutions; Marxism, socialism, and communism; and antidemocratic thought and totalitarian regimes. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 397. American Political Theory.** Survey of American political thought from colonial times to the present. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 398. Theory and Practice of Democratic Government.** Theories of the nature and conditions of democracy; comparison and analysis of contemporary democratic institutions. Prerequisite: Political Science 260 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 400. Selected Topics in Political Theory.** Reading, analysis, and discussion of selected topics of political theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.

401. **History of Political Theories.** Reading and analysis of the leading political thinkers from the Greeks to the middle of the seventeenth century. 1 unit.
402. **History of Political Theories.** Readings and analysis of the leading political thinkers from the middle of the seventeenth century to the present. 1 unit.
427. **Introduction to Quantitative Political Analysis.** Introduction to problems of research design, data collection, data analysis and interpretation, sampling, and some simple measures of statistical association and significance. 1 unit.
428. **Multivariate Analysis for Political Scientists.** Applied use of extended analysis of variance; multiple classification analysis, factor and small-space analysis, causal analysis, multiple regression, and selected topics for research. Prerequisite: Sociology 387 and Political Science 427, or consent of instructor. 1 unit.
430. **Proseminar in Comparative Politics.** Comparative political analysis in the context of the evolution of the social sciences and modern political science, with emphasis on theories of political action and their function in contemporary comparative studies. This course is designed as an introduction to area-oriented seminars and generally is a prerequisite for them. 1 unit.
440. **Comparative Politics and the Political Process.** The comparative study of selected national political systems or of specific institutional forces that influence the making and application of public policy in several countries. The countries studied and the legal and extralegal political agencies considered vary according to the person conducting the seminar. 1 unit. May be repeated to a maximum of 3 units.
441. **Seminar in African Government and Politics.** Advanced research seminar. Focus will alternate among such topics in African politics as (a) the politics of agriculture (b) state and society (c) African political systems and the challenge of democratic practice and (d) political and economic crisis in Sub-Saharan Africa. Prerequisite: Political Science 222 and 345 or consent of instructor. 1 unit. May be repeated as topics vary to a maximum of 3 units.
450. **Proseminar in American Politics.** An intensive analysis of major institutions and processes of American politics (national, state, and local); research on selected topics in American government. 1 unit.
451. **Seminar on the U.S. Presidency.** Introduction to the literature and research topics on the American Presidency; includes presidential relations with the public and mass media, other governmental institutions and elites, and decision processes in the White House. Prerequisite: Graduate standing. 1 unit. Graduate is not given for both Political Science 451 and 314.
452. **Seminar on the U.S. Congress.** Traces the development of Congress as an institution with special attention to the role of norms; considers intra-institutional aspects of Congress including committee decision-making, floor voting, and leadership; examines congressional relationships with other actors including the presidency and Supreme Court, interest groups, and constituents. Prerequisite: Graduate standing. 1 unit. Graduate credit is not given for both Political Science 452 and 315.
453. **Seminar on Law and Politics.** Legal institutions, legal decision-making, and constitutional politics in the American setting; includes both theoretical and methodological aspects of the law and politics literature. Prerequisite: Graduate standing. 1 unit. Graduate credit for is not given for both Political Science 453 and Political Science 351 or 354.
454. **Seminar on Sub-National Politics.** Political interactions among and within the levels of government in the American national, state, and urban political systems; analytical approaches include empirical theories (e.g., macro-analytic, exchange, public choice, institutionalism) and value theories (e.g., democracy, representation, pluralism, federalism); methodologies range from historical to quantitative with emphasis on combinations. Prerequisite: Graduate standing. 1 unit. Graduate credit is not given for both Political Science 454 and Political Science 306, 312, or 317.

- 455. Seminar on Political Parties and Elections.** The role of political parties and elections in the political process; traces the evolution of American parties as a political institution, assesses their impact upon the policy-making processes, and considers macro-level influences upon the electoral process. Prerequisite: Graduate standing. 1 unit. Graduate credit is not given for both for Political Science 455 and Political Science 326 or 329. 1 unit.
- 456. Seminar on Mass Political Behavior.** Covers the scholarly literature on, and the research techniques used to study, political participation, electoral behavior, political socialization, and public opinion. Prerequisite: Graduate standing. 1 unit. Graduate credit is not given for both Political Science 456 and 328 or 329.
- 457. Collective Action and Interest Groups.** Broad analysis of collective action, interest groups, and politics; examines the meaning of political interests and the forms they take; reviews various approaches to the study of interest groups; analyzes the formation and operation of interest groups; reviews research in the policy areas of housing, agriculture, race, and gender at a variety of institutional levels; examines innovation and change in interest group politics and research. Prerequisite: Graduate standing. 1 unit. Graduate credit is not given for both Political Science 457 and 326.
- 459. Contemporary Governmental Problems.** Special problems of current importance designed especially for students majoring in political science. 1 unit. May be repeated to a maximum of 3 units.
- 460. Organizational Sciences, I.** Same as Business Administration 410, Psychology 453, and Sociology 456. See Business Administration 410.
- 461. Formation of Public Policy.** Same as Labor and Industrial Relations 420. An examination of the institutional and dynamic forces that shape the making of policy and its administration in the United States; separation of powers, pressure groups, administrative and legislative procedures, and judicial activity. 1 unit.
- 465. Problems in Administrative Management.** Analysis of methods of applying administrative principles and procedures to operating problems in government agencies, such as methods of administrative coordination and control, intergovernmental cooperation, legislative-administrative relations, the organization of regulatory functions, and review of administrative decisions. Prerequisite: Political Science 361 or consent of instructor. 1 unit.
- 466. Current Administrative Theory.** A discussion of some recent trends in administrative opinion and practice on such questions as agency structure and functional activities; field and regional organization and relations; the role and functions of the executive; the process of decision making; the relations of line and staff activities; the communication and execution of policies and programs; and employee relations. 1 unit.
- 469. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations, Social Work, and Administration, Higher, and Continuing Education 497. See Labor and Industrial Relations 497.
- 480. Scope and Theory in International Relations.** Deals with the field of international relations, its relationship to political science and the other social sciences; treats the development of the field by examining major theories and approaches that have characterized it in the past, but with emphasis on contemporary theories and concepts. 1 unit.
- 481. Methodology in International Relations.** Deals with major research methodologies in contemporary international relations; includes case studies, aggregate data, content analysis, survey research, gaming and simulations, and causal modelling; and presumes knowledge of basic international relations theory. Prerequisite: Political Science 480. 1 unit.
- 482. Formal Models in International Politics.** Second half of year long sequence, with 481, covering the quantitative literature in international politics. Covers the formal models that have been developed to account for international political phenomena. Prerequisite: Political Science 481. 1 unit.

- 483. International War.** Focuses on the conditions that influence war and peace between nation-states. Considers various factors at different levels of analysis (individual, national, dyadic, and systematic) in an attempt to understand why nations go to war. Readings will consist of current research in this topic area (without ignoring, however, certain "classical" theoretical approaches). Prerequisite: Political Science 480. 1 unit.
- 484. International Organizations.** General development and operations of international organizations with special emphasis on United Nations and related agencies. Focuses on activities in security, economic, and social issue areas. Prerequisite: Political Science 480. 1 unit.
- 485. International Political Economy.** A comprehensive introduction to major traditions in contemporary thought on the political structure and workings of the global economy. Presumes background knowledge pertaining to the workings of the international economy and its institutions as well as familiarity with the assumptions and approaches of classical I.P.E. thought and International Relations theory. Prerequisite: Political Science 480. 1 unit.
- 486. Comparative Foreign Policies.** Focuses on the formulation and implementation of foreign policy within the state, first as an international phenomenon, and second as a national one for specific states (e.g. United States, Soviet Union, India, China, Japan, etc.). Prerequisite: Political Science 430 or 480. $1/2$ or 1 unit.
- 489. International Relations: Special Problems in Theory and Research.** Advanced seminar on special topics in international relations. Prerequisite: Political Science 480 or 481, or consent of instructor. 1 unit. May be repeated under different instructors to a maximum of 3 units.
- 490. Proseminar in Political Behavior, I.** Interdisciplinary approaches to the analysis of political behavior; formation of opinions, interests, roles, and personality; applications of organization theory to political institutions; applications of conflict and bargaining theory to political processes; and systematic studies of the distribution of values. 1 unit.
- 491. Proseminar in Political Behavior, II.** Continuation of Political Science 490. Prerequisite: Political Science 490. 1 unit.
- 492. Problems of Explanation in Social Science.** Special topics in the methodology of social sciences, especially theory formation and theory testing. 1 unit.
- 493. Research in Selected Topics.** Research in selected topics by arrangement with the instructor. $1/2$ to 3 units.
- 494. Dissertation Design Seminar.** Addresses the basic steps involved in the development of a dissertation proposal; aims to facilitate the completion of the dissertation proposal for students who have passed the qualifying examinations. Prerequisite: Successful completion of required qualifying examinations. 0 units.
- 495. Philosophical Bases of Political Inquiry.** Definitions of the scope and subject matter of political science; methodological issues in political science; major conceptions of methodology as embodied in current leading studies of politics; and the present state of research in political science. Prerequisite: graduate standing. 1 unit.
- 496. Research Design and Techniques.** Indicates the relevance of certain research techniques for answering questions of concern in political science; indicates the range of tools available to the student; and includes discussion of problems in concept formation. Presents current methods of concept measurement in the context of political research problems. Prerequisite: Political Science 495 or consent of instructor. 1 unit.
- 498. The Logic of Political Inquiry: Selected Topics.** Application of analytic principles and procedures developed in Political Science 495 to such topics as patterns of explanation; current theoretical perspectives; group theory, functionalism, systems theory, decision making, simulation, etc; the logic of judicial decisions; and justifications of political ideologies. This list is not exhaustive, nor will all of these topics be included each semester. Prerequisite: Political Science 495. 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

PRINTMAKING

(See Art and Design)

PSYCHOLOGY

Head of Department: Emanuel Donchin

Department Office: 308 Psychology Building, 603 East Daniel Street, Champaign

- 100. Introduction to Psychology.** Study of human behavior with special reference to perception, learning, memory, thinking, emotional life, and individual differences in intelligence, aptitude, and personality; emphasis on the scientific nature of psychological investigations; and discussion of research methods and the relation of their results to daily life and everyday problems. Lectures, discussions, and five hours of participation as a subject in psychological experiments. 4 hours. Credit is not given for Psychology 100 and Psychology 103 or 105.
- 102. Psychology Orientation.** Lectures designed to acquaint the psychology major with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to psychology students. Recommended for freshmen in psychology. 0 hours.
- 103. Introduction to Experimental Psychology.** Surveys basic topics in experimental psychology; emphasizes perception, learning, memory, motivation, emotion, cognition, language development, and decision-making. Uses simple laboratory experiments to investigate these topics. 4 hours. Credit is not given for Psychology 100, 103, or 105.
- 105. Elements of Psychology.** Description and explanation of the psychological principles of everyday living, with emphasis on how behavior is motivated, how individuals learn intelligent behavior, personality, and applications of psychology to various social issues. Lectures, discussions, and five hours of participation as a subject in psychological experiments. This course may be substituted for Psychology 100 when the latter is listed as a prerequisite or a recommended elective. For placement purposes, enrollment is limited to students whose ACT composite score is 21 and below. 4 hours. Credit is not given for Psychology 103 and Psychology 100 or 105.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 201. Introduction to Social Psychology.** Systematic study of social factors in individual and group behavior; attention to social perception, motivation, and learning; attitudes, norms, and social influence processes; the development and dynamics of groups; and the effects of social and cultural factors on the individual. Credit is not given for both Psychology 201 and Sociology 201. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 210. The Brain and the Mind.** A survey of current knowledge and speculation regarding the brain's role in perception, motivation, sexual behavior, thinking, memory, and learning, based upon human clinical data and research in animal models. Prerequisite: Psychology 100, 103, or 105, or consent of instructor. 3 hours.
- 211. Techniques of Biological Psychology.** Introduction to research techniques used in the physiological study of mental processes; includes recording "brain waves," behavioral analysis of drug and lesion effects, anatomy of the brain, hormones and behavior, and related topics. Prerequisite: Credit or concurrent registration in Psychology 210, or consent of instructor. 2 or 3 hours.
- 214. Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Leisure Studies, and Rehabilitation Education 214. See Human Development and Family Studies 214.
- 216. Child Psychology.** Study of the psychological development of the child. Prerequisite: Psychology 100, 103, or 105. 3 hours.

- 217. Comparative Development.** Survey of phylogenetic and ontogenetic development of behavior. The first part of the course considers the comparative psychology of representative phyla, with special emphasis on the development of sensorimotor coordination, motivation, and learning. The second half of the course is concerned with development of behavior in the individual organism, with most attention devoted to behavioral changes during the life span of vertebrate organisms. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 219. Developmental Child Care: Methods and Issues.** Introduction to current child care programs for children under five; historical philosophical foundations, application of research and theory to program practices for children birth to five with emphasis on full day programs. Prerequisite: Psychology 216, Human Development and Family Studies 105, or Educational Psychology 236. 3 hours.
- 224. Cognitive Psychology.** Introduction to the psychological study of human information processing and memory; acquisition, retrieval, and forgetting; and general knowledge, concepts, reasoning, and related issues in cognition. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 230. Perception and Sensory Processes.** Survey of the experimental psychology of sensory and perceptual processes and behavior; emphasis on the contribution of behavior science to understanding subjective experience of the physical and social environment. Prerequisite: An introductory course in psychology, physiology, or animal biology. 3 hours.
- 231. Research Methods in Experimental Psychology.** Studies experimental laboratory methods as related to applied and basic psychological questions; material includes: research methodology, scientific problem solving, literature search, scientific writing, experimental design, basic data analysis, and research laboratory experience. Prerequisite: Psychology 100, 103, or 105. 4 hours.
- 233. Descriptive Statistics.** Descriptive statistics, including measures of central tendency and dispersion, correlation, probability, transformations, and basic distribution theory; basic principles of sampling and research design. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 3 hours. Students may not receive credit for Psychology 233 and Psychology 235, Economics 171 or 172, Sociology 185 or 385, Statistics 100 or 210 or Educational Psychology 390. (Offered by correspondence only.)
- 234. Inferential Statistics.** Inferential statistics, including sampling distributions estimation, hypothesis testing, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 233. 2 or 3 hours. Students who have earned credit in Economics 171 or 173, Statistics 100 or 210, Sociology 185, or Educational Psychology 390 receive 2 hours credit in Psychology 234. Students may not receive credit for both Psychology 234 and 235. (Offered by correspondence only.)
- 235. Introduction to Statistics.** Development of skill and understanding in the application of statistical methods to problems in psychological research; topics include descriptive statistics, probability, estimation, basic inferential methods, regression, correlation, and basic analysis of variance procedures. Laboratory includes discussion of problems and application of statistical methods to data from experiments and surveys. Prerequisite: Psychology 100, 103, or 105; college algebra or equivalent; or consent of departmental academic adviser. 2 or 5 hours. Students who have earned credit in Economics 171, 172, or 173, Statistics 100 or 210, Sociology 185 or 385, or Educational Psychology 390 receive 2 hours credit in Psychology 235. Students may not receive credit for both Psychology 235 and either Psychology 233 or 234.
- 238. Abnormal Psychology.** Conceptions and facts about disordered behavior, including psychoses, neuroses, and other patterns of psychological disturbance. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 239. Community Psychology.** Redefines human and social problems and the implications for social programs and policies; reviews the historical antecedents, conceptual models, strategies and tactics of social and community programs; and employs examples from selected social systems (e.g., criminal justice, education, employment, and mental health). Prerequisite: Psychology 100, 103, or 105. 3 hours.

- 245. Industrial Organizational Psychology.** A systematic study of the application of psychological methods and principles in business and industry; emphasis on personnel selection and factors influencing efficiency. Prerequisite: Psychology 100, 103, or 105; credit or concurrent registration in a statistics course. 3 hours.
- 246. Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Sociology 246. See Ecology, Ethology, and Evolution 246.
- 248. Psychology of Learning and Memory.** Survey of basic phenomena in learning and memory emphasizing experimental data from animal and human research. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 250. Psychology of Personality.** The study of personality from various points of view: biological, experimental, social, and humanistic; surveys theory and empirical research in the study of personality. Prerequisite: Psychology 100, 103, or 105. 3 hours.
- 258. Human Factors in Human-Machine Systems.** Same as Industrial Engineering 248. Examines equipment and training variables that influence the human operator in human-machine systems; includes the nature of human-machine systems, the capabilities of humans and machines, and simulation for design decision; and research and principles for the design and use of symbolic and pictorial displays, control systems, and simulators for training. Prerequisite: Psychology 100, 103, or 105; or junior standing. 3 hours.
- 260. American Sign Language.** Same as Linguistics and Speech and Hearing Science 260. A beginning course in American Sign Language (ASL), the language developed and used by the deaf community of North America; consists of a preparatory phase to attune students to communication in the manual-visual mode, followed by instruction and extensive practice in basic sign vocabulary, sentence structure, elementary conversation, and the literature of the ASL community. 3 hours.
- 290. Special Topics.** Supervised participation in research and scholarly activities usually as an assistant to an investigator. Prerequisite: 10 hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours.
- 291. Honors Individual Study.** Prerequisite: Junior standing; admission to psychology honors program. 2 to 4 hours. May be repeated to a maximum of 10 hours. (Counts for advanced hours in LAS.)
- 293. Honors Senior Thesis.** Planning, researching, and writing of an undergraduate honors thesis, under supervision of a faculty member, on a problem of appropriate scope and character. Prerequisite: Psychology 297. 2 to 4 hours. (Counts for advanced hours in LAS.)
- 294. Individual Topics.** Supervised independent investigation of special topics in psychology; requires a written report with a final copy submitted for departmental records. Prerequisite: Ten hours of psychology or cognate area, or written consent of instructor. 1 to 4 hours. May be repeated to a maximum of 9 hours. (Counts for advanced hours in LAS.)
- 297. Junior Honors Seminar.** Seminar on experimental methods and contemporary psychological research. Prerequisite: Junior standing and admission to departmental honors program. 0 to 4 hours. (Counts for advanced hours in LAS.)
- 298. Senior Honors Seminar.** Continuation of Psychology 297. Prerequisite: Psychology 297. 0 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
- 300. Psychology for Medical Students and Health Professionals.** An advanced treatment of psychological concepts with an emphasis on their interaction with medicine. Topics include: perception, learning, memory, thinking, emotions, and individual differences; psychological theories and data relevant to the analysis of illness and disease; decision making and medical problem solving. Prerequisite: 12 hours of psychology and a 4.0 grade-point average; and senior, graduate, or professional standing; or consent of instructor. 3 hours or 1 unit.
- 301. The Computer as a Laboratory Instrument.** The computer as a control device in biobehavioral experiments; data acquisition using computer-controlled devices; and includes introduction to computer architecture and application language programming, study of recent experimental literature for which the computer was an indispensable tool, and practicum utilizing laboratory computers available at the Department of Psychology.

Prerequisite: Computer Science 103 or equivalent; two 200-level psychology courses or consent of instructor. 4 hours or 1 unit.

306. **Statistical Methods, I.** Techniques in applied statistics used in psychological research, including simple linear regression, partial and multiple correlation, and nonparametric methods; thorough review of statistical estimation and significance tests; emphasizes applied statistics and statistical computing. Introduces experimental design; one-way ANOVA. Prerequisite: 12 hours in psychology and Psychology 235, or equivalent. 4 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
307. **Statistical Methods, II.** Continuation of Psychology 306. Experimental design, including Latin Squares, factorials, and nested designs; expected Mean Squares, Analysis of Covariance; emphasizes the general linear model; introduces multivariate methods, such as factor analysis, scaling, classification, and clustering. Discrete multivariate analysis—multiway contingency tables. Prerequisite: Psychology 306. 4 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
311. **Laboratory in Physiological Psychology.** Research on classical and current problems; emphasis on the nervous and endocrine systems in information processing and in the regulation of behavioral adaptation; and examples from sensation, perception, motivation, emotion, and learning. Laboratory. Prerequisite: Psychology 211 and consent of instructor. 4 hours, or $1/2$ or 1 unit.
313. **Psychopharmacology.** Behavioral and physiological effects of chemicals either used therapeutically to treat psychological disorders or that may be abused for their psychotropic effects; emphasizes mechanisms and models for the study of drug action. Prerequisite: Psychology 210, Ecology, Ethology, and Evolution 353, or Biology 303; or consent of instructor. 3 hours, or $3/4$ or 1 unit.
314. **Brain, Learning, and Memory.** Conveys a knowledge of current research on the physiological bases of learning and memory; considers a wide range of topics from molecular (e.g., cellular morphological and functional plasticity) to relatively molar (e.g., effects of clinical and experimental brain damage on learning and memory processes). Prerequisite: Psychology 210 or Biology 303; or Psychology 248 or 348; or consent of instructor. 3 hours or 1 unit.
315. **Human Neuropsychology.** Surveys how the neurological substrate of the human brain governs and influences cognition; biological bases of language, memory, spatial processing, and emotion; principles of brain organization, localization of function and individual differences; includes developmental and clinical issues. Prerequisite: Psychology 210 or equivalent. 3 hours, or $1/2$ or 1 unit.
318. **Psychology of the Infant.** Early infant behavior, emphasizing critical evaluation of the various research techniques; prenatal and perinatal influences, ontogeny of psychological processes, environmental determinants, and infant assessment. Prerequisite: Psychology 216. 3 hours or 1 unit.
319. **Day Care Practicum.** Same as Human Development and Family Studies 319. Application of psychological theory in day care settings; supervised experiences focusing on the relation between aspects of child development and the planning and carrying out of effective day care programs. Typical sections offered include experience with infants, preschool, handicapped, hospitalized, and maltreated children. Prerequisite: Psychology 216 or Human Development and Family Studies 105; Human Development and Family Studies 202; acceptance into the Development Child Care Program; consent of instructor. 2 to 4 hours, or $1/2$ to 1 unit. May be repeated.
320. **Principles of Psychophysiology.** Theoretical and practical aspects of human psychophysiology; measurement techniques and the application of psychophysiological principles to problems in developmental, clinical, social, and experimental psychology. Prerequisite: Psychology 234 or 235, 6 hours of psychology, and an introductory course in physiology. 3 hours or 1 unit.
321. **Human Memory.** Advanced treatment of human memory. Examines basic theory and methodology; types of memory; semantic, episodic, procedural, memory for language, places, and events; knowledge and memory; autobiographical memory; exceptional memory; mnemonics. Prerequisite: 6 hours in psychology at or above 200 level, such as Psychology 224 or 248. 3 hours or 1 unit.

- 322. Introduction to Mental Retardation.** Same as Social Work 322 and Special Education 322. See Special Education 322.
- 323. Language Acquisition.** Same as Linguistics 323 and Communications 323. Survey of theory and research on the acquisition of language, concentrating on the acquisition of a first language by the young child. Prerequisite: 6 hours of psychology or linguistics above the 100-level, or consent of instructor. 3 hours or 1 unit.
- 324. Psychology of Thinking.** Survey of problems, experimental methods, and research findings in human thinking; emphasis on concept formation, problem solving and decision making, and creativity. Prerequisite: Psychology 235. 3 hours or 1 unit.
- 325. Psychology of Language.** Survey of theory and research in the psychology of language; topics include relation of linguistics and psychology, language development, and influence of language on perception, memory, and thought. Prerequisite: 6 hours of psychology or consent of instructor. 3 hours or 1 unit. Credit not given for both Psychology 325 and Linguistics 325.
- 326. Motivation and Emotion.** The nature and development of emotion, attitude, and motive, and the role of these processes in social adjustment. Prerequisite: 6 hours of psychology. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 329. Human-Computer Interaction Laboratory.** Same as Industrial Engineering 329. Examines basic concepts, methodology, and critical skills needed in conducting research, evaluating and designing human-computer interfaces. Laboratory includes performing experiments in human-computer interaction. Prerequisite: Psychology 224, 258, or 356; and a course in computer science; or consent of instructor. 4 hours or 1 unit.
- 332. Research Methods in Social Psychology: Laboratory Methods.** Same as Sociology 332. Lecture and laboratory in the methods and techniques of social psychological research in laboratory settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235 or Sociology 185. 4 hours, or $1\frac{1}{2}$ or 1 unit.
- 333. Research Methods in Social Psychology: Natural Settings.** Methods and techniques of social psychological research in natural settings. Students formulate and carry out research problems using procedures appropriate for research in natural settings. Prerequisite: Psychology 201 or Sociology 201; Psychology 235, or Sociology 185. 4 hours or 1 unit.
- 335. Mathematical Formulations in Psychological Theory.** Illustration of mathematical formulations by studying quantitative treatments of various psychological processes; emphasis on learning theory, psychophysical laws, and other selected topics; and the development of simple mathematical tools as required. Prerequisite: Elementary statistics of probability, elementary calculus, and 6 hours of psychology, or consent of instructor. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 336. Clinical Psychology.** Survey of methods in clinical psychology; description, demonstration, and critical review of procedures used by clinical psychologists in the analysis and modification of disordered behavior. Prerequisite: Psychology 238. 3 hours, or $1\frac{1}{2}$ or 1 unit.
- 337. Behavior Modification.** Introduction to the principles and application of behavior modification; includes methods of behavioral assessment, positive and negative reinforcement, punishment and extinction, token economics, programmed instruction, and desensitization; and emphasizes establishing behavioral objectives in the modification of child and adult clinical problems. Prerequisite: Psychology 248. 3 hours or 1 unit.
- 340. Community Projects.** Principles of psychology applied to service problems in the community; students serve as nonprofessional mental health workers in supervised experiences in schools, hospitals, and other nontraditional settings. Prerequisite: Psychology 100 and 239; junior or senior standing; and consent of instructor. 4 hours or 1 unit.
- 341. Advanced Community Projects.** Advanced discussion and practicum on principles of psychology which may supplement mental health and other human services in a community. Students serve as nonprofessional mental health workers in supervised experiences in school hospitals and other nontraditional settings. Prerequisite: Psychology 340 and consent of instructor. 4 hours or 1 unit.
- 342. Behavior-Genetic Analysis.** Same as Anthropology 342 and Ecology, Ethology, and Evolution 350. Concepts, methods, and problems in the analysis of relations between

genetic systems and behavior, including a historical and analytical examination of the scientific foundations of racism. Prerequisite: Anthropology 240 or Biology 106, 123 or 210. 3 hours or $\frac{3}{4}$ unit.

343. **Hormones and Behavior.** Same as Ecology, Ethology, and Evolution 353. Survey of the behavioral effects of hormones in vertebrates and invertebrates; emphasizes the extensive literature on hormonal effects on reproductive and social behavior. Students enrolled for graduate credit may write a term paper for an extra $\frac{1}{4}$ unit credit. Prerequisite: Biology 111, 123 or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
345. **Laboratory in Comparative Psychology.** Animal behavior with particular reference to the behavior of vertebrates. Prerequisite: 6 hours of psychology and an introductory course in biology, or consent of instructor. 4 hours, or $\frac{1}{2}$ or 1 unit.
347. **Behavior Genetics Laboratory.** Same as Anthropology 337 and Ecology, Ethology, and Evolution 352. Examination of the relations between genetic mechanisms, population structure, and individual differences in behavior; laboratory work on techniques of behavior study and genetic analysis. Prerequisite: Concurrent registration in Psychology 342. 2 hours or $\frac{1}{2}$ unit.
348. **Theories of Learning.** A critical analysis of selected theories of learning; consideration of problems of theory construction in the context of past controversies in learning as well as recent theories of animal and human learning. Prerequisite: Psychology 248 or Educational Psychology 211. 3 hours, or $\frac{1}{2}$ or 1 unit.
349. **Social Psychology of Sport.** Same as Kinesiology 347. See Kinesiology 347.
350. **Laboratory in Personality.** The study of personality emphasizing active participation in designing, conducting, analyzing, and presenting of research; lectures concern the practical aspects of research methodology and the philosophy of personality research; and laboratory involves conducting original research in small groups. Prerequisite: Psychology 235 or equivalent; and Psychology 250 or consent of instructor. 4 hours or 1 unit.
352. **Attitude Theory and Change.** Same as Communications 352 and Sociology 352. Comprehensive analysis of theories of attitude acquisition, organization, and change; emphasis on attitude change through communication and effects of persuasive communication on public opinion. Prerequisite: Psychology 201 or Sociology 201, or a comparable course of introduction to social psychology. 3 hours, or $\frac{1}{2}$ or 1 unit.
353. **Social Perception.** Analysis of theory and research on problems related to the manner in which persons judge themselves and others or the basis of information received; topics include impression formation integration, determinants of interpersonal attractions, and attribution processes. Prerequisite: Psychology 201 and 235, or graduate standing, or consent of instructor. 3 hours or 1 unit.
354. **Small Group Behavior.** The nature of interpersonal transactions; theories and methods for their investigation; and consideration of both individual and social determinants of such transactions. Prerequisite: Psychology 201. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **Industrial Social Psychology.** Same as Labor and Industrial Relations 355. Social psychological research and theory applied to industrial problems; emphasis on interaction and communication theory, role theory, leadership theory, motivational and perceptual theory, and group structure theory as an aid in understanding and analyzing industrial problems. Prerequisite: Psychology 201 or 357. 3 hours, or $\frac{1}{2}$ or 1 unit.
356. **Human Performance and Engineering Psychology.** Same as Industrial Engineering 346. Human capabilities and limitations in processing information; models and theories of signal detection, stimulus analysis, short-term memory, choice reaction time, decision-making, attention, and motor performance are evaluated with respect to experimental data; emphasizes theory, although implications for design of man-machine systems are considered. Prerequisite: Psychology 100, 103, or 105 or consent of instructor. 3 hours or 1 unit.
357. **Psychology of Industrial Relations.** Same as Labor and Industrial Relations 357. An analysis, in terms of the behavior of individuals, of the causes and possible solutions of industrial conflict. Offered in the special interest of industrial relations, commerce, and engineering students. Prerequisite: Psychology 100 or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.

- 359. The Social Psychology of Organization.** Same as Sociology 359. Analysis of the interrelationships between social and psychological factors, and organizational structure and process; emphasis on sources, consequences, and modes of resolution of intraindividual, intraorganizational, and interorganizational conflict. Prerequisite: Psychology 201. 3 hours or 1 unit.
- 360. Modern Viewpoints in Psychology.** Examines modern behaviorism, psychoanalysis, and cognitive psychology, viewed as conceptions of man, styles of theorizing and investigative strategies; critically evaluates the more influential theories and research. Prerequisite: 6 hours of psychology. 3 hours, or $1/2$ or 1 unit.
- 362. Cognitive Development.** Survey of theory and research on the development of problem-solving skills, memorial and metamemorial processes, logical thinking, and language. Prerequisite: Psychology 216 and 235. 3 hours or 1 unit.
- 363. Laboratory in Developmental Psychology.** Experience in designing, carrying out, and reporting an original research project. Prerequisite: Psychology 216 and 235, or equivalent. 4 hours or 1 unit.
- 365. Personality and Social Development.** Same as Educational Psychology 315. Major theories of personality and social development, with attention to processes of social learning, individual differences in personality development, and outcomes of social development; applications to school, home, and other field settings. Prerequisite: Psychology 216 or Educational Psychology 236, or equivalent. 3 hours or 1 unit.
- 368. Psychology and Law: Civil Liberties and Constitutional Issues in the Mental Health, Educational, and Criminal Justice Systems.** Examines relationship of the administrative, civil, and criminal justice systems to educational and mental health institutions; individual rights, social issues, and psychological well being. Prerequisite: 6 hours of social science. 3 hours, or $1/2$ to 1 unit.
- 371. The Psychology of Voting Behavior.** An application of psychological methods and theories to the study of political behavior; attention to research methods and to content problems in voting behavior and national security policy. Prerequisite: 6 hours in psychology beyond 100-level courses, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
- 372. Environmental Psychology.** Same as Environmental Studies 372. See Environmental Studies 372.
- 373. Theory and Method in the Cross-Cultural Study of Individual Social Behavior.** Same as Anthropology 373. Centers on cross-cultural study of substantive areas such as personality, motivation, socialization, interpersonal behavior, psychological environments, cognition and cognitive development, ethnocentrism and stereotypes, and visual perception; emphasis on methodological limitations and contributions of cross-cultural study; and discussion of current problems and research. Prerequisite: 6 hours of psychology or anthropology, or consent of instructor. 3 hours or 1 unit.
- 375. Personnel Psychology.** Introduces problems and research relevant to personnel issues in organizations. Topics include: individual differences; selection of personnel; test theory; performance appraisal; equal employment opportunity legislation, regulation, and litigation; assessing bias in selection. Prerequisite: Psychology 235 or equivalent, and either Psychology 245 or Business Administration 351. 3 hours, or $3/4$ or 1 unit.
- 380. Introduction to Mental Health Programs.** Historical foundations, schema for classification of mental health delivery systems, contemporary treatment strategies, ethical and legal issues, and alternatives to institutional treatment; includes field trips to a variety of treatment facilities. Prerequisite: Credit or concurrent registration in Psychology 336 and 337. 3 hours or 1 unit.
- 381. Beginning Practicum in Mental Health.** Didactic instruction and supervised practicum experience in a community treatment agency; self-report, observational, and physiological approaches to client assessment; and lecture-discussion and direct agency experience each week. Prerequisite: Psychology 380. 4 hours or 1 unit.
- 382. Issues in Mental Health Work, I.** Basic behavioral principles useful in formulating, carrying out, and evaluating a treatment plan; focuses on the training of nonprofessionals (e.g., parents) or staff members in treatment roles. Prerequisite: Psychology 381 and concurrent registration in Psychology 383. 2 hours or $1/2$ unit.

383. **Advanced Practicum in Mental Health, I.** Supervised practicum experiences in a community agency which correspond to didactic material presented in the companion course, Psychology 382. Prerequisite: Concurrent registration in Psychology 382. 4 hours or 1 unit.
384. **Issues in Mental Health Work, II.** Procedural alternatives to the operant approaches presented in Psychology 382 and 383; students are encouraged to focus their interests on a particular client population; and lecture-discussion with individualized reading programs. Prerequisite: Concurrent registration in Psychology 385. 2 hours or $\frac{1}{2}$ unit.
385. **Advanced Practicum in Mental Health, II.** Supervised practicum experiences in a community agency corresponding to didactic material presented in the companion course, Psychology 384; twelve-hour-per-week assignments reflect student interests in specific population. Prerequisite: Psychology 382 and 383, and concurrent registration in Psychology 384. 4 hours or 1 unit.
390. **Laboratory in Psychological Measurement and Test Development.** The measurement of human behavior in psychological studies; the construction and use of psychological tests; introduction to tests of intelligence, achievement, personality, and interest; and practice in test construction, administration, and validation. Lectures and laboratory. Prerequisite: A knowledge of statistics equivalent to that from Psychology 235. 4 hours or 1 unit.
396. **Seminar in Psychology.** Special topics in the field of psychology. Prerequisite: Junior standing and consent of instructor. 2 to 4 hours, or $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 12 hours or 3 units.
398. **Human Factors in the Design of Complex Systems.** Same as Industrial Engineering 348. See Industrial Engineering 348.

NOTE: The prerequisites stated below apply to graduate majors in psychology. Graduate students minoring in psychology may, by special permission of instructors, enroll in certain of these courses without having met all the prerequisites.

402. **Systematic Psychology.** Analysis of methodological problems, including forms and roles of models and theories, status of unobservable organismic events, validation of measures and manipulations, possible forms of laws, forms of data language, and status of private reports; evaluation of the approaches to these problems provided by several varieties of behaviorism, standard and omnitheoretic views in the philosophy of science, and network methods. Prerequisite: 12 hours of psychology. 1 unit.
405. **Neurochemistry.** Same as Physiology 405. The fundamentals of neurochemistry and topics of current interest; detailed study of chemical transmission, including metabolism, neuroanatomical distribution, pharmacology, and functions of neurotransmitters. Lecture-seminar. Prerequisite: Biochemistry 350, Psychology 210, or consent of instructor. $\frac{3}{4}$ unit.
406. **Psychological Scaling: Unidimensional Methods.** Same as Sociology 406. Measurement of psychological values; centrally concerned with how subjective values of multiple physical dimensions combine to produce unidimensional subjective values; and includes conjoint and functional measurement theory and methods, theoretical models of judgment and the analysis of empirical structures, and applications of scaling models to problems in social, personality, perception, and cognitive psychology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. 1 unit.
408. **Design of Experiments in Psychology.** Advanced experimental designs in psychological research; special methods of data analysis. Prerequisite: Psychology 307. 1 unit.
409. **Psychological Scaling: Multidimensional Methods.** Same as Sociology 409. Basic scaling theory; metric, nonmetric, and individual differences multidimensional scaling models and methodology, emphasizing underlying assumptions and interpretation; and applications of scaling methods to measurement problems in social and personality psychology, perception, cognition, and sociology. Prerequisite: Psychology 307, Sociology 387, or equivalent course in quantitative methods. Psychology 406 is recommended but not required. 1 unit.

- 410. Advances in Psychobiology: Introduction for Graduate Students.** Deals with the relevance of biological psychology to the subdisciplines of psychology; topics include current theory and treatment of psychosis, neuropsychology of movement disorders, human memory models and the brain, hormones and sexuality, biorhythms in normal and abnormal behavior, physiology of sensing and perceiving, selective attention, and others. Prerequisite: Psychology 210 or consent of instructor. $1/2$ to 1 unit. Consent of instructor is required for more than $1/2$ unit.
- 411. Advanced Physiological Psychology.** Detailed examination of the physiological mechanisms in behavior; emphasis on research methodology and contemporary literature in the physiology of motivation, learning, perception, and emotion; and includes laboratory demonstrations and problems. Prerequisite: 12 hours of psychology, including Psychology 311 or equivalent. $1/2$ or 1 unit.
- 414. Neurotoxicology.** Same as Environmental Studies 414 and Veterinary Biosciences 414. See Environmental Studies 414.
- 415. Experimental Sensory Psychology.** A systematic study of sensory processes, including vision, audition, gustation, olfaction, and somesthesia; emphasis on experimental methods, research findings, and theory. Prerequisite: 12 hours of psychology, including a laboratory course in experimental psychology. 1 unit.
- 416. Perception.** Systematic study of methods and research findings in the field of human perception, together with an evaluation of theoretical interpretations. Prerequisite: 12 hours of psychology. 1 unit.
- 417. Experimental Psychology of Learning, I: Basic Processes.** Study of experimental investigation of basic learning processes; emphasis on the nature of the problems, experimental procedures, and theoretical significance. Prerequisite: 12 hours of psychology. 1 unit.
- 418. Experimental Psychology of Learning, II: Human Learning.** Data and theories of verbal learning; verbal mediators and their functions in learning and retention; transfer of training; short-term and long-term memory; and conceptualizations of the forgetting process. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
- 421. Knowledge Representation.** Surveys theories and data about the representation of knowledge by human beings; examines images, concepts, semantic features, propositions, semantic nets, rules, parallel distributed, procedural, schemas, mental models, and theories. Prerequisite: Background in either cognitive psychology, linguistics, or artificial intelligence. 1 unit.
- 422. Models of Human Memory.** Detailed examination and comparison of human memory models. Emphasis on understanding the central aspects of 5-8 recent models and their similarities and differences. Prerequisite: Psychology 224, 324, and 418, or consent of instructor. 1 unit.
- 423. Problem Solving and Cognitive Skill Acquisition.** Selected topics in how people solve problems and learn cognitive skills. A broad range of empirical findings will be discussed, along with psychological and computational accounts. Prerequisite: Psychology 324 or consent of instructor. 1 unit.
- 424. Developmental Psycholinguistics.** Same as Communications and Linguistics 424. Examination of empirical and theoretical literature on the acquisition of language; emphasis on universal patterns in the acquisition of a first language and on a consideration of explanations, both psychological and linguistic, for these patterns. Prerequisite: Linguistics 325, Psychology 325 or 362, or consent of instructor. 1 unit.
- 425. Psycholinguistics.** Same as Communications 425 and Linguistics 425. A critical survey of methods and theories in the psychological study of the communication process; emphasis on linguistic, information-theory, and learning-theory approaches; psycholinguistic analysis of language decoding and encoding; and the development and measurement of symbolic processes, including meaning. Prerequisite: Consent of instructor. 1 unit.

426. **Psychology of Reading.** Same as Educational Psychology 416.
427. **Engineering Psychology.** Experimental psychology applied to the study of man-machine systems; considers research issues, methodological matters, and principles of design and training in terms of contemporary aircraft, highway, industrial, and health-care systems. Prerequisite: Psychology 258 or 356, or consent of instructor. 1 unit.
428. **Cognitive Determinants of Behavior.** Theoretical and experimental analyses of the role of decision processes and causal attributions in the control of behavior; examines a variety of subparadigms from several areas of psychology. Prerequisite: 12 hours of psychology. 1 unit.
429. **Second Language Acquisition and Bilingualism.** Same as Linguistics 429. See Linguistics 429.
430. **Foundations of Industrial-Organizational Psychology.** Same as Labor and Industrial Relations 430. Theoretical and empirical foundations of various content areas in industrial-organizational psychology; sample topics include employee selection and placement, training, human factors engineering, work motivation, employee attitudes, leadership, and organizational theory. Prerequisite: 12 hours of psychology or consent of instructor. 1 unit.
431. **Psychological Measurement in Industry.** Application of psychometric methods and the finding of differential psychology to the selection, classification, and performance evaluation of industrial personnel. Prerequisite: Psychology 307 or equivalent. 1 unit.
432. **Introduction to Clinical Psychology Practicum.** Supervised practice in mental health delivery services; includes assessment and modification of problem behaviors in short-term treatment programs and beginning experience in school and community consultation; and emphasizes the development of skills in interviewing, conceptualization of problem behaviors, report writing, and effective staff interactions. Prerequisite: First-year graduate standing in clinical psychology and credit or concurrent registration in Psychology 438. 1 unit.
433. **Internship in Industrial/Organization Psychology.** Supervised practice in organizational practice and research, implementation of programs, evaluation, feedback of survey results, applied assessments, assistance in EAP programs, and development of personnel guidelines; emphasizes applications of principles and procedures. Offered in special interest of graduate students in I/O psychology program. Prerequisite: Graduate standing in Psychology, credit or concurrent registration in Psychology 430, and consent of instructor. 1 unit.
434. **Models of Decision and Choice.** Same as Accountancy 495. Survey of mathematical and other formal models of human judgment and decision processes. Emphasizes differences between normative and descriptive models. Prerequisite: Psychology 307. 1 unit.
435. **Motivation and Morale in Industry.** Same as Labor and Industrial Relations 435. Concepts and methods in the study of motivation of employees; determinants of employee attitudes and job satisfaction; and modification of attitudes and morale. Prerequisite: 4 units of graduate credit in psychology or consent of instructor. 1 unit.
436. **Mathematical Models in Psychology.** Recent developments in mathematical models in psychology; special emphasis on human learning, higher processes, and modern psychophysics. Prerequisite: One year of calculus and Psychology 306 and 307, or consent of instructor. 1/2 or 1 unit.
438. **Introduction to Clinical Psychology, I.** Introduction to clinical psychology as a science and profession. Considers psychodynamic, behavioral, and community perspectives; emphasizes the conceptual foundations of each approach. Required of all entering graduate students in clinical psychology. Prerequisite: Consent of instructor required for all students not admitted to graduate program in clinical psychology. 1 unit.
439. **Introduction to Clinical Psychology, II.** Considers critical issues in the assessment and study of psychological and social dysfunction, as manifested in adult psychopathology, childhood disorders, and community problems. Required of all entering graduate students in clinical psychology. Prerequisite: Credit or concurrent registration in Psychology 438; consent of instructor required for students not admitted to graduate program in clinical psychology. 1 unit.

- 440. Social Development.** Same as Educational Psychology 440. See Educational Psychology 440.
- 441. Personality and Behavior Dynamics.** Theory and research in personality, emphasizing personality as individual differences among persons and personality as attributed to persons by others; explores the measurement, antecedents, and consequences of such differences and attributions. Prerequisite: 12 hours of psychology. $\frac{1}{2}$ or 1 unit.
- 442. Skill, Expertise, and Mental Models in Complex Systems.** Same as Industrial Engineering 442. See Industrial Engineering 442.
- 443. Clinical Assessment.** Instruction and practice in the administration and interpretation of individual tests of general intelligence, special abilities, and achievement. Prerequisite: 12 hours of psychology, including Psychology 390 or equivalent; Psychology 432 and 439. 1 unit.
- 445. Strategies of Clinical Intervention.** A critical survey of issues, principles, practice, and research related to modifying human behavior; covers psychotherapeutic and somatic approaches; symptomatic relief and personality-restructuring; goal-orientations; and individual family, group, milieu, and preventive community intervention. Prerequisite: Concurrent registration in Psychology 447 strongly recommended. 1 unit.
- 446. Laboratories in Clinical Psychology.** Intensive practice in techniques of clinical assessment and behavior modification with emphasis on recent innovations; small sections of the course formed according to the specialized interests of students and staff. Prerequisite: Psychology 432 and 445, or consent of instructor. $\frac{1}{2}$ to 1 unit.
- 447. Internship.** Supervised field experience in clinical psychology. Prerequisite: Consent of instructor. 0 to 4 units.
- 450. Community Psychology and Social System Change.** Intensive examination of the historical antecedents, conceptual models, strategic tactics, and evaluation methods of planned social and ecological change; focuses on the role of the community psychologist in such endeavors; and reviews interventions in several social systems, such as criminal justice education, employment, and mental health. Prerequisite: Psychology 239 or equivalent; graduate standing in psychology or consent of instructor. $\frac{1}{2}$ or 1 unit.
- 451. Theory and Method in Social Psychology, I.** First of two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
- 452. Theory and Method in Social Psychology, II.** Second of a two-course sequence for first-year graduate students in social psychology. Advanced theoretical and research approaches to a broad range of issues in social psychology; participation and seminar presentations by social psychology program faculty. Each student participates in seminar presentations and develops and conducts a research study in conjunction with one or more faculty members. Prerequisite: Consent of instructor. 1 unit.
- 453. Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Sociology 456. See Business Administration 410.
- 456. Attitude Measurement and Behavioral Prediction.** Same as Communications 456. Comprehensive examination of the theory and method of attitude measurement and its implications for behavioral prediction; emphasis on the attitude concept and the validity of behavioral criteria. Prerequisite: Consent of instructor. 1 unit.
- 457. Theory and Research in Organizational Psychology.** Theory and research on the psychological processes involving the demands of organizations on the behavior of individuals; emphasis on the processes of power, authority, influence, leadership, communications, decision making, and organizational change. Prerequisite: Psychology 455 or consent of instructor. 1 unit.
- 458. Advanced Problems in Attitude Research.** Intensive analyses of recent developments in attitude theory and research; emphasis on the attitude-behavior relationship; and examination of theories of attitude and attitude change with respect to their utility in predicting and changing social behavior. Prerequisite: Consent of instructor. 1 unit.

459. **Advanced Problems in Research on Groups.** Intensive examination of current research and theory on structure, process, and performance of groups; critical examination of recent research and theoretical literature; and development of research designs for related issues in the field. Prerequisite: Consent of instructor. 1 unit.
460. **Motivation and Personality Development in Children.** Theory, method, and research on the interaction of motivational, personality, and learning processes and development in children; emphasis on experimental studies and a social learning theory approach. Class projects involve some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
463. **Research Methods in Clinical Psychology and Personality.** The logical analysis of clinical inferences and their role in research; problems and methods in the investigation of the development, dynamics, and structure of personality; and research in psychotherapy. Prerequisite: Psychology 306. 1 unit.
464. **Advanced Problems in the Study of Individual Social Behavior.** An intensive examination of current research into one or more of the following areas: social perception and cognition, social motivation, social learning, and environmental factors in social behavior; critical examination of recent research and theoretical literature, and development of research designs for selected current issues. Prerequisite: Consent of instructor. 1 unit.
467. **Personality Assessment.** Methods and theory in the quantitative assessment of personality; review of research findings and trends. Prerequisite: Psychology 307 or equivalent. 1 unit.
468. **Contemporary Behavior Theory.** Analysis of contemporary issues in animal and human learning; specific topics vary. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 1 unit.
469. **Cognitive Development.** Examination of laboratory investigations of cognitive development in children; emphasis on current theories of cognition and language; and class projects involving some laboratory work with children. Prerequisite: 12 hours of psychology; consent of instructor. 1 unit.
470. **Principles and Methods of Teaching Psychology.** Designed for graduate students in psychology; areas considered include developing course objectives and content; developing and presenting teaching-learning situations; evaluating the attainment of course objectives; advising and counseling students; ethics in teaching; and research problems on the teaching of psychology. Prerequisite: Second-year graduate standing in psychology or consent of instructor. 0 to 1 unit.
471. **Proseminar in Cognitive Science.** Same as Anthropology 470, Computer Science 449, Educational Psychology 471, and Linguistics 470. See Anthropology 470.
472. **The Methodology of Eye Movements in the Study of Cognition.** Same as Educational Psychology 470. See Educational Psychology 470.
483. **Psychology of Speech and Hearing Disorders, I.** Same as Speech and Hearing Science 483. See Speech and Hearing Science 483.
485. **The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Sociology 485. See Business Administration 435.
486. **Multivariate Correlational Techniques in Educational Research.** Same as Educational Psychology 485. See Educational Psychology 485.
488. **Covariance Structure and Factor Models.** Same as Educational Psychology, Sociology, and Statistics 488. Introduction to covariance structure models, linear structural equations, and factor analysis; identification and parameter estimation problems; assessing goodness-of-fit; use of computer packages LISTREL and EQS; applications to a wide variety of social and behavioral science modeling problems. Prerequisite: Psychology 494, Statistics 471, or Sociology 387. 1 unit.
489. **Doctor of Psychology Report.** Limited to students pursuing the Psy.D. degree. Prerequisite: Credit or concurrent registration in Psychology 447. 0 to 4 units (summer session, 0 to 2 units). May be repeated.
490. **Individual Research.** For graduate students who wish to conduct research on special problems not included in graduate theses. Prerequisite: Consent of instructor. 0 to 4 units.

- 492. Psychology of Learning and Instruction.** Same as Educational Psychology 492. See Educational Psychology 492.
- 493. Seminar.** Discussion of current topics in their historical setting, with special emphasis on research problems. Prerequisite: 6 units of graduate credit in psychology; consent of instructor. 0 to 1 unit.
- 494. Multivariate Analysis in Psychology and Education.** Same as Educational Psychology 494 and Sociology 494. Examines the principal methods of descriptive and inferential statistics used in the analysis of multiple measurements, emphasizing linear transformations, multiple regression, principal components, multivariate analysis of variance, canonical correlation and variates, discriminant functions and variates, and conventional procedures of factor analysis; involves both theory and applications. Prerequisite: Psychology 307 or Educational Psychology 496; consent of instructor. 1 unit.
- 495. Theories of Measurement.** Same as Educational Psychology 495. See Educational Psychology 495.
- 499. Thesis Research.** 0 to 4 units.

RADIO AND TELEVISION

Acting Head of Department: J. W. Carey

Department Office: 119 Gregory Hall, 810 South Wright Street, Urbana

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 291. Special Problems.** Special projects, research, and independent reading in radio and television for students capable of individual work under the guidance of a faculty adviser. Prerequisite: Consent of department. 2 or 3 hours.
- 368. Legal and Policy Issues in Telecommunications.** Same as Communications 368. See Communications 368.
- 450. Special Problems in Television.** Project work for advanced students in specific areas of television, including news, advertising, directing, writing, etc. Prerequisite: A television course in the area of specialization; consent of department. $1/2$ to 3 units. A maximum of 3 units is permitted toward degree.
- 462. Seminar in Radio and Television.** Same as Communications 462. Studies the performance of radio and television in terms of content, government and industry controls, social responsibility, economic bases, and psychological and social effects. Prerequisite: Consent of department. 1 unit.
- 463. World Broadcasting.** Same as Communications 463. Studies the broadcast systems used by the nations of the world; alternative and mixed systems; international organizations, agreements, exchanges, and problems; broadcasts to and from other countries; implications of such new developments as satellites; and mass and nonmass uses. Prerequisite: Consent of department. 1 unit.
- 490. Special Topics in Radio and Television.** Prerequisite: Consent of department. $1/2$ or 1 unit.
- 499. Thesis Research.** Prerequisite: Graduate standing in radio and television. 1 or 2 units.

REHABILITATION EDUCATION

Director of Division: P. Leung

Division Office: 105 Rehabilitation Education Center, 1207 South Oak Street, Champaign

- 151. Prescribed Exercise.** Prescribed exercises adapted to individual needs, capacities, and interests; open to paraplegic, permanently disabled, and individuals with significant temporary disabilities who will require long term rehabilitation. 1 hour.
- 199. Undergraduate Open Seminar.** 1 to 4 hours. May be repeated.
- 206. Working With Persons with Disabilities, I.** Designed primarily for students who serve

as live-in student-staff aides to the severely physically disabled students living in the Beckwith Living Center. Classroom and supervised experience in identifying the individual needs of persons with disabilities, recognizing the variance of disabilities, and administering the activities of daily living. Prerequisite: Biology 120 or Physiology 103, or consent of instructor. 3 hours.

207. **Working With Persons with Disabilities, II.** Designed primarily for students who serve as live-in student-staff aides to the severely physically disabled students living in the Beckwith Living Center. Experience in identifying the individual needs of persons with disabilities, recognizing the variance of disabilities, and administering the activities of daily living; a continuation of the laboratory experience in Rehabilitation 206, augmented by a paper. Prerequisite: Rehabilitation 206 or consent of instructor. 3 hours.
214. **Introduction to Aging.** Same as Health and Safety Studies, Human Development and Family Studies, Leisure Studies, and Psychology 214. See Human Development and Family Studies 214.
301. **Introduction to Rehabilitation.** Orientation to general field of rehabilitation; includes foundations, resources, assessment, counseling, and placement. 4 hours, or 1 unit.
302. **Medical Aspects of Disabilities.** Examination of the scope of medical disabilities, their implications, complications, and management. Prerequisite: Biology 122 and Cell and Structural Biology 234; or consent of instructor. 4 hours or 1 unit.
303. **Independent Living.** Focuses on the concept of independent living, its medical aspects, and application to elimination of physical and social barriers to persons with disabilities. Prerequisite: Rehabilitation 301 or consent of instructor. 2 hours or $1\frac{1}{2}$ unit.
307. **Social and Cultural Contexts of Disability.** Examines the social and cultural contexts of disabilities, their consequences for the experience of disability, and implications for the development of habilitation and rehabilitation practice. Prerequisite: 6 hours of social or health science, or consent of instructor. 2 hours or $1\frac{1}{2}$ unit.
335. **Job Placement Techniques.** Examines theories of job placement, job seeking skills, and techniques for outreach with employees. Focuses on a systems approach to job placement for persons with disabilities. Topics include supported employment, labor market trends, and job restructuring. Lab time with disabled clients who are active in the job search process is required. 2 hours or $1\frac{1}{2}$ unit.
340. **Introduction to Sensory Impairments.** Introduces sensory impairments (i.e., vision and hearing) from a rehabilitation perspective. Prerequisite: Biology 122 or equivalent; Psychology 100 or equivalent; Rehabilitation 301. 4 hours, or 1 unit.
344. **Introduction to Adaptive Technologies for Persons with Disabilities.** Introduction and orientation to available adaptive technologies, their applications to various disability groups, and current research and field testing. Prerequisite: Rehabilitation 301; Rehabilitation 302, or consent of instructor. 4 hours, or 1 unit.
351. **Rehabilitation Biomechanics.** Study of the biological and mechanical principles of human motor performance, and how they relate to the field of rehabilitation and administration of sports. Prerequisite: Physiology 103, Cell and Structural Biology 234, or consent of instructor. 3 hours or $3\frac{3}{4}$ unit.
381. **Rehabilitation Practicum.** Practical experience in a major area of rehabilitation; discussion/laboratory sections cover such areas as physical therapy, occupational therapy, sensory impairments, recreational therapy, administration, counseling, or supported employment. Prerequisite: Rehabilitation 301 and consent of instructor. 1 unit.
401. **Research Methods in Rehabilitation.** Examines methods and techniques of conducting and evaluating rehabilitation research; experimental and survey designs and procedures; data collection and current directions of rehabilitation research. Prerequisite: Rehabilitation 301, Educational Psychology 390, and consent of instructor. 1 unit.
420. **Social Psychology of Persons with Disabilities.** Same as Special Education 420. Study of the social and emotional adjustment of individuals with disabilities; evaluation of effects imposed by societal attitudes; analysis of the implications for rehabilitation professionals in dealing with individuals who have a disability; review of relevant research. Prerequisite: Rehabilitation 301 and 302, and consent of instructor. 1 unit.
421. **Rehabilitation Administration.** Overview of rehabilitation management in the public and private sectors; emphasis on rehabilitation service delivery and the interface of

rehabilitation administration, supervision, and service delivery to all persons with disabilities; coverage of construct areas such as the State/Federal System of Vocational Rehabilitation, and private sector facilities; emphasis on the organizational role and administrative practices, management, supervision, and other relevant areas of leadership development and modeling. Prerequisite: Rehabilitation 301, 401, Special Education 410, or consent of instructor. 1 unit.

436. **Vocational Evaluation.** Encompasses both the theory and practice of vocational evaluation techniques for persons with disabilities. Reviews basic psychometric instruments and adds practical experience with work samples and computer-based testing. Taught in the Rehabilitation Research and Evaluation Center and includes hands-on experience in the evaluation of disabled clients. Prerequisite: Rehabilitation 301, or one basic course in testing. 4 hours or 1 unit.
437. **Introduction to Neuropsychological Testing for Rehabilitation Counselors.** Use by rehabilitation counselors of neuropsychological test batteries and other related tests; particular emphasis on understanding test reports and useful applications for neuropsychological testing in terms of rehabilitation clients. Prerequisite: Rehabilitation 301; consent of instructor. 1 unit.
483. **Supervised Practice in Rehabilitation Counseling.** Development of individual counseling skills in a rehabilitation setting; emphasis on vocational evaluation and placement skills as developed in case management and planning experiences as well as adjustment to disability, vocational choice, and job placement techniques. Prerequisite: Rehabilitation 301, 420, 437, and consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
491. **Seminar in Rehabilitation.** Interdisciplinary seminar on topics of current interest. Students, faculty, and visiting lecturers present seminars based on their study, research or professional activities in the selected rehabilitation topic area. Prerequisite: Consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 1 unit.
493. **Special Problems in Rehabilitation.** Independent research on special projects. Open only to majors. Prerequisite: Rehabilitation 301; consent of instructor. $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units.
494. **Special Topics.** Lecture course on topics of current interest; specific subject matter announced in *Timetable*. Prerequisite: Will be determined for each topic and will be indicated in *Timetable*; Rehabilitation 301; consent of instructor. $\frac{1}{2}$ to 1 unit. May be repeated to a maximum of 2 units.
499. **Thesis Research.** Preparation of thesis in rehabilitation. Prerequisite: Satisfactory standing in the master's program. 0 to 2 units. May be repeated to a maximum of 2 units.

RELIGIOUS STUDIES

Director of Program: G. G. Porton

Program Office: 3014 Foreign Languages Building, 707 South Mathews Avenue, Urbana

101. **The Bible as Literature.** Same as English 114. Themes and literary genres in the Bible, emphasizing content important in Western culture. 3 hours.
103. **The Qur'an in Translation.** Study in English of the Qur'an, the holy Word of God for the world's Muslims; focuses on its importance, literary style, major themes, and methods of interpretation. No knowledge of Arabic or Islam is necessary. 3 hours.
104. **Asian Mythology.** Same as Asian Studies 104. An introductory survey of the mythologies of India, China, and Japan. 3 hours.
106. **Archaeology and the Bible.** Examination of archaeological evidence, especially from Syria-Palestine, and discussion of its use in the interpretation of Biblical literature. 3 hours.
110. **World Religions.** Same as Philosophy 110. See Philosophy 110.
111. **Elementary Greek, I.** Same as Greek 101. See Greek 101.
112. **Elementary Greek, II.** Same as Greek 102. See Greek 102.

120. **A History of Judaism.** Examines the social, political, economic, and intellectual history of the Jews from Abraham to the present-day; with particular attention to Jewish thought and society. 3 hours.
121. **Christianity: An Introduction.** Typological and historical approaches to major forms of Christianity: Eastern Orthodoxy, Catholicism, and Protestantism. 3 hours.
122. **History of East Asian Religions.** Same as East Asian Languages and Cultures 122. Introduction to East Asian religious traditions from classical to modern times; emphasizes the ideas of Confucianism, Taoism, Shinto, and Buddhism in China and Japan and their historical interactions. 3 hours.
123. **Islam: An Introduction.** History of Islamic thought from the time of Muhammad to the present, including the prophethood of Muhammad, the Qur'an, theology and law, mysticism and philosophy, sectarian movements, modernism and legal reform, and contemporary resurgence. 3 hours.
125. **War, Religion, and Society.** Examines the implications of religious and secular moral theories for our views of war, including nuclear war, and nuclear deterrence; gives attention to the religious and secular underpinnings of just war theory and pacifism, to nuclear strategy, and weaponry, to the positions of contemporary religious and secular groups on the morality of current policies and to conflicts over scarce resources. Serves as an introduction to religious ethics. 3 hours.
130. **Jewish Practices: A Religio-historical Approach.** The major festivals and life-cycle rituals of Judaism; focuses on sacred time, interaction of external and internal factors producing change and conservatism, relationship of ritual and theology, and the thematic development inherent in the rituals. 3 hours.
132. **Zen.** Same as East Asian Languages and Cultures 132. Introduces the history, teachings, and practice of Zen Buddhism in China and Japan. 3 hours.
160. **Ancient Greek and Roman Religion.** Same as Classical Civilization 160. See Classical Civilization 160.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Classical and Koine Greek Prose.** Same as Greek 201. See Greek 201.
201. **Hebrew Bible in English.** Analyzes the critical issues in the interpretation of the literature of the Hebrew Bible/Old Testament; surveys the history and religion of Ancient Israel with special reference to Israel's setting in the ancient Near East. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
202. **New Testament in English.** Analyzes the literature of the New Testament in its social and religious setting, with special reference to the ministry and teaching of Jesus, the emergence of the church as a sect within ancient Judaism, and the development of Christian institutions in the Graeco-Roman world. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
204. **Classical and Koine Greek Prose, II.** Same as Greek 202. See Greek 202.
205. **Introduction to Classical Hebrew, I.** Same as Hebrew 205. See Hebrew 205.
206. **Introduction to Classical Hebrew, II.** Same as Hebrew 206. See Hebrew 206.
210. **Biblical Prose.** Same as Hebrew 210. See Hebrew 210.
221. **American Judaism.** Forms of Judaism in America: Reform, Conservative, Reconstructionist, Orthodox, and Hasidic Judaism; the American rabbi; Zionism in America; American Jewish communal life; national Jewish organizations; the American synagogue; and the secular Jew. 3 hours.
224. **Chinese Thought from Confucius to Mao.** Same as History 224. See History 224.
225. **Gods and Man in Modern Japanese Drama.** Same as East Asian Languages and Cultures and Comparative Literature 225. See East Asian Languages and Cultures 225.
229. **Sociology of Religion.** Same as Sociology 229. See Sociology 229.
230. **Philosophy of Religion: Introduction.** Same as Philosophy 230. See Philosophy 230.
232. **Ancient Greek Sanctuaries.** Same as History of Art 218 and Classical Civilization 232. See Classical Civilization 232.
242. **The Holocaust: Religious Responses.** The theoretical foundation for ideas of national and racial superiority which attended the holocaust and responses to this phenomenon

- by major Jewish and Christian thinkers, including Rubenstein, Buber, Fackenheim, Berkowitz, Reuther, and Wiesel. 3 hours.
251. **Germanic Mythology.** Same as Scandinavian 251. See Scandinavian 251.
260. **Mystics and Saints in Islam.** Examines mystical concepts and practices in Islam through the ages, through the lives and writings of important mystics and Sufi holy men and women, as well as the integration of mysticism and the Sufi Orders into Muslim society and Islamic orthodoxy. No knowledge of Islam or foreign language is required. 3 hours.
268. **Religious Rebellions and Messianic Movements in History.** Same as History 268. See History 268.
283. **Jewish Sacred Literature.** Same as Comparative Literature and English 283. Literary study of the major postbiblical sacred texts of Judaism; includes readings in translation from Mishnah, Tosefta, Talmudim, midrashim, piyyutim, and mystical treatises. Emphasizes nature, history, function, and development of literary patterns and forms and the relationships between form and content in these texts. 3 hours.
284. **Modern Jewish Literature.** Same as Comparative Literature and English 284. See English 284.
286. **Introduction to Hinduism.** Elements of Hindu thought and practice; selected topics presented in historical order and in the context of Indian cultural history (including the present). 3 hours.
287. **Introduction to Buddhism.** Same as East Asian Languages and Cultures 287. A thematic approach to the history of Buddhism from its origin in India to its spread throughout China and Japan; explores how the doctrinal and social development of Buddhism in East Asia is related to the process of cultural adaptation. 3 hours.
288. **Religion in Asian Societies.** Same as Asian Studies 288 and Sociology 288. See Asian Studies 288.
289. **Comparative Muslim Societies.** Same as Anthropology 289 and History 289. Examination and comparison of the commonalities that unite over 800 million Muslims with special attention on the Qur'an, judgment, hajj, hijra, education, contemporary communications, and the experience of Muslim minorities in non-Muslim societies. 3 hours.
290. **Independent Study.** Special topics not treated in regularly scheduled courses; designed primarily for upperclassmen. Prerequisite: Evidence of adequate preparation for such study; consent of staff member supervising the work. 2 to 6 hours. May be repeated.
293. **Honors Senior Thesis.** Two-semester research project. Prerequisite: Senior majors in religious studies who are eligible for graduating with distinction from the program. 3 hours. Must be taken for two semesters for a total of 6 hours. (Counts for advanced hours in LAS.)
294. **Topics in Religious Thought.** Topics in contemporary theological problems. 3 hours.
295. **Topics in Asian Religions.** Same as East Asian Languages and Cultures 295. Topics in Hinduism, Buddhism, Taoism, and other Asian religious traditions. Prerequisite: Sophomore standing or consent of instructor. 3 hours. May be repeated as topics vary to a maximum of 6 hours.
296. **Special Topics in the History of Judaism.** 3 hours. May be repeated for a maximum of 6 hours.
298. **Special Topics in Biblical Interpretation.** Detailed interpretation of selected books of the Bible. 3 hours. May be repeated as topics vary to a maximum of 6 hours.
301. **Introductory Coptic, I.** Same as Coptic 301 and Linguistics 314. See Coptic 301.
302. **Introductory Coptic, II.** Same as Coptic 302 and Linguistics 315. See Coptic 302.
304. **Medieval Civilization.** Same as History 304. See History 304.
305. **The Age of the Renaissance.** Same as History 305. See History 305.
306. **The Age of the Protestant and Catholic Reformation, 1500-1648.** Same as History 306. See History 306.
307. **Islam and the Near and Middle East from Mohammed to 1258.** Same as History 307. See History 307.
308. **Islam and Society in the Modern Middle East and North Africa.** Same as Political Science 339. Examines the role of Islam in contemporary politics, the contemporary resurgence of Islam, and the articulation of Islamic approaches to the new economic order, nationalism, and the changing role of women. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.

311. **Hebrew Poetry.** Same as Hebrew 311. See Hebrew 311.
312. **Readings in Sanskrit, I.** Same as Sanskrit 303. See Sanskrit 303.
313. **Readings in Sanskrit, II.** Same as Sanskrit 304. See Sanskrit 304.
329. **Language of Religion.** Same as Linguistics and Speech Communication 329. Introduction to the study of the language of religion; topics include: theoretical and empirical issues related to the field, methodology for the study of language of religion, analysis of religious texts, critical evaluation of the philosophical, theological, and linguistic perspectives on the nature and function of the language of religion, and analysis of diverse forms and styles of the language of religion. 3 hours or 1 unit.
340. **The Formation of Christian Thought.** Study of major developments in early Christian thought (first four centuries) through discussion of primary texts in translation. Prerequisite: Religious Studies 201 and 202, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
341. **Martin Luther.** Same as German 341. See German 341.
342. **History of Early Judaism.** The history of Judaism from Ezra to the rise of Islam: Hellenism and Judaism, varieties of Judaism, Palestinian Judaism and its documents, Babylonian Judaism, the rabbis, and popular Jewish culture. Prerequisite: Credit in one course in religious studies at the 200- or 300-level, or consent of instructor. 3 hours or $3/4$ unit.
343. **Ancient Near Eastern Cultures.** Examines the literature and religious practice of the great civilizations of the Near East, particularly the Sumerian, Assyro-Babylonian, Egyptian, Canaanite and Hittite cultures. Prerequisite: Religious Studies 201 or equivalent. 3 hours or $3/4$ unit.
362. **Philosophy of Religion.** Same as Philosophy 324. See Philosophy 324.
363. **Religion in Anthropological Perspective.** Same as Anthropology 363. See Anthropology 363.
381. **American Intellectual and Cultural History to 1865.** Same as History 371. See History 371.
382. **American Intellectual and Cultural History since 1859.** Same as History 372. See History 372.
384. **Buddhist Meditation.** Same as East Asian Languages and Cultures 380. Examines classical systems of Buddhist meditation and their relation to Buddhist psychology and world view. Prerequisite: Religious Studies 287, or consent of instructor. 3 hours or $3/4$ unit.
388. **History and Thought of Chinese Buddhism.** Survey of the history of Chinese Buddhism since its introduction; analysis of Buddhological trends and styles; and the sociocultural milieu of Chinese Buddhism and its place in the total history of ideas and lifestyles. Prerequisite: Religious Studies 287 and 288, or consent of instructor. 3 hours, or $3/4$ or 1 unit.
400. **Contemporary Study of Religion, I.** Investigates seminal books and articles in the study of religion from a variety of disciplinary perspectives. 1 unit.
401. **Contemporary Study of Religion, II.** Investigates seminal books and articles in the study of religion from a variety of disciplinary perspectives. 1 unit.
430. **Proseminar: Religious Studies.** Systematic investigation of issues, resources, and modes of inquiry in the major areas of the study of Bible, Asian religions, or religious thought; topics vary according to the needs of the graduate students. Prerequisite: Consent of instructor. $3/4$ unit. May be repeated as topics vary.
440. **Seminar in Religious Studies.** Research in special problems in the study of Bible, Asian religions, or religious thought; topics vary according to the needs of the graduate students. Prerequisite: Consent of instructor. 1 unit. May be repeated as topics vary.
480. **Readings in Religious Literature.** Readings in primary texts in original languages which are relevant to Biblical studies, Asian religions, or religious thought. Prerequisite: Consent of instructor. $1/4$ to 1 unit.
490. **Independent Study.** Special topics not treated in regularly scheduled courses; for graduates. Prerequisite: Evidence of adequate preparation for such study and consent of staff member supervising the work. $1/2$ to $1\frac{1}{2}$ units. May be repeated.

RHETORIC AND COMPOSITION

(See English)

RURAL SOCIOLOGY

(See Agricultural Economics)

RUSSIAN AND EAST EUROPEAN STUDIES

Director of Department: Diane P. Koenker

Department Office: 104 International Studies Building, 910 South Fifth Street, Champaign

- 295. Senior Seminar.** Interdisciplinary seminar normally taken in the senior year. Topic will vary each year, but will involve the incorporation of several disciplinary approaches to problems related to the USSR and Eastern Europe. Prerequisite: Declared major in Russian and East European studies; junior or senior standing. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
- 450. Seminar in Russian and East European Studies.** Interdisciplinary seminar required for candidates for the Master of Arts in Russian and East European Studies. Team-taught, focusing each year on an introduction to Soviet and East European studies as a discipline, plus surveys of four distinct areas of scholarly inquiry in the field. Prerequisite: Enrollment in the MA program in Russian and East European Studies. 1 unit.

SLAVIC LANGUAGES AND LITERATURES

(Including Bulgarian, Czech, Polish, Russian, Serbo-Croatian, Slavic, and Ukrainian)

Head of Department: Maurice Friedberg

Department Office: 3092 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Bulgarian

- 381. Structure of Modern Bulgarian.** Analysis of the sound system and grammar of the contemporary Bulgarian language. Prerequisite: Russian 212 or 214, or equivalent. 3 hours or $3/4$ unit.
- 382. Readings in Bulgarian Literature.** Reading, analysis, and discussion of selected excerpts from Bulgarian literature, scientific prose, and the press. Prerequisite: Bulgarian 381 or consent of department. 3 hours or $3/4$ unit.
- 383. Bulgarian Literature in Translation.** Critical survey, in translation, of Bulgarian literature from its beginning to the present day. Particular attention to the cultural-historical context of these works, and study of parallels between developments in Bulgarian literature and Russian literature. Prerequisite: Bulgarian 381 and Bulgarian 382 or consent of instructor. 3 hours or $3/4$ unit.

Czech

199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.
383. The Structure of Modern Czech. Analysis of the sound system and grammar of the contemporary Czech language with some reference to its historical development. Prerequisite: Knowledge of another Slavic language, preferably Russian, or consent of instructor. 3 hours or ³/₄ unit.
384. Readings in Czech. Reading and analysis of selected texts. Prerequisite: Czech 383 or consent of instructor. 3 hours or ³/₄ unit.

Polish

101. Elementary Polish, I. Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no prior work in Polish. 4 hours.
102. Elementary Polish, II. Continuation of Polish 101. Prerequisite: Polish 101. 4 hours.
103. Intermediate Polish, I. Grammar review, conversation practice, written exercises, and selected readings. Prerequisite: Polish 102 or equivalent. 4 hours.
104. Intermediate Polish, II. Continuation of Polish 103. Prerequisite: Polish 103. 4 hours.
199. Undergraduate Open Seminar. 1 to 5 hours. May be repeated.
345. Polish Literature in Translation, I. Same as Comparative Literature 355. A critical survey, in translation, of Polish literature from the Middle Ages to the end of the nineteenth century, special attention given to the works in their cultural context. 3 hours or 1 unit.
346. Polish Literature in Translation, II. Same as Comparative Literature 356. A critical study, in translation, of modern Polish fiction, drama, poetry and essay, from Young Poland to the "New Wave"; their contribution to literary styles and genres in Poland and abroad; special emphasis on Wyspianski, Witkiewicz, and Gombrowicz. 3 hours or 1 unit.
355. The Structure of Modern Polish. Analysis of the sound system and grammar of the contemporary Polish language. Prerequisite: Knowledge of another Slavic language or consent of instructor. 3 hours or ³/₄ unit.
356. Readings in Polish. Reading and analysis of selected texts. Prerequisite: Polish 355 or consent of instructor. 3 hours or ³/₄ unit.

Russian

NOTE: Courses taught in Russian are 211, 212, 213, 214, 215, 216, 303, 304, 313, and 314.

101. First-Year Russian, I. Oral-aural practice and elements of grammar, reading, and writing. For students who have no credit in Russian. 4 hours. Students may not receive credit for both Russian 101 and 121.
102. First-Year Russian, II. Continuation of Russian 101. Oral-aural practice and elements of grammar, reading, and writing. Prerequisite: Russian 101. 4 hours.
103. Second-Year Russian, I. Oral-aural practice, systematic functional grammar, reading, and writing. Prerequisite: Russian 102 or equivalent. 4 hours.
104. Second-Year Russian, II. Systematic review of the structure of Russian covered in Russian 101-103 through class lectures, drills, and homework exercises. Prerequisite: Russian 103. 4 hours.
111. Intensive First-Year Russian. Accelerated course covers material of Russian 101 and 102 in one semester. Allows for more efficient scheduling, more effective drilling, and quicker mastery of basic grammar and vocabulary. 8 hours.
112. Intensive Second-Year Russian. Accelerated course covers material of Russian 103 and 104 in one semester. Allows for more efficient scheduling, more effective drilling, and quicker mastery of intermediate grammar and vocabulary. Prerequisite: Russian 102 or 111. 8 hours.
113. Russian Civilization Through Literature. The civilization of pre-Soviet Russia as reflected in Russian literature of the time. 3 hours.

114. **Soviet Society Through Literature.** The political, cultural, social and economic realities of the Soviet Union as reflected in Soviet literature. 3 hours.
115. **Russian Masterpieces in Translation, I.** Introduction to major works from the medieval period to 1880 in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
116. **Russian Masterpieces in Translation, II.** Introduction to major works from 1880 to the present in the context of Russian history and European literature. No knowledge of Russian required. 3 hours.
119. **Introduction to Russian and Soviet Film.** Survey of major films, film makers, and trends from Tolstoi adaptations through the revolutionary Eisenstein to current satire. Weekly film screenings. No knowledge of Russian required. 2 hours.
121. **Beginning Russian for Reading.** Survey of all grammar and basic vocabulary in one semester, in preparation for the reading of Russian prose in Russian 200. No emphasis on speaking or writing; all exercises and tests are from Russian to English. 3 hours. Students may not receive credit for both Russian 121 and 101.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Intermediate Reading and Translation.** Development of rapid reading comprehension and vocabulary acquisition; includes unadapted nonfiction texts in various humanities and science fields. Class discussion entirely in English. Prerequisite: Russian 104 or 121. 3 hours.
211. **Russian Conversation, I.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 104 or consent of instructor. 3 hours.
212. **Russian Conversation, II.** Conversational practice for the development of oral facility with emphasis on contemporary usage. Prerequisite: Russian 211 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
213. **Russian Composition, I.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 104 or consent of instructor. 3 hours.
214. **Russian Composition, II.** Grammar review; training in writing Russian; translation from English and free composition. Prerequisite: Russian 213 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
215. **Introduction to Russian Literature, I.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Three years of college Russian or consent of instructor. 3 hours.
216. **Introduction to Russian Literature, II.** Reading and analysis of Russian literary texts; conducted in Russian. Prerequisite: Three years of college Russian or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
222. **Dostoevsky and Tolstoy.** Same as Comparative Literature 248. The art and thought of Russia's two greatest novelists; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
225. **Soviet Russian Literature.** Same as Comparative Literature 249. Major works since 1917 by Mayakovsky, Babel, Olesha, Bulgakov, Sholokhov, and others; readings and discussion in English. 3 hours. (May count for advanced hours in LAS. See LAS Handbook.)
270. **Parateaching.** Same as French, German, Latin, and Spanish 270. See French 270.
279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Spanish 279. See Humanities 279.
280. **Teachers Course.** An introduction to the problems of the teaching of Russian and a study of textbooks. Prerequisite: Three years of college Russian or equivalent. 4 hours.
290. **Readings in Russian.** Individual topics or projects chosen in consultation with a Slavic Department representative. Prerequisite: Russian 104 or equivalent proficiency. 1 to 4 hours. May be repeated to a maximum of 8 hours.
293. **Honors Senior Thesis.** Intended primarily for candidates for honors in Russian but open to other seniors. Prerequisite: Senior standing. 2 hours. May be repeated. (Counts for advanced hours in LAS.)

301. **Introduction to Russian Poetics.** Studies phonics and prosody of Russian poetry; includes selected texts from folklore and the masterpieces of classical and modern poetry (Pushkin, Lermontov, Nekrasov, Koltsov, Fet, Hippus, Ahkmatova, Mandelshtam, Esenin, Mayakovsky, Tsvetaeva). Taught in Russian. Prerequisite: Russian 212 or 214; or equivalent proficiency. 3 hours or $\frac{3}{4}$ unit.
303. **Advanced Reading and Conversation, I.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Three years of college-level Russian. 3 hours or $\frac{1}{2}$ unit.
304. **Advanced Reading and Conversation, II.** Conversation practice in Russian, based on reading materials from Russian literature and culture. Prerequisite: Russian 303 or equivalent. 3 hours or $\frac{1}{2}$ unit.
307. **Structure of Russian.** The syntax and morphology of modern Russian. Prerequisite: 3 years of Russian or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
308. **Russian Phonetics and Pronunciation.** Study of the Russian sound system; training in the improvement of pronunciation and intonation. Prerequisite: 3 years of Russian or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Advanced Composition and Usage, I.** Practice in advanced composition and study of advanced problems of grammatical structure; emphasis on morphological categories in Russian grammar. Prerequisite: Three years of college Russian, including Russian 214, or consent of department. 3 hours or $\frac{1}{2}$ unit.
314. **Advanced Composition and Usage, II.** Further practice in advanced composition and study of advanced problems of grammatical structure; emphasis on syntax, usage, and style. Prerequisite: Russian 313 or consent of department. 3 hours or $\frac{1}{2}$ unit.
315. **Nineteenth-Century Literature in Translation.** Same as Comparative Literature 337. A study of major Russian writers from Pushkin through Chekhov; no knowledge of Russian required. 3 hours or $\frac{3}{4}$ unit.
317. **Twentieth-Century Literature in Translation.** Same as Comparative Literature 338.
324. **Russian Modernism.** Same as Comparative Literature 357. Representative works of the period 1880 to 1917, with emphasis on Chekhov, Gorky, and Blok; readings for nonmajors and class discussions in English. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
335. **Russian Drama.** Same as Comparative Literature 368. Historical survey of Russian dramatists and their works, from the origins in folk and liturgical playlets through classicism, Gogol, Ostrovsky, Chekhov, and Stanislavsky to Meierhold and the Soviet drama. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
337. **Nineteenth Century Russian Poetry.** A study of major Russian poets and their works from Zhukovsky through the end of the nineteenth century. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
338. **Twentieth Century Russian Poetry.** A study of major Russian poets and their works from Blok to the present. Prerequisite: Russian 216. 3 hours or $\frac{3}{4}$ unit.
360. **Studies in Russian Literature and Society.** Same as Comparative Literature 340. The role of Russian literature in the social, political, and intellectual life of Russia from the 1840s to the present. Prerequisite: Junior standing. 3 hours or $\frac{3}{4}$ unit.
370. **Nabokov and Emigre Literature.** Same as Comparative Literature 370. Twentieth-century non-Soviet Russian authors, including Nabokov, Bunin, Tsvetaeva, Gippius, and Adamovich; no knowledge of Russian required. Prerequisite: Junior standing or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
375. **Russian Literary Translation.** Theory and practice of literary translation in Russia from the eighteenth century to the present; "literal" versus "creative" translation; and practical work in translation into English of various Russian literary texts. Prerequisite: Russian 214 or 216, or equivalent. 3 hours or $\frac{3}{4}$ unit.
376. **Russian Literary Criticism and Theory.** Surveys major figures and approaches in Russian literary theory and criticism from the eighteenth century to the present. Taught in Russian. Prerequisite: Russian 212 or 214; or equivalent proficiency. 3 hours or $\frac{3}{4}$ unit.

400. **Beginning Russian for Graduate Students.** Basic grammar and vocabulary; introduction to the reading of Russian texts in the sciences and the humanities. Designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. 3 hours. No graduate credit.
401. **Readings in Russian for Graduate Students.** Reading and translation of general and individually specialized materials, to increase speed, accuracy, and vocabulary; designed for graduate students preparing to offer a reading knowledge of Russian for the Ph.D. Prerequisite: Russian 400 or equivalent. 3 hours. No graduate credit.
406. **Russian Morphology.** Survey of the various parts of speech of modern standard literary Russian with special emphasis on the nominal and verbal systems. Prerequisite: Russian 307 or equivalent. 1 unit.
408. **Russian Phonology.** Same as Linguistics 408. The sound pattern of Russian in its synchronic and diachronic aspects. Prerequisite: Russian 308 or equivalent. 1 unit.
410. **Old Russian Literature.** Reading and analysis of texts with historical and literary commentary. Prerequisite: Slavic 405 or equivalent. 1 unit.
412. **Literature of the Eighteenth Century.** Reading of texts; historical and literary background of the period. 1 unit.
414. **Pushkin.** The age of Pushkin; Pushkin's works in historical and comparative perspective; textual criticism, linguistic and structural analysis, intellectual interpretation, and aesthetic evaluation. 1 unit.
415. **Dostoevsky.** Same as Comparative Literature 415. Dostoevsky: historical background, textual analysis, structure, philosophy, artistic evaluation, and influence on French, English, American, and German literatures. 1 unit.
416. **The Early Realists: Turgenev, Aksakov and Goncharov.** Intensive study of the three representative nineteenth century Russian novelists; aspects considered include historical perspective, textual criticism, structural analysis, and aesthetic evolution. 1 unit.
417. **History of the Russian Language.** Historical grammar, origin, and development of the literary language. Prerequisite: Slavic 380 or 405 or equivalent. 1 unit.
419. **Tolstoy.** Same as Comparative Literature 419. Tolstoy: historical background, textual analysis, structure, philosophy, aesthetic evaluation, and influence on French, English, American, and German literatures. 1 unit.
420. **Chekhov.** Same as Comparative Literature 420. Chekhov: historical background, textual criticism, structural analysis, philosophy, artistic evaluation, and interrelationship with English, French, German, Scandinavian, and American literatures. 1 unit.
424. **Gogol.** Historical background, textual criticism, structural analysis, philosophy and ideology, and aesthetic evaluation. 1 unit.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Italian, Portuguese, and Spanish 463. See French 463.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Italian, Portuguese, and Spanish 481. See French 481.

Serbo-Croatian

101. **Basic Serbian or Croatian, I.** Oral and written work on pronunciation, grammar, and vocabulary. For students with no previous study of Serbian or Croatian. 4 hours.
102. **Basic Serbian or Croatian, II.** Continuation of Serbian or Croatian 101. Prerequisite: Serbian or Croatian 101 or equivalent proficiency. 4 hours.
103. **Intermediate Serbian or Croatian, I.** Completion of Grammar; written and oral exercises aimed at active command of the language. Prerequisite: Serbo or Croatian 102 or equivalent proficiency. 4 hours.
104. **Intermediate Serbian or Croatian, II.** Selected readings in Serbian or Croatian literature and culture. Prerequisite: Serbian or Croatian 103 or equivalent proficiency. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

- 392. Structure of Modern Serbian or Croatian.** Analysis of the sound system and grammar of the contemporary Serbian or Croatian language. Prerequisite: Knowledge of another Slavic language or consent of department. 3 hours or $\frac{3}{4}$ unit.
- 393. Readings in Serbian and Croatian.** Reading and analysis of selected texts. Prerequisite: Serbian or Croatian 392 or consent of department. 3 hours or $\frac{3}{4}$ unit.

Slavic

- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 319. Studies in Russian and East European Cinema.** Same as Communications and Speech Communication 319. Study and analysis of major film-makers, genres, trends, and theories, including the 1920s Soviet avant-garde and the Polish and Czech "New Wave" since 1953; lectures, discussions, screenings, term paper. No reading knowledge of Russian required, except for majors in Slavic Languages and Literatures. Prerequisite: Russian 119; or a college-level course in Russian/East European Studies or in cinema studies; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 380. Introduction to Slavic Linguistics.** Same as Linguistics 380. The development of Common Slavic from Indo-European and its relationship to contemporary Slavic languages. Prerequisite: Knowledge of a Slavic language. 3 hours or $\frac{3}{4}$ unit.
- 381. Introduction to Study and Research in Slavic Languages and Literatures.** Introduction to methods and resources for study and research in Slavic languages, Russian literature, and Russian language teaching. 2 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit.
- 382. Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Portuguese, and Spanish 382, and Linguistics 386. See Humanities 382.
- 387. Topics in Folklore.** Same as Comparative Literature, English, German and Speech Communication 387. See English 387.
- 405. Old Church Slavonic.** Analysis of grammar and reading of texts. Prerequisite: Knowledge of a Slavic language. 1 unit.
- 425. Seminar in Slavic Literature.** Selected subjects in Russian and Slavic prose, poetry, drama, and literary criticism. Topics vary. 1 unit. May be repeated to a maximum of 3 units.
- 460. Seminar in Slavic Linguistics.** Selected topics in the analysis of Slavic languages. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 491. Individual Topics.** Prerequisite: Graduate standing with a major or minor in Russian; consent of department. $\frac{1}{4}$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

Ukrainian

- 101. Basic Ukrainian, I.** Oral and written work on basic pronunciation, grammar, and vocabulary. For students with no previous study of Ukrainian. 4 hours.
- 102. Basic Ukrainian, II.** Continuation of Ukrainian 101. Prerequisite: Ukrainian 101 or equivalent proficiency. 4 hours.
- 103. Intermediate Ukrainian, I.** Completion of grammar, oral drills, and written exercises. Prerequisite: Ukrainian 102 or equivalent. 4 hours.
- 104. Intermediate Ukrainian, II.** Selected readings in contemporary Ukrainian literature. Prerequisite: Ukrainian 103 or equivalent. 4 hours.
- 118. Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 398. Ukrainian Literature in Translation.** Critical survey of major works in Ukrainian literature from the beginnings to the modern period in light of their historical and cultural background; lectures and readings in English. 3 hours or $\frac{3}{4}$ unit.

SOCIAL SCIENCE

Office: College of Liberal Arts and Sciences, 294 Lincoln Hall, 702 South Wright Street, Urbana

- 300. Socio-Economic Management as Public Policy.** Same as Accountancy, Business Administration and Political Science 300. See Political Science 300.

SOCIAL WORK

Dean of School: Paula A. Meares

School Office: 1207 West Oregon Street, Urbana

- 100. Contemporary Social Work.** A broad survey of the field of social welfare; introduction to social services, social welfare organizations, major social problems and target population groups, and the methods employed in service to individuals, groups, and communities; and includes the range of personnel and skills in social work agencies, and the means of education and training for social work. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 290. Honors Seminar.** Lectures, student presentations, and discussions on selected topics in social work. Prerequisite: Twelve hours in social work courses; senior standing; 4.0 grade-point average in social work courses; and consent of instructor. 2 to 4 hours. May be repeated to a maximum of 4 hours.
- 298. Practice Seminar.** Critical examination of the application of knowledge to social work practice; emphasis on reciprocal relationships between personal problems and needs, social environment, agency services, and helping methods; and consideration of new trends in practice and empirical knowledge. Prerequisite: Social work major; consent of undergraduate field instruction coordinator; concurrent registration in Social Work 299. 3 hours.
- 299. Field Instruction.** The student is assigned to field instructors for learning experiences in social agencies and communities; experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele and communities. Prerequisite: Social work major; consent of undergraduate field instruction coordinator. 4 to 12 hours.
- 300. Methods of Social Work Intervention, I.** Examination of the methods of social work intervention (casework, group work, and community organization) utilized in various social work agencies and social welfare settings; emphasis on understanding of the values, knowledge, principles, and processes of social work practice. Prerequisite: Admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
- 301. Methods of Social Work Intervention, II.** An introduction to social work practice in groups, organizations, and communities; emphasizes understanding the values, principles, and processes of social work practice as well as developing skills for service delivery to groups, organizations, and communities. Prerequisite: Social Work 300; admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.
- 303. Delivery of Health Care: Problems and Perspectives.** The wide range of factors—ecological, social, cultural, medical, organizational, economic, and political—which influence health care in a complex nation like the United States; attention to perspectives from various fields of study. Prerequisite: Junior standing and consent of instructor. 3 hours or 1 unit.
- 310. Social Welfare Policy and Services, I.** Critical study of the income maintenance system in the United States as a response to the problems of inequality of opportunity and income, poverty, and income security; consideration of alternative approaches with discussion of the social worker's role in the system. 3 hours or 1 unit.

- 311. Social Services Policy and Services, II.** Critical evaluation of social policy and services in selected problem areas; includes the process of social policy analysis, current issues in funding and monitoring of personal social services, and strategies for dealing effectively with social problems. Prerequisite: Credit or concurrent registration in Social Work 310. 3 hours or 1 unit.
- 313. Social Services for Health and Rehabilitation.** The psychological and sociological impact of illness and disability on the individual, the family, and the community, emphasizing the social worker's role in medical and rehabilitation settings. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 314. Social Services in Mental Health and Retardation.** Examination of comprehensive community mental health services as they evolve from definitions of the problems and changes in federal and state social policy; the concept of normalization and its criteria for program evaluation; and changing roles of mental health professionals, paraprofessionals, and consumers in policy making and service delivery. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 315. Social Work Services for the Aged.** The social needs of older people in the context of developing services and income transfer benefits; identifies major issues in social service delivery; and reviews methods of intervention on behalf of older people in terms of both skill required and policy implications. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 316. Social Services for Children and Families.** Child and family welfare policies and practice in relation to social services which support, supplement, or substitute for parental care of children; practice and policy issues in relation to the state's responsibility for guardianship, juvenile court, employment of children and young persons, and regulation of child-care facilities; and consideration of trends and issues in family and child welfare planning. Prerequisite: Admission to B.S.W. or M.S.W. program, or consent of instructor. 3 hours or 1 unit.
- 317. Human Services in Industrial and Occupational Settings.** Same as Health and Safety Studies 317 and Labor and Industrial Relations 317. Critical examination of the growing field of Occupational Social Work and Employee Assistance Programs from theoretical and practice dimensions. Studies the following with regard to their respective implications for social welfare policy and research: specific strategies of interventions including counseling sources to individuals, families and groups; occupational alcoholism and substance abuse programs; families, and groups; occupational alcoholism and substance abuse programs; and corporate social responsibility. For social work graduate students opting for a subspecialization in Occupational Social Work, this course will meet the requirements of a field of practice course. Prerequisite: Social Work 300 or 310; or consent of instructor. 4 hours or 1 unit.
- 318. Special Problems.** A small group seminar for independent study of a topic or topics of special interest in the field of social welfare; emphasis on examination and discussion of significant and current social welfare issues and problems. Prerequisite: Credit or concurrent registration in Social Work 300; consent of instructor. 3 hours or 1 unit.
- 319. Social Work and the Public School.** Social work services in schools as a process in school-community-pupil relations; focuses on the school as a social system; includes education as a continuum from preschool to adulthood, financing and other major problem areas, education, legislation, policies, and service needs, some current education innovations; contains content related to meeting the needs of exceptional children and their families in the public schools. Prerequisite: Graduate standing in social work or consent of instructor. 4 hours or 1 unit.
- 322. Introduction to Mental Retardation.** Same as Psychology 322 and Special Education 322. See Special Education 322.
- 327. Research Methods in Social Work Practice.** Objectives of research pertaining to social work practice; design of experiments; measurement and methods of collecting data; design of questionnaires and schedules; methods of data analysis including statistical hypothesis testing and applications of inferential techniques; interpretation of results; and preparation of reports. Prerequisite: An introductory course in statistics and admission to B.S.W. or M.S.W. program. 3 hours or 1 unit.

- 351. Human Behavior and Social Environment, I.** Current research and theory concerning the environmental influences on individual behavior; the family, small group, community, and social organization and the social and cultural causes and effects of discrimination. The social work practice context of each unit of content is a central focus. Prerequisite: Admission to B.S.W. or M.S.W. program and a course in human development. 3 hours or 1 unit.
- 400. Comparative Analysis of Approaches to Casework.** Systematic and critical examination of selected approaches, conceptualizations, procedures, and techniques in casework theory and practice; includes the employment of a framework for the analysis and assessment of the various approaches, study of research related to process and outcome, and identification of practice issues. Prerequisite: Social Work 300. 1 unit.
- 401. Comparative Approaches to Social Group Work Practice.** Social work practice theory in social group work through comparative study of various practice approaches; includes the utilization of the group work method in contemporary social work practice, practice principles, and the use of group process. Prerequisite: Social Work 300. 1 unit.
- 402. Comparative Approaches in Community Organization Practice.** Principles and methods which characterize identifiable approaches used in community organization practice at neighborhood, community, state, and other levels. Prerequisite: Graduate standing in social work; Social Work 300 or consent of instructor. 1 unit.
- 404. Seminar and Practicum in Clinical Group Work.** Exploration of concepts and issues related to integrity and encounter groups, self-help groups, and group psychotherapy; provides experience in an intensive encounter based on a structured, contractual integrity group; and emphasizes development of self-awareness, interpersonal skill, and leadership in facilitating clinical groups. Prerequisite: Social Work 401 or equivalent. 1 unit.
- 405. Behavior Modification in Social Work.** Examination of conceptual ideas about behavior modification and their usefulness in working with clinical problems of concern to the social worker; focuses on intervention with individuals and families and the application of behavioral principles in working with groups, institutions, and communities; and emphasizes the development of a systematic approach for applying behavior modification principles in actual practice situations. Prerequisite: Social Work 300. 1 unit.
- 406. Intervention with Children and Adolescents.** Examination and critical evaluation of selected methods/approaches of intervention; research on their effectiveness and application to specific problems of children and adolescents that come to the attention of social workers and other helping professionals; attention given to remediation and prevention. Prerequisite: Social Work 351 or equivalent, and Social Work 300 or consent of instructor. 1 unit.
- 407. Intervention Strategies for Institutional Change.** An ecological systems approach to social work intervention within the public school system; examination of practice principles, issues, and strategies for organizational change, collaborative team work with school and community professionals, and intervention, especially group work, with students and families; contains content related to meeting the needs of exceptional children and their families. Prerequisite: Social Work 300 and graduate status, or consent of instructor. 1 unit.
- 420. Social Welfare Planning.** Examination of the interactional, interpersonal, and political aspects of social welfare planning in a variety of settings and under a number of auspices; formulation of models for social welfare planning. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 426. Social Welfare Administration.** Principles and process of administration and management of social welfare organizations, including review of organization theory, policy formulation, agency structure and staff organization, and budgeting. Prerequisite: Admission to M.S.W. program or consent of instructor. 1 unit.
- 427. Service Accounting in Social Welfare.** Examines different types of services, to whom they are provided at what costs and with what results; within a systems perspective, considers methods of describing, reporting, and measuring client and target population characteristics, services, and resources; and includes allocation of scarce resources among

competing demands and practice in specific methods. Prerequisite: Social Work 327 or equivalent. 1 unit.

428. **Family Therapy Seminar and Practicum.** The principles, issues, and practices of family therapy; examines and compares major theoretical concepts; and enables students to learn how to do family therapy by studying theory and applying it in an actual practice experience. Prerequisite: Social Work 400 or consent of instructor. 1 unit.
431. **Practice in Organizational Settings.** Critical analysis of social work practice: the agency's target population and clientele, task environment, structure, functions, task definitions, monitoring and planning mechanisms; methods of service delivery; ethical and legal considerations in service delivery; the impact of racism, ethnocentrism, and sexism on social work practice. Section for school social work students contains content related to meeting the needs of exceptional children and their families in the public schools. Prerequisite: Concurrent registration in Social Work 468. 1 unit.
432. **Practice Evaluation.** Evaluation of social work practice: defining practice problems; operationalizing goals and objectives; developing hypotheses; designing evaluation plans to test hypotheses; describing interventions; collecting, analyzing, and interpreting data; and presenting results. Students complete an evaluation of some aspect of their own practice or their agency's program. Prerequisite: Social Work 431; concurrent registration in Social Work 469. 1 unit.
435. **Supervision/Consultation/Staff Development.** The philosophy, objectives, principles, and methods of social work supervision, consultation, and training for staff development; analysis of similarities and differences in roles, knowledge, and skills required with emphasis on the teaching-learning-evaluating components; and issues arising from agency setting, changing legislation and program provisions, and relationships to social welfare administration. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
439. **Theory of Social Work Interventions.** Presents theory for social work interventions with individuals, families, groups, and communities and organizations; critically analyzes different theoretical frameworks for such interventions; and examines the conceptual links between theory, process, outcome, and evaluations. Prerequisite: Social Work 400, 401, and 402. 1 unit.
451. **Women: Society and Social Welfare Issues.** Examination and critical evaluation of current research on theory concerning the environmental influences on women's behavior and application of these ideas in practice and policy; attention given to both dynamics of victimization and change strategies as they affect women and children in the social welfare system; emphasis on issues of special concern to poor and minority women. Prerequisite: Social Work 351 or consent of instructor. 1 unit.
452. **Human Growth and Behavior and the Social Environment, II: Psychosocial Disorders.** Interrelationship of physical, emotional, learning, and social aspects of behavior disorders, and implications for the patient, family, and community; psychopathology, including neuroses, psychoses, character disorders, organic conditions, psychophysiologic disorders, and mental retardation; and diagnosis and treatment methods, including psychotherapy, somatic and drug therapies, and social work. Prerequisite: Social Work 351 or equivalent. 1 unit.
461. **Special Studies in Social Work, I.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. $1/2$ to 2 units.
462. **Special Studies in Social Work, II.** Independent or group study in areas of special interest; application of social work principles to special problems or settings. Prerequisite: Consent of instructor. $1/2$ to 2 units.
468. **Field Instruction, II.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Consent of instructor. 1 to 2 units.

- 469. Field Instruction, III.** The student is assigned to field instructors for learning experiences in social agencies and communities. Such experiences include the use of knowledge and understanding in analyses of case and problem situations and in direct service to agency clientele. Prerequisite: Social Work 468. 1 to 2 units.
- 484. National Social Welfare Policy, I.** Analyzes alternative concepts of social policy, the policy formulation process, and constraints on policy development in the United States; examines approaches to assessment of social policies. 1 unit.
- 485. National Social Welfare Policy, II.** Emphasis on the case approach within the context of basic political and governmental processes which influence the development, enactment, and application of national policy; analytical study of the background, legislative history, amendments, judicial interpretations, and operation of major national acts comprising our national social welfare policy, or bearing directly on social welfare such as the Social Security Act, the Employment Act, the Civil Rights Acts, and the Economic Opportunity Act. Prerequisite: Social Work 484 or consent of instructor. $\frac{1}{2}$ to 2 units.
- 489. Social Work and the Law.** Legal procedures and issues of special relevance to social work practice; includes legal provisions related to poverty, family development and crises, racial and ethnic minorities, institutionalized persons, crime and delinquency, legal authority of social agencies, and regulation of the profession. Prerequisite: Graduate standing in social work or consent of instructor. 1 unit.
- 491. Research Seminar.** Seminar for students preparing research projects, either in groups or individually; experience in the application of research methods to current social work problems. Prerequisite: Social Work 327 or equivalent. 1 to 2 units.
- 492. Seminar on Models for Directed Change.** Same as Sociology 492. See Sociology 492.
- 493. Seminar: Design of Social Work Research.** Issues and problems in social work research; includes proof and verification, generalizability, and use of scaling and of judgments; and design of original research study. Prerequisite: Admission to Ph.D. program and Social Work 327, or consent of instructor. 1 unit.
- 497. Collective Bargaining in Public Employment.** Same as Labor and Industrial Relations 497, Administration, Higher, and Continuing Education 497, and Political Science 469. See Labor and Industrial Relations 497.
- 499. Thesis Research.** Research and writing of doctoral thesis. 0 to 4 units.

SOCIOLOGY

Head of Department: James R. Kluegel

Department Office: 326 Lincoln Hall, 702 South Wright Street, Urbana

- 100. Introduction to Sociology.** Examination of how societies grow and change; reciprocal effects of economic, political, community, familial, and scientific institutions on each other and on individual life changes; and social conflict, problems of bureaucratic growth and planned and unplanned social change. 4 hours.
- 131. Social Problems.** Origin of problems; consequences of ameliorative strategies. Typical topics include crime, mental illness, drug use, suicide, sexual behavior, violence, and intergroup conflict. 3 hours.
- 145. Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Studies 145 and Women's Studies 112. See Women's Studies 112.
- 150. The Construction of Science.** What scientists actually do; readings, discussions, and essay projects to develop an understanding of both the technical and social aspects of scientific practice, what is distinctive about science as well as illuminating the interrelation of science with other elements of our culture; includes a cultural analysis of technology. Prerequisite: For students in the Campus Honors Program; others may enroll with the consent of instructor and the Director of the Honors Program. 3 hours.
- 180. Social Thought. Same as Anthropology 108.** Examines the problem of social order and cohesion as treated in the works of major social thinkers from Plato and Aristotle to the present. 4 hours.

- 185. Introduction to Social Statistics.** Same as Geography 185. A first course in social statistics for students without mathematics beyond the high school level; topics include the role of statistics in social science inquiry, measures of central tendency and dispersion, simple correlation techniques, contingency analysis, and introduction to statistical inference; includes the statistical analysis of social science data using personal computers in the Social Science Quantitative Laboratory. 4 hours. Students may not receive credit for Sociology 185 if they have already received credit for college level introductory statistics course.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 200. Introduction to Sociological Theory.** Analysis of such classical theorists as Marx, Weber, Durkheim, and Mead and such contemporary theorists as Parsons, Merton, and Blau. 3 hours.
- 201. Introduction to Social Psychology.** The social context of individual and interpersonal behavior. Observation, experimental and survey studies of: socialization; language acquisition and use; sources and changes of self concept; social interaction; emotions; coordination of interpersonal behavior; individual and interpersonal aggression, violence, and control; and adoption or rejection of innovations through social networks. 3 hours. Credit is not given for both Sociology 201 and Psychology 201.
- 205. Young Children with Special Needs.** Same as Human Development and Family Studies 205. Examines family and personal problems of children, birth to five years, with special needs owing to mental and physical handicaps, hospitalization, abuse, and emotional disturbance; studies social environmental effects on the classification of such children; parental needs; program development. 3 hours.
- 206. Political Sociology.** A study of power relations within and between the state, bureaucracy, community, social classes, and elites in the United States and other countries. 3 hours.
- 208. Collective Political Violence.** The study of the causes, processes, and effects of collective violence, particularly of riots, coups, and revolution. 3 hours. (Counts for advanced hours in LAS.)
- 210. The Industrializing Third World.** Explores the development of industrial Third World societies. Particular attention to the state as agent of development, socio-economic structures, labor and social movements, and dependent relationships with the world economy. Case studies from Africa, Asia, and Latin America. 3 hours.
- 218. Technology and Society.** Examines the social and cultural origins of modern technology and technological innovation; the effects of technology and its change on society. Topics include the impact of technology on beliefs and values, accommodation and resistance to change, and technology and the Third World. 3 hours.
- 222. Introduction to Modern Africa.** Same as African Studies, Anthropology, and Political Science 222. See African Studies 222.
- 223. Social Stratification.** Inequities in power, prestige, income, privilege, and lifestyles in the United States and other countries; class and status as determinants of group interests, ideologies, and interaction; and effects of social change and mobility. 3 hours.
- 224. Women in Society.** Same as Women's Studies 224. Examines the place of women in society; how society shapes women's opportunities, behavior, values, power, roles, and well-being; how women, in turn, shape social changes in the home and at work. 3 hours.
- 225. Racial and Cultural Minorities.** A sociological and social-psychological analysis of minority groups; illustrative material drawn from representative racial, ethnic, and status groups. 3 hours.
- 226. Ethnicity in America.** Presents theories of ethnicity: assimilation-Melting Pot, pluralism, competition-conflict. Examines relationships among groups, accommodation among groups as a challenge in national unification, group versus national identification, methods of studying ethnicity, comparisons between United States and other multi-ethnic societies, and immigration as a social problem and policy issue. 3 hours.
- 229. Sociology of Religion.** Same as Religious Studies 229. The functions of religious institutions in societies; religious leaders and leadership; religious groups in American society; and adaptations of religious institutions to modern needs and conditions. 3 hours.

231. **Juvenile Delinquency.** Historical change in definitions of delinquency, its causes and control; gangs; the juvenile justice system; treatment of offenders; and preventive programs. 3 hours.
240. **Crowds, Social Movements, and Violence.** Crowd formation and participation; recurring forms of individual and social behavior in crowds; routine and problematic crowd dispersal; social movement origins and participation; growth and organization; strategies, tactics, and consequences for participants and society; origins and consequences of racial, prison, sports and festival riots, and of violent confrontations between protest movements and the police. 3 hours.
241. **Alcohol and Society.** Examines social psychology of alcohol use, patterning and abuse; etiology and epidemiology of alcoholism; politics of social control and treatment; history of prohibition, reform movements, social and cultural comparisons. 3 hours.
242. **Family Violence.** Same as Human Development and Family Studies 242. Examines the sociology of conjugal and intrafamily violence from comparative, historical, and social psychological perspectives; abuse of family members; the violent situation; interpersonal violence. 3 hours.
243. **Social Perspectives on the Family.** Examines the societal forces shaping aspects of stable and changing family relations in the U.S. and other countries; focuses on social-structural factors affecting marriage, divorce, co-habitation, child-bearing, the division of work and authority, and other features of life. 3 hours.
246. **Vertebrate Social Organization.** Same as Anthropology, Ecology, Ethology, and Evolution and Psychology 246. See Ecology, Ethology, and Evolution 246.
249. **Sport and Modern Society.** Same as Kinesiology 249. See Kinesiology 249.
251. **Social Aspects of Mass Communications.** Same as Communications and Journalism 251. See Journalism 251.
259. **Organizations.** Conflict, communication, coordination, and leadership in the bureaucracies that characterize modern society; relations of individuals, organizations, and society; how organizations are intended to work and how they do work, emphasizing business firms, unions, schools, public agencies, hospitals, and prisons. 3 hours.
260. **Work and Occupations.** The meaning of work and leisure in modern society; job satisfaction, alienation, and the work ethic; occupational conflicts over money, status, and authority; impact of occupational segregation by sex and race on earnings, unemployment, and politics; job and career mobility; and improvement of work life and leisure. 3 hours.
264. **Introduction to Medical Sociology.** The sociology of health and illness behavior and the social structure of systems which deliver health care services; includes social constraints on illness, the illness role, medical organizations and professions, and the application of the illness model to deviant forms of behavior. 3 hours.
265. **Contemporary Korean Society.** Same as East Asian Languages and Cultures 265. See East Asian Languages and Cultures 265.
270. **Population Issues.** Same as Rural Sociology 270. Examines the current world population situation; the historical and current patterns of birth, death, migration, marriage, contraception, and abortion; and the world food and energy resources, crowding, and problems of overpopulation. 3 hours.
275. **Community.** Structure and function of communities in mass society; ecological and social psychological perspectives; social networks; ethnographic case studies of small towns and neighborhoods; and community types. 3 hours.
276. **Cities and Suburbs.** Metropolitan communities in modern society; neighborhoods, suburbs, ghettos, and slums as subcommunities; demographic, ecological, and technological aspects of urban change; and urban social networks. 3 hours.
277. **The Social Context of Agriculture.** Same as Rural Sociology 277. See Rural Sociology 277.
288. **Religion in Asian Society.** Same as Asian Studies 288 and Religious Studies 288. See Asian Studies 288.
290. **Individual Study.** Individual study or research project. Prerequisite: Six hours of sociology; written consent of instructor on form available in 326 Lincoln Hall. 1 to 6 hours.

May be repeated.

291. **Honors Individual Study.** Prerequisite: Open only to seniors in the sociology major who are eligible for departmental distinction; written consent of instructor on form available in 326 Lincoln Hall. 3 hours. May be repeated. (Counts for advanced hours in LAS.)
295. **Junior-Senior Honors Seminar.** Intensive scrutiny of current literature on one selected topic. Critical reading and discussion followed by writing essays and research proposals. Subject will shift yearly. Prerequisites: For sociology majors only. Student must have at least 4.5 grade-point average in sociology courses and consent of instructor. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
296. **Special Topics.** Prerequisite: Sociology 100 and consent of instructor. 3 hours. May be repeated as topics vary.
301. **European Working-Class History: 1750 to the Present.** Same as History 301 and Labor and Industrial Relations 301. See History 301.
302. **Sex Roles.** Same as Human Development and Family Studies 302 and Women's Studies 302. See Human Development and Family Studies 302.
304. **Thought and Society in Early Modern Europe, 1513-1789.** Same as History 346.
305. **Scientific Thought, I.** Same as History 339 and Philosophy 317. See Philosophy 317.
306. **Scientific Thought, II.** Same as History 340 and Philosophy 318. See Philosophy 318.
315. **Sociology of Education.** Same as Educational Policy Studies 315. See Educational Policy Studies 315.
317. **Sociology of Law.** Social origins and consequences of law and legal process, emphasizing problems of legal change and structure and function of legal sanctions. Law and law-like phenomena in primitive and modern societies. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
318. **Industry and Society.** Same as Labor and Industrial Relations 318. Selected problems in industrialization and technological change, labor force, meanings of work, the factory as a work place, corporate organization and corporate society, and alienation and authority. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
321. **Family and Kinship in Industrialized Societies.** Mate selection, marriage and consensual unions, separation and divorce, interaction and authority patterns, family crisis and social change. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
324. **Penology.** History of punishment and treatment of offenders; social organization of prison life, male and female inmate cultures, prison race relations, and violence; reform, parole, community correctional facilities, and effectiveness of treatment. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
325. **The Philosophy of Social Science.** Same as Anthropology 329 and Philosophy 375. See Philosophy 375.
327. **Japanese Society.** Same as East Asian Languages and Cultures 303. The institutions of contemporary Japan and their historical roots; the Japanese approach to modernization and development and social change; and implications of the Japanese experience for applied social change in developing areas and for social science theory and methodology. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science or sociology. 3 hours or 1 unit.
331. **Criminology.** Nature and extent of crime; past and present theories of crime causation; criminal behavior in the United States and its relation to personal, structural, and cultural conditions. Prerequisite: Sociology 100, or 6 hours of anthropology, geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
332. **Research Methods in Social Psychology: Laboratory Methods.** Same as Psychology 332. See Psychology 332.
333. **Mental Health in Social Context.** Mental health issues from organizational, demographic, and social-psychological perspectives; emphasizes the sociological implications of mental problems, the organization of treatment and confinement, and the role of the

- therapist. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
335. **Ethnography of Local Cultures.** Same as Anthropology and Educational Psychology 335. See Educational Psychology 335.
337. **Social Epidemiology.** Examines social correlates of illness (e.g., heart disease, cancer, obesity, alcoholism), methods of social epidemiology, stressors in the social environment, and factors that lessen the impact of stress. Prerequisite: Sociology 264; or 6 hours of anthropology, health and safety studies, psychology, or sociology. 3 hours, or $1/2$ or 1 unit.
339. **The Organization of Health Care.** Same as Health and Safety Studies 356. See Health and Safety Studies 356.
340. **Social Movements.** Origins and development of groups in promoting and resisting change, resource mobilization, strategies and tactics, individual and social consequences. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
343. **Social Change in Developing Areas.** Same as Rural Sociology 343. See Rural Sociology 343.
344. **Perspectives on the Modern World System.** Examines competing theoretical and historical perspectives on the modern world system, including debates on the international division of labor, class structure, the interstate system, and cycles and trends in the modern world economy. Analysis of implications for comparative and historical research. Prerequisite: Sociology 100 or 6 hours of anthropology, history, political science, social geography, or sociology. 3 hours or 1 unit.
346. **Sociology of Sport.** Same as Kinesiology 349. See Kinesiology 349.
347. **Environmental Sociology.** Same as Environmental Studies and Rural Sociology 347. See Environmental Studies 347.
350. **Soviet Social Institutions.** Structural consequences of Communist ideology and industrialism, social stratification and mobility, nationalities, family and education communications and public opinion, and socialized medicine. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1/2$ or 1 unit.
352. **Attitude Theory and Change.** Same as Communications 352 and Psychology 352. See Psychology 352.
354. **Social Structure of Southern Africa.** Same as African Studies 354. Examines formation and development of southern Africa as a regional socio-economic structure: interdependence of class, household, labor-force and production processes; studies social and political movements, state formation, and conflict. Prerequisite: Sociology 100 or 222; or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
357. **Human Rights.** Same as Political Science 357. Examines the idea of human rights: human rights in liberal democracies, especially in the United States; in pre-industrial societies; in totalitarian states. Studies human rights and cultural evolution; justification of human rights. Prerequisite: Sociology 100 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
358. **Crime and the Criminal Justice System.** Examination of crime and its interrelationship with the criminal justice system; includes victimization, policing and law enforcement, processing of criminal cases, and the corrections system. Prerequisite: 6 hours of sociology. 3 hours, or $1/2$ or 1 unit.
359. **The Social Psychology of Organization.** Same as Psychology 359. See Psychology 359.
364. **Population Trends and Patterns.** Introduction to contemporary demographic patterns and their historical development; transition theory and other models of demographic change; components of population growth and distribution; and trends and differentials in mortality and fertility. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit.
365. **Social Structure of Science.** Focuses on science as a social institution; topics include patterns of recruitment to the scientific profession, social forces shaping scientific specialization, the social stratification of scientists, social factors affecting scientific productivity. 3 hours, or $1/2$ or 1 unit.

366. **Sociology of Scientific Knowledge.** Sociological analysis of the production, evaluation, the impact of social interests on the development of scientific knowledge, Kuhn's analysis of science, the social shaping of technology, the rationality debate. 3 hours or 1 unit.
367. **Seminar in Sociology of Technology.** Explores important contemporary perspectives on the nature of technoscience (science-based technology), its origins and patterns of development, and the distinctive social forms within which it is embedded. Prerequisite: Sociology 218, or consent of instructor. 3 hours or 1 unit.
373. **Latin American Social and Political Institutions.** Class structures, family, kinship, religious, economic, and political institutions; trends in urbanization, ecological organization, and population. Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours, or $1\frac{1}{2}$ or 1 unit.
380. **Methods of Field Research.** Instruction, training, and supervised practice in methods of field research as a basic tool of sociology; emphasis on the role of the field researcher as participant, observer, and interviewer in various kinds of research settings, and on approaches to and applications of field data. Prerequisite: Sociology 100 and 185. 3 hours, or $1\frac{1}{2}$ or 1 unit.
381. **Survey Research.** Principles and applications of social science survey research methods; class project designing and conducting a sample survey; training and experience in analysis of survey data; sampling, questionnaire construction, interviewing and data reduction, and file management; and direct use of the computer in survey data analysis. Prerequisite: Sociology 185; Sociology 100 or 6 hours in social geography, anthropology, or political science. 3 hours or $\frac{3}{4}$ unit.
385. **Social Statistics, I.** Introduces statistical methods as applied to sociology and other social sciences: probability concepts, binomial and normal distributions; statistical inference, t-test and F-test, bivariate correlation and regression, multiple regression, dummy variables and analysis of variance, contingency tables; reliability and simple index construction; types of sampling and their effects on analysis. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 185, or Mathematics 112; or equivalent. 3 hours or 1 unit. Students may not receive credit for Sociology 385 if they have received credit for any one of the following: Statistics 100, 210, 310, or 311; Psychology 233, 234, or 235; Economics 171 and 172; Agronomy 340; Educational Psychology 390; Biology 371, 372, or 373; Forestry 321; Social Work 327.
386. **Social Statistics, II.** Examines social science applications of the general linear model and its extensions; topics include: model specification; ordinary and generalized least squares; multicollinearity; selection of predictors; interaction of variables and nonlinear regression; panel and time-series data; measurement error; path analysis; recursive and nonrecursive structural equation models. Applies statistical computing packages (e.g., SPSS) to social science data. Prerequisite: Sociology 385 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 306 and Sociology 386.
387. **Social Statistics, III.** Examines social science applications of discrete and continuous multivariate analysis; topics include: analysis of categorical data (loglinear modelling, probit analysis, etc); geometric interpretation of matrices; factor analysis and index construction; canonical analysis; discriminant analysis; unobserved variables and structural equation models; issues in model specification and estimation. Applies statistical computing programs such as ECTA and LISREL to social science data. Prerequisite: Sociology 386 or equivalent. 3 hours or 1 unit. Students may not receive credit for both Psychology 307 and Sociology 387.
388. **Basic Methods of Demographic Analysis.** Introduction to statistical and mathematical procedures in population analysis; the gathering, processing, and evaluating of registration and census data; the life table model; and procedures of mortality and fertility analysis and population projections. Prerequisite: Mathematics 112, or equivalent. 3 hours or 1 unit.
396. **Special Topics.** Prerequisite: Sociology 100 or 6 hours of anthropology, social geography, political science, or sociology. 3 hours or 1 unit. May be repeated as topics vary.
400. **Classical Sociological Theory.** Analysis of major classical sociological theorists of the nineteenth and early twentieth centuries, stressing the social, historical, and philosophic foundations of sociological theory; primary emphasis on Marx, Durkheim, and Weber. Prerequisite: Sociology 200 or equivalent. 1 unit.

401. **Contemporary Sociological Theory.** Major theorists and schools of thought since World War I with emphasis on the contemporary period; includes functionalism, exchange theory, conflict theory, symbolic interaction, and phenomenology. Prerequisite: Sociology 400 or equivalent. 1 unit.
402. **Social Stratification.** Theory and data concerning structured social inequality in industrialized societies, with special focus on the United States. 1 unit.
403. **Principles of Sociological Inquiry.** Examines the relationship between theory and method in sociological research; topics include problem formulation, research design, alternative theoretical frameworks and research strategies comparison of actual applications. Prerequisite: Sociology 385 or equivalent. 1 unit.
406. **Psychological Scaling: Unidimensional Methods.** Same as Psychology 406. See Psychology 406.
407. **Techniques in Demographic Analysis.** Same as Rural Sociology 407. The analysis of family formation and dissolution; measures of population movement and distribution; and introduction to the stable population model and to applications in the estimation of demographic measures. Prerequisite: Sociology 388. 1 unit.
409. **Psychological Scaling: Multidimensional Methods.** Same as Psychology 409. See Psychology 409.
411. **Methods in Comparative Sociology.** Examines problems in the design and conduct of research in cross-cultural and cross-national comparative sociology; levels of analysis and observation; the problem of equivalence and that of investigator ethnocentrism; qualitative and quantitative approaches; the ethics and politics of such research. Prerequisite: 1 unit of graduate credit in sociology, or consent of instructor. 1 unit.
414. **Seminar on Social Interaction.** Same as Communications 414. An analysis of social interaction based on the social psychology of C. H. Cooley, G. H. Mead, and W. I. Thomas; presentation of problems of theory, concepts, and method. Prerequisite: 1 unit of graduate credit in sociology. 1 unit.
416. **Survey Research Methods, II.** A laboratory course in survey research methods to provide students with advanced training and experience in problem formulation and computerized data analysis using statistical packages, e.g. SPSS; under staff guidance, a student will select a topic and write a professional-level paper. Three to ten hours of laboratory time per week. 1 unit.
418. **Seminar in Industrial and Economic Sociology.** Same as Labor and Industrial Relations 418. See Labor and Industrial Relations 418.
420. **Social Organization.** Major issues and perspectives on the structure and dynamics of social organization; stratification, elites, formal organizations, and social change; contemporary theoretical and methodological developments in selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
421. **Demography and Human Ecology.** Classic and contemporary issues and perspectives in demography and human ecology, emphasizing the relationship between demographic phenomena and social life and on the ecological approach to social organization; demographic change, analytic methods in demography, fertility, mortality, and migration; new research developments. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
423. **Social Psychology.** Development of social psychology; contemporary theoretical and methodological perspectives; selected areas of research. Prerequisite: Graduate standing, or consent of instructor. 1 unit.
425. **Feminist Scholarship in the Social Sciences: Theory and Research.** Same as Women's Studies 402. See Women's Studies 402.
432. **Special Problems in Theory and Research on Deviant Behavior.** A seminar concerned with the critique of recent theory and research on selected problems in the study of delinquency, crime, mental disorder, and the collaborative development of new theory and research designs. Prerequisite: Sociology 331 or consent of instructor. 1 unit. May be repeated as topics vary.
444. **Seminar in Public Opinion.** Same as Communications 444. Development and theory of public opinion process in society; censorship, interest groups, and propaganda; and mass media and public opinion. 1 unit.

- 445. **Sociology of Leisure.** Same as Leisure Studies 445. See Leisure Studies 445.
- 449. **Seminar: Sociology of Sport.** Same as Kinesiology 449. See Kinesiology 449.
- 456. **Organizational Sciences, I.** Same as Business Administration 410, Political Science 460, and Psychology 453. See Business Administration 410.
- 474. **Survey Methods in Marketing Research.** Same as Business Administration 431. See Business Administration 431.
- 477. **Seminar on Community Organization.** Same as Rural Sociology 477. Theories relating to the community concept and the analysis of community organization; the process of community change as applied to societies in various parts of the world. Prerequisite: Sociology 275 or consent of instructor. 1 unit.
- 482. **Recent Developments in Sociology.** Intensive study of selected topics based on contemporary works of major importance in the development of sociological theory. 1 unit. May be repeated as topics vary.
- 485. **The Sampling of Human Populations and Social Organizations.** Same as Business Administration 435 and Psychology 485. See Business Administration 435.
- 487. **Special Problems in Rural Sociology.** Same as Rural Sociology 487. See Rural Sociology 487.
- 488. **Covariance Structure and Factor Models.** Same as Educational Psychology, Psychology, and Statistics 488. See Psychology 488.
- 490. **Individual Topics in Sociology.** Supervised individual investigation or study of a topic not covered by regular courses; topic selected by the student and the proposed plan of study must be approved by the adviser and the staff member who supervises the work. $1\frac{1}{2}$ to 2 units.
- 494. **Multivariate Analysis in Psychology and Education.** Same as Educational Psychology and Psychology 494. See Psychology 494.
- 499. **Thesis Research.** 0 to 4 units.

SOILS

(See Agronomy)

SPANISH, ITALIAN, AND PORTUGUESE

(Including Catalan and Romance Linguistics)

Head of Department: Ivan A. Schulman

Department Office: 4080 Foreign Languages Building, 707 South Mathews Avenue, Urbana

Catalan

- 291. **Intensive Catalan Language.** An intensive introduction to the Catalan language, appropriate for students familiar with another Romance language; emphasizes acquisition of the four basic skills, listening, speaking, writing, and reading, in order to achieve competence in the language. Prerequisite: Basic reading knowledge of another Romance language is helpful but not absolutely necessary. 3 hours.
- 302. **Studies in Catalan Literature.** Studies selected aspects of Catalan literature taught in Catalan. Topics will be selected from among the major chronological periods and genres of Catalan literature; such as 20th century novel, Ramon Llull and Ausias March. The intention is to offer the student an in-depth view instead of an introductory overview. May be repeated as topic varies to a maximum of 6 hours or $1\frac{1}{2}$ units. Prerequisite: Catalan 291 or equivalent. 3 hours or $\frac{3}{4}$ unit. May be repeated as topic varies to a maximum of 6 hours or $1\frac{1}{2}$ units.

Italian

101. **Elementary Italian.** For students who have no credit in Italian. 4 hours.
102. **Elementary Italian.** Continuation of Italian 101. Prerequisite: Italian 101 or one year of high school Italian. 4 hours.
103. **Intermediate Italian.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Italian 102 or two years of high school Italian. 4 hours.
104. **Intermediate Italian.** Continuation of Italian 103. Prerequisite: Italian 103 or three years of high school Italian. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Introduction to the Study of Italian Literature.** Emphasis methodology for critical analysis of literary texts and on major periods and movements in their cultural and historical contexts. Prerequisite: Italian 104 or consent of instructor. 3 hours.
208. **Practical Review of Italian.** Reviews major challenges in Italian grammar, with particular emphasis on the verb system (major tenses and moods, morphology, and aspect) and areas of contrast with English. Prerequisite: Italian 104 or equivalent. 3 hours.
210. **Advanced Grammar.** Study of the structure of modern Italian in both its phonological and syntactic aspects for the student who already has a functional command of the language, with an emphasis on developing ability to analyze and interpret grammatical structures. Prerequisite: Italian 208 or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
220. **Conversation, I.** Training in oral-aural skill and in writing. Prerequisite: Italian 210 or consent of instructor. 3 hours.
222. **Conversation, II.** Continuation of Italian 220. Prerequisite: Italian 220 or consent of instructor. 3 hours.
240. **Italian Civilization of the Middle Ages and Renaissance.** Same as Comparative Literature 240. The development of Medieval Italian civilization in a literary context from the Sicilian School of love poetry to the early Renaissance in Florence; lectures and readings are in English. 3 hours.
280. **Italian for Business and the Professions.** Builds preexisting language skills through the study of Italian business practices: financial systems, transactions, banking, import/export and commercial correspondence. Prerequisite: Italian 208 or equivalent. 3 hours. (Counts for advanced hours in LAS.)
290. **Special Topics in Italian Studies.** Selected substantive readings for independent study on a given special topic of Italian literature, culture, language, or linguistics. Prerequisite: Italian 104 and consent of instructor. 2 to 4 hours. May be repeated. (Counts for advanced hours in LAS.)
291. **Honors Senior Thesis.** For candidates for honors in Italian. 2 hours. May be repeated. (Counts for advanced hours in LAS.)
300. **Italian for Speakers of Spanish.** An accelerated language learning course designed for speakers of Spanish. The focus will be primarily on those linguistics structures specific to Italian which differ significantly from Spanish equivalents. Early emphasis on production skills; comprehension-based skills will be introduced in rapid succession. Intended for students who have no credit in Italian. Students who have received credit in Italian 400 and 401 may enroll. 3 hours or $\frac{3}{4}$ unit.
302. **Composition and Stylistics.** Refinement of written discourse for academic and professional expectations and requirements. In addition to quizzes and a final examination, a major, formal paper on an assigned topic will be required. Prerequisite: Italian 210 or equivalent; or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
306. **Italian Culture.** Introduction to factors that have shaped present-day Italy; basic concepts contributing to understanding its present social and cultural development; taught in Italian. Prerequisite: Italian 200 or 220, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
308. **The Italian-American Experience.** Study of the process of acculturation of the Italian ethnic group in North America; taught in Italian. Prerequisite: Italian 306 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
313. **Dante.** Same as Comparative Literature 313. An interpretation of Dante's *Divine Comedy* with special attention to its position in the medieval world; a knowledge of Italian not required. 3 hours or $\frac{3}{4}$ unit.

314. **Petrarch and Boccaccio: Literature of the Italian Middle Ages.** Same as Comparative Literature 314. Studies in Petrarch and Boccaccio; nonmajors in Italian may read the works in translation; lectures are in English. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or $\frac{3}{4}$ unit.
320. **Masterpieces of Italian Renaissance Literature.** Same as Comparative Literature 320. A reading of masterpieces of the 1400 and 1500s and a study of their predecessors and influence; nonconcentrators in Italian may read the works in translation; lectures are in English. Content rotates. Prerequisite: Fulfillment of campus rhetoric requirement. 3 hours or $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units with consent of instructor.
330. **From Baroque to Romanticism.** Major literary developments in Italy from the end of the Renaissance to the New Italy of the Risorgimento (Baroque, Arcadia, Enlightenment, Neoclassicism, Romanticism). Prerequisite: Italian 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
340. **Modern Italian Novel.** An appreciation of the modern Italian novel through a close reading of some representative works (e.g., Verga, Moravia, Vittorini, Pavese). Prerequisite: Italian 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
342. **Modern Italian Poetry.** An appreciation of modern Italian poetry through a close reading of some representative works (e.g., D'Annunzio, Pascoli, Montale, Quasimodo, Saba, Ungaretti, Novissimi, Zanzotto). Prerequisite: Italian 200 or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
350. **Italian Syntax and Phonology.** Introduction to the essential syntactic and phonological structures of Modern Standard Italian in combination with appropriate discussion of corresponding linguistic concepts. Prerequisite: Italian 210 and 302, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, German, Spanish, and Portuguese 360. See English as an International Language 360.
362. **Introduction to Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 362. See Spanish 362.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, German, Portuguese, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Portuguese, Slavic, and Spanish 382, and Linguistics 386. See Humanities 382.
400. **Beginning Course for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Italian for Graduate Students.** An intensive language course designed to teach reading skills to graduate students; a continuation of Italian 400. Prerequisite: Italian 400 or consent of instructor. 4 hours. No graduate credit.
410. **Seminar on Italian Medieval and Renaissance Literature.** Graduate readings and critical studies of major and minor Italian Medieval and Renaissance works from the ninth to sixteenth-century; readings in the original languages; content and topics rotate. Prerequisite: Italian 313, 314, or 320, or consent of instructor. 1 unit. May be repeated to a maximum of 8 units.
440. **Seminar in Modern Italian Literature.** Critical analysis of post-Renaissance literary movements and texts; topics vary. Prerequisite: Italian 330, 340, 342, or equivalent or consent of instructor. 1 unit. May be repeated in a semester to a maximum of 2 units; may be repeated to a maximum of 4 units.
450. **Seminar in Italian Linguistics.** 1 unit.
462. **Seminar in Romance Linguistics.** Same as French, Linguistics, Portuguese, Romance Linguistics, and Spanish 462. See Spanish 462.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Portuguese, Russian, and Spanish 463. See French 463.
471. **Proseminar in Foreign Language Teaching.** Same as Spanish and Portuguese 471. See Spanish 471.

480. **Seminar in Second Language Learning.** Same as German 482, Portuguese 480, and Spanish 480. See Spanish 480.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Portuguese, Russian, and Spanish 481. See French 481.
495. **Special Topics in Italian.** $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** 0 to 4 units.

Portuguese

101. **Elementary Portuguese, I.** For students who have no credit in Portuguese. 4 hours.
102. **Elementary Portuguese, II.** Continuation of Portuguese 101. Prerequisite: Portuguese 101. 4 hours.
103. **Intermediate Portuguese.** Rapid reading, review of grammar, composition, and conversation. Prerequisite: Portuguese 102 or two years of high school Portuguese. 4 hours.
104. **Intermediate Portuguese.** Continuation of Portuguese 103. Prerequisite: Portuguese 103 or three years of high school Portuguese. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
200. **Advanced Grammar.** The study of the structure of modern Portuguese in both its phonological and syntactic aspects for the student who already has a functional command of the language, with emphasis on developing ability to analyze and interpret grammatical structures. Prerequisite: Portuguese 104 or consent of instructor. 3 hours.
210. **Composition and Conversation, I.** Prerequisite: Portuguese 104 or consent of instructor. 3 hours.
212. **Composition and Conversation, II.** Prerequisite: Portuguese 210 or consent of instructor. 3 hours.
220. **Readings in Portuguese.** Readings and discussion in Portuguese of a variety of texts by leading Luso-Brazilian writers covering various genres and themes; designed to emphasize reading, discussion, and enjoyment rather than literary criticism. Open to non-Portuguese majors; may not be counted for majors. Prerequisite: Portuguese 104 or equivalent. 3 hours.
300. **Intensive Portuguese for Spanish Speakers.** An accelerated course based on Portuguese-Spanish contrastive analysis; designed to enable students who can already read Spanish to read nonliterary and literary works in Portuguese and to develop a modicum of listening comprehension. Prerequisite: Spanish 104 or equivalent, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.
304. **Luso-Brazilian Culture.** Affords a broad understanding of the origins of Luso-Brazilian civilization and culture. Prerequisite: Portuguese 212 and 220, or equivalent. 3 hours, or $\frac{1}{2}$ or 1 unit.
306. **Brazilian Film.** A study of the evolution of Brazilian cinema through selected films to explore the nature and development of contemporary Brazilian aesthetics. Prerequisite: Portuguese 210 or 212; Portuguese 220 recommended. 3 hours or $\frac{3}{4}$ unit.
310. **Studies in Brazilian Literature.** Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
320. **Studies in Portuguese Literature.** Prerequisite: Consent of instructor. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, German, Italian, and Spanish 360. See English as an International Language 360.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 362. See Spanish 362.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, German, Italian, and Spanish 380. See Spanish 380.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Slavic, and Spanish 382, and Linguistics 382. See Humanities 382.
410. **Seminar in Brazilian Literature.** Advanced study of literary movements, major writers, and intellectual and cultural ideas in Brazilian literature; subject matter varies each time

the course is offered. Prerequisite: Portuguese 310 or consent of instructor. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.

420. **Seminar in Portuguese Literature.** Advanced studies on a specific topic, writer, group of writers or literary movement in Portuguese literature; subject matter may vary. Prerequisite: Portuguese 320. 1 unit. May be repeated for credit as topics vary.
450. **Seminar in Portuguese Linguistics.** Detailed study of topics in Portuguese and Brazilian language and linguistics. Prerequisite: Portuguese 300 and 362 and Linguistics 300, or consent of instructor. 1 unit. May be repeated for credit as topics vary.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Romance Linguistics, and Spanish 462. See Spanish 462.
463. **College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Italian, Russian, and Spanish 463. See French 463.
471. **Proseminar in Foreign Language Teaching.** Same as Spanish and Italian 471. See Spanish 471.
480. **Seminar in Second Language Learning.** Same as German 482, Italian 480, and Spanish 480. See Spanish 480.
481. **Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Italian, Russian, and Spanish 481. See French 481.
495. **Special Topics in Portuguese and Brazilian Literature.** $\frac{1}{2}$ or 1 unit.
499. **Thesis Research.** 0 to 4 units.

Romance Linguistics

362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 362. See Spanish 362.
462. **Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Spanish 462. See Spanish 462.

Spanish

NOTE: Students in elementary and intermediate language courses may not ordinarily register for credit in more than one course at the same semester level (e.g., 104 or 124). Approval to do so must be obtained from the department.

101. **Elementary Spanish.** For students who have no university credit in Spanish. 4 hours.
102. **Elementary Spanish.** Continuation of Spanish 101. Prerequisite: Spanish 101 at the University of Illinois at Urbana-Champaign. All other second semester Spanish students should enroll in Spanish 122. 4 hours. Credit is not given for both Spanish 142 and 102.
103. **Intermediate Spanish, I.** Continued development of reading, writing, and conversational skills for students who may be interested in pursuing Spanish in more advanced courses. Unlike Spanish 123, Spanish 103 places considerable emphasis on written expression in Spanish. Followed by Spanish 104, or 124, this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
104. **Intermediate Spanish, II.** Continuation of Spanish 103 for students who may be interested in pursuing Spanish in more advanced courses; continued emphasis on written and oral expression and on the reading of advanced texts. Completion of this course fulfills the LAS foreign language requirement. Prerequisite: Spanish 103 or equivalent placement score. 4 hours.
122. **Elementary Spanish.** Second-semester Spanish course for all students who did not take Spanish 101 at this University. Prerequisite: Spanish 101 elsewhere or assignment by placement exam. 4 hours.

- 123. Reading and Speaking Spanish, I.** Readings with discussion in Spanish; review and development of grammar essential to competence in reading and speaking. Followed by Spanish 124, this course fulfills the LAS foreign language requirement. Students completing Spanish 123 may not enroll in Spanish 104 without departmental approval. Students planning to take advanced courses in Spanish should enroll in Spanish 103. Prerequisite: Spanish 102 or 122, or equivalent placement score. 4 hours.
- 124. Reading and Speaking Spanish, II.** Continuation of Spanish 123. Readings with discussion in Spanish; continued development of conversational skills. This course fulfills the LAS foreign language requirement, but does not serve as a prerequisite for more advanced courses in Spanish without departmental approval. Students planning to take additional courses in Spanish should enroll in Spanish 104. Prerequisite: Spanish 103 or 123, or equivalent placement score. 4 hours.
- 125. Beginning Spanish for Near-Native Speakers.** Introduction to Spanish orthography, syntax and vocabulary for students of Hispanic background who have had little or no formal training in the Spanish language. Prerequisite: Consent of instructor. 4 hours.
- 127. Intermediate Spanish for Near-Native Speakers.** Review at the intermediate level of Spanish orthography, syntax, and vocabulary for students of Hispanic background who have little or no formal training in the Spanish language, and an introduction to the study of U.S. Hispanic minority literature. This course fulfills the LAS foreign language requirement. Prerequisite: Spanish 125 or consent of instructor. 3 hours.
- 141. Elementary Spanish for Agriculture and Related Fields, I.** Introductory course for students in agriculture and related disciplines interested in acquiring Spanish-language competency for use in the fields of agriculture, foods and nutrition, and rural development; presents basic grammar and vocabulary, scientific terminology, and agricultural and cultural information on the Spanish-speaking areas of the world. 4 hours. Not open to students who have received credit for Spanish 101.
- 142. Elementary Spanish for Agriculture and Related Fields, II.** Emphasizes conversation and focuses on Latin America; for students in agriculture, foods and nutrition, and rural development. Prerequisite: Spanish 141 or consent of instructor. 4 hours. Credit is not given for both Spanish 102 and 142.
- 191. Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
- 199. Undergraduate Open Seminar.** 1-5 hours. May be repeated.
- 200. Readings in Hispanic Literature and Culture.** Readings and discussion in Spanish of a variety of texts by leading Hispanic and Hispanic-American writers covering genres and themes; designed to emphasize reading, discussion, and enjoyment rather than literary criticism. Open to non-Spanish majors. Prerequisite: Spanish 104 or equivalent. 3 hours. Credit may be received by Advanced Placement "Language" or "Literature" examination. Does not count for credit toward the major.
- 210. Practical Review of Spanish.** Review of major challenges in Spanish grammar, including the verb system (major tenses and moods, morphology, and aspect), areas of contrast with English, and some lexical/semantic issues. Prerequisite: Spanish 104 or equivalent. 3 hours.
- 212. Advanced Spanish Grammar.** Intensive study and analysis of Spanish grammar including tense, aspect, and mood; morphological problems; syntactic variation; style in oral and written expression; brief discussion of dialectal variation. Prerequisite: Spanish 210; senior standing or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 214. Spanish Composition.** Basic composition course; problems of written Spanish and principles of Spanish stylistic patterns; weekly written exercises. Prerequisite: Spanish 210 or consent of instructor. 3 hours.
- 216. Introduction to Spanish Phonetics.** Practical, introductory course to Spanish phonetics, stressing practice in pronunciation. May be offered as intensive eight-week course. Prerequisite: Spanish 104 or equivalent. 2 hours.
- 220. Oral Spanish.** Practice in speaking Spanish; to be taken concurrently with or subsequent to Spanish 210; meets four hours per week. Prerequisite: Spanish 104 or equivalent. 3 hours.

- 222. Intensive Spoken Spanish.** Intensive oral contact with Spanish; meets four hours per week. Prerequisite: Spanish 220 or consent of instructor. 3 hours. May be repeated.
- 225. Introduction to the Study of Hispanic Literature, I.** Introduction to the literatures of both Spain and Spanish America; emphasizes the major periods and movements in the light of cultural, artistic, social, and historical contexts and the methodology for reading those texts through literary analysis appropriate for a variety of genres: novel, drama, poetry, short story, essay; focuses on literature written before 1700. Prerequisite: Spanish 200 (or advanced placement credit for 200) and Spanish 210. Concurrent enrollment in Spanish 214 strongly recommended. 3 hours. No advanced placement credit. Spanish 225 and 227 must be taken in sequence.
- 227. Introduction to the Study of Hispanic Literature, II.** Introduction to the literatures of both Spain and Spanish America; emphasizes the major periods and movements in the light of cultural, artistic, social, and historical contexts and the methodology for reading those texts through literary analysis appropriate for a variety of genres: novel, drama, poetry, short story, essay; focuses on literature written after 1700. Prerequisite: Spanish 225; credit or concurrent registration in Spanish 214. 3 hours. No advanced placement credit. Spanish 225 and 227 must be taken in sequence.
- 230. Introduction to Translation.** Theory and practice of written translations of nontechnical texts from English to Spanish and Spanish to English; brief study of concepts and objectives of translation; analysis of examples and exercises; term project in translation selected in consultation with instructor. Prerequisite: Spanish 210. 2 hours.
- 240. Culture of Spain.** Survey of Spanish civilization from the beginning to present times. Prerequisite: Spanish 210 and 214, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
- 242. Hispanic Literature in the United States.** A survey of literature by and about people of Mexican, Puerto Rican, and Cuban descent in the United States. Taught in English. 3 hours.
- 244. Hispanic Literature and Culture.** Same as Comparative Literature 244. Topics in major areas of Hispanic literature and culture; topics vary. Will count towards major only to satisfy culture requirement. Taught in English. 3 hours. May not be repeated more than twice for credit.
- 250. Spanish Literature, I: Major Works and Writers.** Introduction to selected Medieval and Golden Age texts. Prerequisite: Spanish 214, 225, and 227. 3 hours. (Counts for advanced hours in LAS.)
- 252. Spanish Literature, II: Major Works and Writers.** Introduction to selected texts from 1700 to the present. Prerequisite: Spanish 214, 225, and 227. 3 hours. (Counts for advanced hours in LAS.)
- 254. Spanish American Literature, I: Major Works and Writers.** Study of major writers and representative works of Spanish American literature from Pre-Columbian times until 1875. Prerequisite: Spanish 214, 225, and 227. 3 hours. (Counts for advanced hours in LAS.)
- 256. Spanish American Literature, II: Major Works and Writers.** Study of major writers and representative works of Spanish American Literature from 1875 until the present. Prerequisite: Spanish 214, 225, and 227. 3 hours. (Counts for advanced hours in LAS.)
- 260. Introduction to Hispanic Linguistics.** Introduction to Spanish phonology, syntax, sociolinguistics, dialectology, and history of the language; includes an overview and opportunity to examine an issue in each area in detail. Prerequisite: Spanish 210. 3 hours. (Counts for advanced hours in LAS.)
- 270. Parateaching.** Same as French, German, Latin, and Russian 270. See French 270.
- 274. Spanish Grammar for Communicative Language Teaching.** A survey of major Spanish syntactic and morphological patterns with particular emphasis on the acquisition of Spanish grammar by non-native speakers. Students will develop a sensitivity for appropriate teaching of Spanish grammar. Required for teacher education majors. Prerequisite: Spanish 210 and teacher education major, or consent of instructor. 3 hours.
- 276. Teachers Course.** Required for teacher-education majors in Spanish. Prerequisite: Spanish 210 or 220, or consent of instructor. 4 hours.

279. **Introduction to Foreign Language Education.** Same as French, German, Humanities, Latin, and Russian 279. See Humanities 279.
280. **Spanish for Industry and Commerce, I.** Introduction to vocabulary of Hispanic commerce; composition of business letters and similar texts. Prerequisite: Spanish 104 or consent of instructor. 3 hours.
282. **Spanish for Industry and Commerce, II.** Advanced study of Hispanic commercial vocabulary; composition of commercial correspondence and documentation. Prerequisite: Spanish 280. 3 hours.
284. **Translating and Interpreting for Commercial and International Studies.** Spanish/English and English/Spanish interpretation and technical translation; exercises in translation of technical reports and manuals. Prerequisite: Spanish 230 and 280, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
290. **Advanced Readings in Spanish.** A directed reading course intended to develop an advanced student's interest in a special area of Hispanic linguistics or literature (author, genre, period, group of works, etc.). Topics to be chosen in consultation with an adviser. Only topics not covered in regular offerings will be considered. Prerequisite: Spanish 260 for linguistics topics; and any two of Spanish 250, 252, 254, or 256 for literature topics. 1 to 3 hours. May be repeated for credit as topics vary. (Counts for advanced hours in LAS.)
291. **Special Topics for Honors Students.** For candidates for honors in Spanish; intensive study of topics in Hispanic literature or linguistics. Prerequisite: Consent of instructor and of departmental honors adviser. 1 to 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
299. **Study Abroad.** Lectures, discussions, seminars, and practical work in Spanish language, literature, history, culture, and civilization in Spain and Latin America. Prerequisite: Spanish 104 or equivalent. 0-18 hours. May be repeated to a maximum of 36 hours in separate semesters. (May count for advanced hours in LAS. Consult the departmental adviser for details.)
300. **Introduction to Medieval Spanish Literature.** Historical and cultural background for the Middle Ages; selected readings in medieval literature from the Jarchas to the Corbacho. Prerequisite: Spanish 250 or equivalent. 3 hours or $\frac{3}{4}$ unit.
302. **Medieval Literature.** In-depth study of selected major works of literature through 1550, surveying the principal currents of pertinent scholarship; special emphasis on the position of Spanish medieval literature in the broader context of European literature in both the Latin and the various vernacular languages. Prerequisite: Spanish 300. 3 hours or $\frac{3}{4}$ unit.
310. **Literature of the Golden Age.** A study of authors and genres of the Golden Age. Prerequisite: Spanish 250 or equivalent. 3 hours or $\frac{3}{4}$ unit.
314. **Cervantes: *Don Quixote*.** Introduction to *Don Quixote*, to its relationship to other selected masterpieces of the Golden Age, and to the main currents and forms of Golden Age prose. Prerequisite: Spanish 250 or equivalent. 3 hours or $\frac{3}{4}$ unit.
320. **Neoclassicism, Romanticism, Realism.** Study of representative authors and genres of the nineteenth century; particular emphasis on the neoclassical comedy, romantic drama and poetry, and the realistic novel. Prerequisite: Spanish 250 and 252 or equivalent. 3 hours or $\frac{3}{4}$ unit.
322. **Spanish Literature from 1898 to 1939.** Study of representative authors of the Generations of 1898 and 1927 with particular emphasis on literary experimentalism (symbolism, impressionism, surrealism, etc.) and the historical and ideological currents of the period as related to Spanish literature. Prerequisite: Spanish 252 or equivalent. 3 hours or $\frac{3}{4}$ unit.
324. **Contemporary Spanish Literature.** Study of the representative authors, genres, and literary modalities in the literature of Spain since the Spanish Civil War; particular emphasis on the neo-realist, existentialist (*tremendista*) novel, and the social novel and theatre, as well as on social and experimental trends in all genres since the mid-1960s and in the post-Franco era. Prerequisite: Spanish 252 or equivalent. 3 hours or $\frac{3}{4}$ unit.
330. **Colonial Spanish American Literature.** Intensive study of Colonial Spanish American literature from the chronicles through the literature of Emancipation; topics include the development of genres and their adaptations, presence of indigenous cultures, contrastive poetics, relationship of socioeconomic and literary development and independence. Prerequisite: Spanish 254 or equivalent. 3 hours or $\frac{3}{4}$ unit.

340. **Spanish-American Novel.** Major movements and writers in the development of the Spanish-American novel from its beginnings to the present. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
342. **Spanish-American Drama.** Intensive and analytical study of the works of principal playwrights of the modern and contemporary periods in Spanish America. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
344. **Spanish-American Short Story.** Intensive and analytical study of the principal cuentistas of Spanish America. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
346. **Spanish-American Poetry.** Major poets and movements in the development of Spanish-American poetry from the Colonial Period to the present. Prerequisite: Spanish 254 and 256, or equivalent. 3 hours or $\frac{3}{4}$ unit.
350. **Introduction to Spanish Linguistics.** Introduction to the study of language as a formal object and a communicative code using Spanish as a data base; development of Spanish phonology, morphology, syntax, and semantics; consideration of pragmatic and sociolinguistic dimensions. Prerequisite: Spanish 212, 216, and 260, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
352. **Spanish Syntax.** Systematic introduction to the foundations of Spanish syntax based on standard and more recent treatments of Spanish and syntactic theory. Prerequisite: Spanish 350. 3 hours or $\frac{3}{4}$ unit.
354. **Spanish Phonology.** Systematic introduction to the sound structures of Spanish, concentrating on recent contributions of theoretical linguistics to the understanding of the phonology of Spanish in its standard and selected dialectal varieties. Prerequisite: Spanish 350. 3 hours or $\frac{3}{4}$ unit.
360. **Principles of Language Testing.** Same as English as an International Language, French, German, Italian, and Portuguese 360. See English as an International Language 360.
362. **Introduction to Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 362. Comparative and historical analysis of the Romance languages. Prerequisite: Four semesters of a Romance language or Latin, or equivalent; Linguistics 200, Spanish 260, French 316, or equivalent. 3 hours or $\frac{3}{4}$ unit.
364. **History of the Spanish Language.** 3 hours or $\frac{3}{4}$ unit.
380. **Classroom Language Acquisition.** Same as English as an International Language, French, German, Italian, and Portuguese 380. Provides for an introduction to the context, process(es), and product of classroom language acquisition; emphasis is placed upon research, research findings, and implications of research. Prerequisites: Humanities 279, Linguistics 200, or equivalent, or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
382. **Computer-Based Foreign Language Teaching.** Same as Classical Civilization, English as an International Language, French, German, Humanities, Italian, Portuguese, and Slavic 382 and Linguistics 386. See Humanities 382.
390. **Topics in Hispanic Studies.** Topical studies of Hispanic literature or linguistics beyond the scope of regular offerings at the 300-level. Prerequisite: Corresponding introductory course at the 300-level, or consent of instructor. 3 hours or $\frac{3}{4}$ unit. May be repeated as topics vary to a maximum of 9 hours or $2\frac{1}{4}$ units.
399. **Study Abroad.** Lectures, seminars, and practical work in Spanish language, literature, and civilization in Spain. Prerequisite: Spanish 200, 225, and 227, or 220 and 222, or equivalent. 0 to 18 hours, or 0 to 3 units.
400. **Beginning Spanish for Graduate Students.** Basic grammar and vocabulary; reading practice. 4 hours. No graduate credit.
401. **Readings in Spanish for Graduate Students.** Continuation of Spanish 400; special readings in the critical literature of several disciplines. Prerequisite: Spanish 400 or consent of instructor. 4 hours. No graduate credit.
404. **Seminar in Medieval Literature.** Research work in medieval Spanish literature; theory and practice. Topics vary. Prerequisite: Spanish 300, 302, or equivalent. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.
410. **Seminar in Golden Age Literature.** Same as Comparative Literature 404. Prerequisite: Spanish 310 or equivalent. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.

- 420. Seminar in Modern Spanish Literature.** Study of problems in the works of a major writer or group of writers of the eighteenth or nineteenth centuries. Prerequisite: Spanish 320. 1 unit. May be repeated for credit as topics vary for a maximum of 2 units.
- 422. Seminar in Twentieth-Century Spanish Literature.** Investigation of literary problems presented by the Spanish novel, drama, poetry and/or essay since 1900. Prerequisite: Spanish 324 or equivalent. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.
- 430. Seminar in Spanish-American Novel.** Same as Comparative Literature 462. Special problems in methodology and research; includes other prose fiction. Prerequisite: Spanish 340 or equivalent. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.
- 432. Seminar in Spanish-American Poetry.** Prerequisite: Spanish 346 or equivalent. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.
- 440. Seminar in the History of Ideas.** Major topics in Hispanic intellectual history; sample topics include *El ensayo como Genero instrumental de las ideas*; *El peso de la identidad cultural*, *Corrientes ideologicas coloniales*, and *Idealismo y realismo*. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.
- 442. Seminar in Special Topics of Hispanic Literature.** Selected topics in Hispanic literature not previously covered in existing courses. 1 unit. May be repeated for credit as topics vary to a maximum of 4 units.
- 450. Seminar in Spanish Synchronic Linguistics.** Selected topics of Spanish phonology, syntax and sociolinguistics in the light of present-day linguistic theory. Prerequisite: Graduate standing in Spanish or consent of instructor. 1 unit. May be repeated for credit as topics vary to a maximum of 4 units.
- 452. Seminar in Spanish Diachronic Linguistics.** Selected topics on the development of Spanish and its dialects in the light of present-day historical methods. Prerequisite: Consent of instructor. 1 unit. May be repeated for credit as topics vary to a maximum of 2 units.
- 462. Seminar in Romance Linguistics.** Same as French, Italian, Linguistics, Portuguese, and Romance Linguistics 462. Selected topics in comparative Romance linguistics. Prerequisite: Spanish 362 and consent of instructor. 1 unit. May be repeated as topics vary.
- 463. College Teaching of Foreign Languages.** Same as English as an International Language, French, German, Italian, and Portuguese, and Russian 463. See French 463.
- 471. Proseminar in Foreign Language Teaching.** Same as Italian and Portuguese 471. An in-depth exploration of fundamental concepts in foreign language teaching; designed for departmental Teaching Assistants; topics include classroom discourse, teaching approaches, reading, listening, writing, and principles of language testing. Prerequisite: Teaching assistantship in the Department of Spanish, Italian, and Portuguese, or consent of instructor. 1 unit.
- 480. Seminar in Second Language Learning.** Same as German 482, Italian 480, and Portuguese 480. Treats specific topics in second language learning that are of current research and/or theoretical interest. Topics vary from semester to semester. Prerequisite: Spanish 380 or equivalent or consent of instructor. 1 unit. May be repeated as topics vary to a maximum of 4 units.
- 481. Seminar in Linguistic and Psychological Foundations of Language Teaching.** Same as English as an International Language, French, German, Italian, Portuguese, and Russian 481. See French 481.
- 495. Special Topics in Spanish.** $\frac{1}{2}$ or 1 unit.
- 499. Thesis Research.** 0 to 4 units.

SPECIAL EDUCATION

Head of Department: Susan Fowler

Department Office: 288 Education Building, 1310 South Sixth Street, Champaign

- 117. Exceptional Children.** Introduction to the study of children who deviate from the average in mental, physical, and social characteristics, including a study of the characteristics of such children and the adaptation of educational procedures to their abilities and disabilities. Prerequisite: Sophomore standing or Psychology 100. 3 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 218. Exceptional Students in Secondary Schools.** Introduction to the education of handicapped students in secondary schools, covering the legal bases for special education, the historical treatment of handicapped high school students, and modifications in teaching methods to meet specific learning or behavior difficulties. 1 hour.
- 249. Independent Study.** The study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper 5 percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
- 291. Thesis.** Prerequisite: Senior standing. 2 hours.
- 292. Thesis.** Prerequisite: Senior standing. 2 hours.
- 308. Teaching Students with Learning and Behavior Problems in the Regular Classroom.** Examination of the role of the regular classroom teacher in educating students with mild learning and behavior problems; topics include: identifying and describing learning and behavior problems, classroom behavior management techniques, remediation of academic skill deficits, and measuring and evaluating pupil progress. 3 hours or 1 unit.
- 309. Vocational Education for Special Needs Learners.** Same as Vocational and Technical Education 309. See Vocational and Technical Education 309.
- 314. Applications in Assessment of Young Exceptional Children.** Practice in designing and applying assessment devices and procedures and in using them to make educational decisions for handicapped children, birth through kindergarten age. Prerequisite: Credit or concurrent registration in Special Education 324; consent of instructor. 2 hours or $1/2$ unit.
- 316. The Gifted Child in School and Society.** A consideration of the gifted in society; who they are, their physical, psychological, social, and educational characteristics, and society's needs and provisions for them. The major portion of the course is devoted to the consideration and evaluation of instructional and administrative adjustments that should be made for the gifted in the educational structure. Prerequisite: Educational Psychology 211 or 236. 3 hours, or $1/2$ to 1 unit.
- 322. Introduction to Mental Retardation.** Same as Psychology and Social Work 322. Study of the history and current status of the social, emotional, physical, and learning characteristics and problems of mentally handicapped children; identification and diagnosis; available services and provisions; and educational programs and lifelong problems and adaptations for these individuals and their families. Prerequisite: Psychology 100 or Special Education 117; or equivalent. 3 hours, or $1/2$ or 1 unit.
- 324. Tests and Measurements in Special Education.** Interpretation of norm- and criterion-referenced tests for special populations including their reliability and validity; selection and design of observation systems; application of measurement and other assessment data to making instructional decisions for handicapped infants, children, and young adults. 2 hours or $1/2$ unit.
- 332. Characteristics and Methods of Educating the Multiply Handicapped.** The study of the physical and developmental characteristics of multiply handicapped individuals; places special emphasis upon individuals with cerebral palsy and other physical handicaps; reviews methods of educational interventions and requires demonstration of competencies in rudimentary physical management of multiply handicapped individuals. 3 hours or 1 unit.

- 335. Behavior Analysis for Teachers: Applications with Exceptional Individuals.** Remediation of behavior problems of exceptional students and adults using applied behavior analysis techniques; includes definition, observation, recording, charting, and evaluating behavior and behavior change and application of behavioral procedures to remediate behavior problems in the classroom. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 336. Systematic Instruction for Students with Special Needs.** Elements of data-based instruction emphasizing educational planning for individuals with special needs; includes task and developmental analysis, writing instructional programs, and individualization of instruction. Covers infancy to young adults; mild to severe degrees of handicap. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 4 hours or 1 unit.
- 337. Curriculum Development and Classroom Organization for Students with Moderate and Severe Handicaps.** Curriculum design, development, and adaptation for students with moderate and severe handicaps; includes the following basic curriculum areas: domestic/home living, self-care, socialization, community living, leisure and recreation, and functional academics; and emphasizes throughout the course the evaluation of curriculum and program effectiveness. Prerequisite: Special Education 336. 4 hours or 1 unit.
- 338. Families of Children with Special Needs.** The impact of children with special needs of their families; models for the study of family systems are applied to understanding families of special needs children; emphasis on planning family-focused interventions and exploring strategies for working with parents in a variety of settings. Prerequisite: Practicum experience or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 345. Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Vocational and Technical Education 345. Orientation to a behavioral approach to vocational training for handicapped adolescents and adults; topics include training, managing and evaluating vocational behavior, total service planning, and competitive employment placement and follow-up. Prerequisite: Credit or concurrent registration in Special Education 335, or consent of instructor. 3 hours or 1 unit.
- 359. Workshop and Laboratory in Curriculum and Methodology.** An intensive exploration of curriculum development in specialized areas of education. Requests for initiation of course sections are made by faculty or students. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.
- 365. Intervention Issues and Practices with Young Children with Disabilities.** Introduction to the field of early childhood special education, including its history and major issues; instructional methods used in teaching and facilitating development in young children with disabilities are covered in depth. Prerequisite: Concurrent registration in Special Education 424 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
- 410. Law and the Handicapped.** Legal rights of handicapped and disabled individuals, with special emphasis on educational aspects; examines the inter-relationship of constitutional law, statute law, administrative law, and case law at the federal, state, and local levels. 1 unit.
- 411. Drugs in Special Education.** A general survey of psychoactive drugs used extensively with children in special education, including reasons for the prescription, behavioral effects as observed in the classroom, effects on the child's behavior at home, issues concerning the use of the drugs, and litigation about these issues. 1 unit.
- 417. Programs for Special Students.** Introduction to special education: characteristics, assessment, and teaching methodology for students with learning and other handicaps; methodology is directed to the regular classroom teacher of special students. Prerequisite: Provisional teaching certification or completion of student teaching; or consent of instructor. 1 unit.
- 420. The Social Psychology of Persons with Disabilities.** Same as Rehabilitation 420. See Rehabilitation 420.
- 421. Administration and Supervision of Special Education.** Examination of administrative and supervisory practices in educating exceptional children with emphasis on special education programs in the public schools; and application of administrative theory to special education programs. Designed for advanced graduate students preparing for

administrative or supervisory positions in special education programs. Field trips to observe and evaluate programs are required. Prerequisite: Special Education 417; Administration, Higher, and Continuing Education 450. 1 unit.

422. **Theories of Academic Remediation.** Examination of the major theoretical approaches in the areas of mild disabilities and their critical evaluation in light of research. Topics include: assessment and remediation strategies, critical evaluation of research, and issues in mild disabilities. 1 unit.
424. **Supervised Practice in Special Education.** Supervised practice in one or more settings in which either mildly or severely impaired students are served; practicum settings may include day, residential, special, and regular schools which serve handicapped students. Prerequisite: Admission to the graduate program in special education; consent of supervising faculty member. $\frac{1}{2}$ to 2 units.
425. **Principles and Practices of Resource/Consulting Teaching.** Focuses on effective instructional practices for teachers of students with mild learning and behavior problems. Trains teachers in direct service delivery models for collaborative resource teaching. Prerequisite: One semester of Special Education 424. 1 unit.
426. **Theories and Practice of Consultation for Special Educators.** Focuses on aspects of collaborative resource and consultant teacher services that go beyond direct instruction services; emphasis on training resource room teachers to work as collaborative consultants to regular classroom teachers, parents and paraprofessionals. Students complete a series of collaborative/consultation projects. 1 unit.
438. **Interdisciplinary Team Approaches to Planning and Intervention for Special Needs Children.** Study of roles and functions of teams in special education service delivery; considers models of team process within and between service settings; explores dynamics of interaction on teams, including approaches to decision-making, communication, and conflict resolution; examines professional roles and tasks of team members in the intervention process. Prerequisite: Practicum experience or consent of instructor. $\frac{1}{2}$ or 1 unit.
448. **Mental Retardation in the Community.** Seminar on the integration of mentally handicapped adults into community settings; topics include legal, empirical, and ideological factors in the selection of residential, day-service, and recreational alternatives for the institutionalization and deinstitutionalization of mentally handicapped individuals. Prerequisite: Special Education 322. 1 unit.
449. **Independent Study.** Self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department head prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of adviser and department head.
456. **Problems and Trends in Special Education.** Introduction to significant problems, points of view, and trends in the field concerned; explores significant research related to organization, content, and techniques in the field in question. Students are encouraged to make special studies in approved areas. 1 to 2 units.
465. **Development and Characteristics of Young Children with Special Needs.** Examines the major handicapping conditions found in young children, birth - six, with a focus on the impact of these handicaps on development; briefly examines interventions used by a variety of professions in addressing specific developmental needs of children with a variety of handicaps. Prerequisite: Educational Psychology 236 or equivalent. $\frac{1}{2}$ or 1 unit.
466. **Early Childhood Special Education: Organizing for Early Intervention.** Program issues and research on the efficacy of various program models for young children with special needs from infancy to six; implications for program organization variables such as space, personnel roles, and curriculum. Prerequisite: Special Education 365, and concurrent enrollment in Special Education 424 or consent of instructor. $\frac{1}{2}$ or 1 unit.
483. **Single Subject Research Design.** Same as Educational Psychology 483. Study of the analysis of behavior in one or a few subjects using advanced time series designs; includes making accurate and reliable assessment of objective behaviors and designing experiments that feature interpretable comparisons among interventions and credible

generalizability to subjects, settings, and time periods other than those specifically studied. Classical and current exemplars of these designs are studied and critiqued in depth. Prerequisite: Educational Psychology 390 or equivalent. 1 unit.

490. **Seminar for Advanced Students of Education.** Seminar in the education of exceptional children; open only to persons who have been admitted for doctoral study. Sections may be offered in the following fields: (d) program planning and orientation; and (t) teacher education. 0 to 2 units.
491. **Field Study and Thesis Seminar.** Planning field studies and thesis problems by doctoral candidates; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze all presentations critically. Limited to students who have been admitted for doctoral study. 1 to 2 units.
492. **Concepts and Issues in Special Education, I.** Roles and competencies for special education leadership positions; includes literature critique, and preparation and presentation of a major review paper in an area of research interest. Prerequisite: Admission to doctoral studies in Special Education, or consent of instructor. 1 unit.
493. **Concepts and Issues in Special Education, II.** Seminar in current concepts and issues relating to all exceptional children; includes analyses of national policy and annual reports to Congress, on issues related to special education; introduction to grant proposal writing; and introduction to journal reviewing; requires critical review of key readings and preparation of papers synthesizing lectures, discussions and readings. Prerequisite: Special Education 492 or consent of instructor. 1 unit.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

SPEECH AND HEARING SCIENCE

Head of Department: Peter J. Alfonso

Department Office: 901 South Sixth Street, Champaign

102. **Human Communication: Systems, Processes, and Disorders.** Examines broad perspectives of theories and information regarding normal and abnormal communication: how speech and language develop, how people hear, how they produce speech and what can go wrong; addresses the impact of speech and hearing science on society, culture, and modern technologies. 3 hours.
105. **Voice and Articulation.** Same as Speech Communication 105. Basic factors of voice and speech sound production; analysis of faults that result in minor speech deviations or inadequacies; and individual analysis and guided practice toward improvement of speech habits. 2 hours.
198. **Freshman Seminar.** A special experimental seminar or independent study course intended to cover topics not treated by regular course offerings; open to undergraduates at any level. Requests for activation of this course may be made by students or by faculty and should be directed to the head of the academic department concerned. While credit toward graduation is normally granted, credit toward satisfying specific college or departmental requirements is contingent upon approval by the appropriate college or departmental committee. 0 to 9 hours. May be repeated.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **General Phonetics.** Same as Speech Communication 201. Basic principles of phonetic study; includes observation and representation of pronunciation, ear training, and practice in transcription. 3 hours, or $\frac{1}{2}$ or 1 unit.
260. **American Sign Language.** Same as Linguistics and Psychology 260. See Psychology 260.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Ten hours of speech and hearing science, and written approval by the faculty members who will supervise the student's work. 2 to 4 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)

291. **Honors Course.** Individual study leading either to a thesis or to departmental honors. Prerequisite: Senior standing; a grade-point of 4.0 or consent of the head of the department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
302. **Manual Communication, I.** Study of methods of manual communication with hearing impaired individuals; analysis of the language of signs and finger spelling in relation to origins, development, and structure; and extensive practice in manual communication. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
303. **Manual Communication, II.** Continuation of Speech and Hearing Science 302; an in-depth study of manual methods of communicating with hearing impaired individuals; particular emphasis on development of fluency in communicating with language-deficient deaf children and adults; and extensive practice in idiomatic language of signs. 2 hours or $\frac{1}{2}$ unit.
310. **Effects of Noise.** Presents the effects of noise (industrial, recreational, and transportation) on the individual and the community. Topics include methods of measuring noise, the physiological and psychological effects of noise; methods of abatement and hearing conservation; and legal aspects of noise damage and noise control. 3 hours or $\frac{1}{2}$ unit.
348. **Speech and Language Clinical Methods in the Schools.** Study of methods and materials used in the schools by the speech and language clinician. Prerequisite: Speech and Hearing Science 388. 3 hours or $\frac{1}{2}$ unit.
375. **Speech Science, I.** Same as Speech Communication 375 and Linguistics 375. Introduction to the anatomic and physiologic characteristics of the normal speech and hearing mechanisms. 4 hours or 1 unit.
376. **Speech Science, II.** Same as Speech Communication 376 and Linguistics 376. Consideration of the physiology of the speaking act, the acoustical characteristics of voice and of speech sounds, and the hearing of speech. Prerequisite: Consent of instructor. 4 hours or 1 unit.
378. **Hearing Science.** Acoustics, anatomy, and physiology of the auditory system; psychophysical methods; and a consideration of auditory theories and mechanics. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
380. **Prepracticum in Speech-Language Pathology.** Introduction to clinical practicum through assignment to supervisor/graduate clinician team. The student is responsible for clinical record-keeping and data collection while observing and interacting with client-clinician. Students will conduct some independent therapy during the semester. Prerequisite: Speech and Hearing Science 201, 375, 376, 378, 383, 385, 386 or consent of instructor. 2 hours or $\frac{1}{2}$ unit. May be repeated to a maximum of 4 hours or 1 unit.
383. **Development of Spoken Language.** Same as Speech Communication 383. Study of the correlates of language development from the prelinguistic period to adulthood. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
384. **Introduction to Stuttering.** Study of the theoretical and research literature concerning the causes, diagnosis, and treatment of stuttering and an analysis of clinical procedures in stuttering therapy. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
385. **Speech Pathology, I.** A study of the symptoms, causes, and treatment of articulation disorders. Prerequisite: Consent of instructor. 3 hours or $\frac{1}{2}$ unit.
386. **Language Disorders in Children.** Definition, etiology, and description of various types of language disorders in children; assessment and intervention of these clinical cases. Prerequisite: Consent of instructor. 3 hours or 1 unit.
387. **Beginning Practicum in Speech-Language Pathology.** Discussion, demonstration, and practice of clinical approaches used with speech and language disordered clients. Prerequisite: Speech and Hearing Science 201, 375, 376, 378, 380, 383, 385, and 386. 3 hours.
388. **Speech Pathology, II.** A study of the symptoms, causes, and treatment of voice disorders. Prerequisite: Speech and Hearing Science 385 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
389. **Appraisal in Speech Pathology.** Introduction to principles of diagnosis; discussion of administration, scoring, and interpretation of tests utilized during speech and language evaluation. Prerequisite: Speech and Hearing Science 383 and 385, or consent of instructor. 3 hours or $\frac{1}{2}$ unit.

- 390. Introduction to Hearing Disorders and Audiometry.** Review of the history of audiology as a profession; study of symptoms, causes, and treatment of hearing losses; and principles and application of basic audiometry. 4 hours or 1 unit.
- 392. Diagnosis of Hearing Impairments in Infants and Young Children.** Symptoms and causes of hearing impairment in young children; practice in procedures used for the measurement of residual hearing; and the selection and use of hearing aids. Prerequisite: Consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 393. Aural Habilitation and Rehabilitation.** Principles and methods of clinical and classroom retraining of the hard-of-hearing; includes lip reading, auditory training, speech disorders and conservation, and counseling. Required in curriculum of teacher training in speech and hearing science. Prerequisite: Consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 399. Design and Analysis of Experiments in Speech and Hearing Science.** An introduction to experimental designs and methods of statistical analysis in speech and hearing research. Prerequisite: Graduate standing or consent of instructor. 3 hours, or $1/2$ or 1 unit.
- 401. Applied Phonology.** A survey of basic knowledge concerning normal and deviant phonological development, and principles for applying this knowledge to the assessment and remediation of phonological disorders. Prerequisite: Consent of instructor. 1 unit.
- 418. Communication and Language Problems of the Hearing Impaired, I.** An advanced course in the problems and procedures involved in the acquisition of language and communication by persons with severe hearing impairment, particularly those with profound prelingual deafness; emphasis on research and measurement in the development of speech, speechreading, residual hearing, reading, written language, and manual communication, including finger spelling and the language of signs; and stress on the applications of recent approaches in linguistics and psycholinguistics to language development. Prerequisite: Consent of instructor. 1 unit.
- 475. Experimental Phonetics, I.** Same as Linguistics 475. Theoretical consideration of speech as motor behavior; special reference to physiological investigations of normal respiration, phonation, and articulation; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
- 476. Experimental Phonetics, II.** Same as Linguistics 476. Theoretical consideration of speech as an acoustical phenomenon; special reference to acoustical investigations of voice and speech sounds; and survey of the experimental literature. Prerequisite: Consent of instructor. 1 unit.
- 481. Seminar in Neuropathologies of Speech and Language.** Advanced study of speech, vocal, and linguistic problems associated with cerebral palsy and aphasia; topics offered in rotation, one or two each semester, include neurological aspects, aphasia, and cerebral palsy. Prerequisite: Consent of instructor. 1 unit. May be repeated for a maximum of 3 units.
- 482. Seminar in Stuttering.** Advanced study of stuttering disorders; topics vary, but emphasis is placed on measurement, clinical evaluation, and therapeutic methods. Prerequisite: A course in stuttering. 1 unit.
- 483. Psychology of Speech and Hearing Disorders, I.** Same as Psychology 483. Survey of psychological techniques utilized in the clinical and experimental study of speech and hearing disorders, with special reference to speech disorders; review of research findings and development of experimental designs. Prerequisite: Consent of instructor. 1 unit.
- 486. Advanced Clinical Practicum in Hearing Assessment and (Re)Habilitation.** Supervised assessment and management of patients. Includes audiological evaluation techniques; treatment counseling; hearing aid selection and evaluation; and aural rehabilitation management. External placement in a variety of sites is available as well as in the departmental clinic. Prerequisite: Graduate standing plus Speech and Hearing Science 378, 390, 393, or equivalent course work and consent of instructor. $1/4$ to 1 unit. May be repeated to a maximum of 5 units; students may also register more than once in the same semester to a maximum of 1 unit.
- 487. Advanced Clinical Practicum in Speech-Language Pathology.** Supervised management of clients demonstrating a variety of communicative disorders. Participation in diagnosis of problems and planning of treatment. External placement in a variety of outside sites. Graduate standing plus Speech and Hearing Science 201, 380, and 387 or the equivalents. $1/4$ to 1 unit. May be repeated to a maximum of 5 units.

- 489. **Seminar in Orofacial Anomalies and Laryngeal Pathologies of Speech.** Advanced study of speech and vocal problems associated with cleft palate, laryngeal dysfunctions, and facial-maxillary disturbances; topics offered in rotation, one each semester, include cleft palate and vocal problems. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units.
- 490. **Medical Aspects of Speech Disorders and Audiology.** Study of acute and chronic hearing and speech disorders traceable to disease of the ear and vocal mechanisms in relation to the techniques and philosophies utilized in a medically oriented environment. Prerequisite: Consent of instructor. 1 unit. Offered in alternate years.
- 491. **Seminar in Hearing Disorders.** Principles and methods of clinical management of all types of hearing disorders; survey of current literature and research. The following topics are offered in rotation, one or two each semester: automatic audiometry, aural rehabilitation, and hearing aids and amplification. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 3 units.
- 492. **Advanced Audiology.** Advanced study of rationale and development of principles associated with special techniques, procedures, and methods used in audiology. 1 unit.
- 495. **Special Problems.** Investigation of speech and hearing projects not included in theses. Prerequisite: Consent of head of the department. $1\frac{1}{2}$ to 2 units.
- 496. **Proseminar in Speech and Hearing Science.** Required seminar for all graduate students; involves reporting of ongoing research of faculty, visiting researchers, and students. 0 units.
- 499. **Thesis Research.** Individual research in the various areas of speech and hearing science. 0 to 4 units.

SPEECH COMMUNICATION

Head of Department: J. G. Delia

Department Office: 244 Lincoln Hall, 702 South Wright Street, Urbana

- 101. **Principles of Effective Speaking.** Preparation and presentation of short informative and persuasive speeches; emphasis on the selection and organization of material, methods of securing interest and attention, and the elements of delivery. 3 hours. Credit is not given for both Speech Communication 101 and either 111 or 112.
- 102. **Introduction to Speech Communication.** Survey of the questions probed, the methods employed, and the current status of knowledge in the speech communication discipline; provides opportunities to understand the range of concerns and to explore specific areas of interest of the field. 4 hours.
- 105. **Voice and Articulation.** Same as Speech and Hearing Science 105. See Speech and Hearing Science 105.
- 107. **Parliamentary Procedure.** Principles and practice of parliamentary procedure. 2 hours.
- 111. **Verbal Communication.** Principles and practice in communication; stress on fundamentals of exposition in writing and speaking. The University rhetoric requirement is fulfilled by this course in conjunction with Speech Communication 112. 3 hours. Credit is not given for both Speech Communication 111 and 101. Credit is also not given for both Speech Communication 111/112 and for Rhetoric 105/108.
- 112. **Verbal Communication.** Theory and practice of communication; stress on deliberation and fundamentals of persuasion through speaking and writing. The University rhetoric requirement is fulfilled by this course in conjunction with Speech Communication 111. Prerequisite: Speech Communication 111. 3 hours. Credit is not given for both Speech Communication 112 and 101. Credit is also not given for Speech Communication 111/112 and Rhetoric 105/108.
- 113. **Group Discussion and Conference Leadership.** Study of leadership, group process, and interpersonal relations in the small group, conference, and the public forum; emphasis on

- practice in leading and participation in various types of public discussion and conference with materials drawn from current public questions. Prerequisite: Sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours.
120. **Advanced Oral Communication.** Advanced principles of speech preparation and presentation, special problems and types of speeches, and considerable practice in composition and delivery of speeches. Prerequisite: Speech Communication 101 or equivalent. 3 hours.
125. **Public Discussion and Debate.** Study of and participation in public discussion and debate with emphasis on thorough preparation and research, principles of analysis, reasoning, evidence, and persuasive presentation of well-founded convictions; previous debate experience not required. 3 hours.
141. **Oral Interpretation.** Same as Theatre 180. Oral reading for understanding, appreciation, and communication. 3 hours.
142. **Group Oral Interpretation of Literature.** Same as Theatre 181. Study of modern modes of group presentation of literature; emphasis on practice in script preparation, directing, and performance in chamber theatre and readers' theatre. Prerequisite: Speech Communication 141 or consent of instructor. 2 hours.
161. **Fundamentals of Acting.** Same as Theatre 170. See Theatre 170.
177. **The Arts of Public Discourse.** The nature and forms of practical and artistic public speech, including adaptations for the mass audience. 4 hours.
178. **The Arts of the Theatre and Interpretative Speech.** The nature and forms of performing speech arts of theatre, interpretation, and film, including adaptations for the mass audience. 4 hours.
191. **Freshman Honors Tutorial.** Study of selected topics on an individually arranged basis. Open only to honors majors or to Cohn Scholars and Associates. Prerequisite: Consent of departmental honors adviser. 1 to 3 hours. May be repeated once.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **General Phonetics.** Same as Speech and Hearing Science 201. See Speech and Hearing Science 201.
203. **Dramatics for Teachers.** Survey of methods and procedures of play production in the secondary school. 3 hours.
204. **Speech for Teachers.** A course in teaching methods designed for prospective teachers who are non-speech communication majors; discussion of methods and materials available for teaching speech and directing extracurricular speech activities. 3 hours.
207. **Analysis of Screen Genre.** General introduction to the theory and analysis of film and television genre; detailed study of one or two representative types of genres (genres vary from semester to semester). Considers aesthetic, ideological, cultural, and historical views of genre. Students are required to view a limited number of films and television programs outside of class. Prerequisite: Sophomore standing and Speech Communication 102 or 177, or one course in film. 3 hours.
208. **Ideology and the Rhetoric of Film.** Examines the nature and communicative functions of the ideological content of narrative cinema, with emphasis on the Hollywood film; considers ideological dimensions of film as communication, explicit and implicit ideological dimensions of the Hollywood social problem film, relationship of genre and ideology, and the ideology of the institution of cinema. Prerequisite: Sophomore standing and one course in speech communication or film. 3 hours.
210. **The Rhetorical Tradition.** Survey of major trends in the development of rhetorical theory from Homer to the present. 3 hours. (Counts for advanced hours in 1 AS.)
211. **Business and Professional Speaking.** Study, preparation, and presentation of the chief types of business speeches, special attention to conferences, sales talks, interviews, and job applications. Prerequisite: Speech Communication 101. 2 hours.
212. **Introduction to Organizational Communication.** Considers major theories, research, questions, and approaches. Prerequisite: Speech Communication 102. 3 hours.
213. **Persuasion and the Arts.** Introduction to the study of narrative films, theatre, fiction, and poetry as vehicles of indirect and overt persuasion. 3 hours.

221. **Persuasion.** Study of the processes of motivation as applied to speeches intended to influence group opinion and action; practice in the preparation and delivery of short persuasive speeches. Prerequisite: Speech Communication 101; junior standing. 3 hours. (Counts for advanced hours in LAS.)
223. **Argumentation: Theory and Practice.** Study of the theory of argument, e.g., evidence, reasoning, and construction of briefs; practice in formal and informal forms of debate and public discourse on current public questions. Prerequisite: Speech Communication 101; sophomore standing. By permission of the head of the department the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
230. **Interpersonal Communication.** Study of communication theory and its application to interpersonal relations; extensive discussion of problems of conflict and misunderstanding in personal affairs to facilitate the development of knowledge, insights, and skills in the processes of face-to-face interaction. Prerequisite: Speech Communication 101 and sophomore standing; by permission of the head of the department, the prerequisite may be waived for superior students, including James Scholars. 3 hours. (Counts for advanced hours in LAS.)
247. **Teaching of Speech.** Same as Curriculum and Instruction 247. See Curriculum and Instruction 247.
251. **Communication Problems in Public Information Management.** Study of communication problems and practices involved in the management of public information. Considers functions, contexts, and evaluation of public information efforts. Prerequisite: Sophomore standing and one course in Speech Communication. 3 hours.
252. **The Rhetoric of Dissent.** A study of the rhetorical strategies and tactics employed in selected cases of dissent in American political and social life. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
253. **Case Studies in Public Discourse.** Detailed examination of selected cases of significant public discourse. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours.
254. **Freedom of Speech and the Ethics of Speech Communication.** Examination of the nature and variety of responses to value questions concerning communication; includes a survey of the evolution of and current controversies in freedom of speech. Prerequisite: Speech Communication 101 or 102, or consent of instructor. 3 hours. (Counts for advanced hours in LAS.)
255. **Directing: Script Preparation.** Same as Theatre 281. See Theatre 281.
290. **Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.25; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
291. **Honors Individual Study.** Individual investigation of special problems. Prerequisite: Twelve hours of speech communication; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
293. **Honors Senior Thesis.** Individual study leading to a thesis for honors in the Department of Speech Communication. Prerequisite: Senior standing; a grade-point average of 4.50; and consent of head of department. 2 hours. May be repeated to a maximum of 4 hours. (Counts for advanced hours in LAS.)
296. **Special Topics in Speech Communication.** Special topics in speech communication not treated in regularly scheduled courses. See *Timetable* for current topics. Prerequisite: Sophomore standing and one course in speech communication; or consent of instructor. 3 hours. May be repeated to a maximum of 6 hours. (Counts for advanced hours in LAS.)
308. **Cultural Analysis of Screen Media.** Same as Communications 308. Study of theories and methods for analyzing the cultural significance and influence of the content of film and television media; detailed application to one or two particular dimensions of the relation-

ship of screen media to culture (applications vary from semester to semester and are chosen to highlight current issues in cultural analysis of media). Students are required to view a limited number of films and television programs outside of class. Prerequisite: Speech Communications 207 or 208 or 213; or consent of instructor. 3 hours or 1 unit.

311. **Organizational Communication Assessment.** Organizational communication theory applied to the assessment of communication practices in organizations; systematic procedures for diagnosing communication problems and facilitating effective communication in organizations. Extensive use of case studies. Students conduct a communication audit of an organization. Prerequisite: Speech Communication 212. 3 hours or 1 unit.
312. **Organizational Communication Processes.** Advanced study of theory and research in organizational communication; considers such topics as communication networks, superior-subordinate communications, task-related and social information processing, and communicating with the external environment. Prerequisite: Speech Communication 212. 3 hours or 1 unit.
313. **Interpersonal Communication: Discussion and Interview.** Advanced study of theory, research, techniques, and training methods in interviewing and group discussion; emphasis on empirical research findings concerning communication processes in face-to-face groups. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
315. **Greek, Roman, and Medieval Rhetorical Theory.** Same as Classical Civilization 315. Examination of the development of rhetorical theory, criticism, and pedagogy in Western thought; analysis of the contributions of major figures and works from Homer to the Renaissance. Prerequisite: Junior standing or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
317. **Contemporary Rhetorical Theory.** Coverage of the major contributors to rhetorical theory from James and Winans to the present. 3 hours, or $\frac{1}{2}$ or 1 unit.
319. **Studies in Russian and East European Cinema.** Same as Communications and Slavic 319. See Slavic 319.
320. **Argumentation and Public Decision Making.** Study of the philosophical, logical, and psychological bases of public decision making through discussion and debate. Prerequisite: Speech Communication 223 or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
321. **Theories of Persuasion.** Survey of theories of persuasion derived from rhetorical, philosophical, and psychological sources and their application to persuasive discourse. Prerequisite: Speech Communication 221 or graduate standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
322. **Renaissance and Modern Rhetorical Theory.** Significant movements in the development of rhetorical theory in England, France, and America from 1500 to the present. Prerequisite: Senior standing. 3 hours, or $\frac{1}{2}$ or 1 unit.
323. **Rhetorical Criticism.** Methods of interpreting and judging persuasive discourse with emphasis on political speaking and writing; lectures and practice in criticism. Prerequisite: Credit or concurrent registration in Speech Communication 322 or 350. 3 hours, or $\frac{1}{2}$ or 1 unit.
324. **Persuasion in the Campaign and Movement.** Consideration of factors central to the sustained persuasive campaign or movement; special attention to the nature and functions of persuasion in the political campaign. Prerequisite: Speech Communication 221 or 321, or consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
329. **Language of Religion.** Same as Religious Studies and Linguistics 329. See Religious Studies 329.
332. **Women and Language.** Same as Linguistics and Women's Studies 332. Study of actual and perceived differences and similarities in the use of language by women and by men; emphasizes the social contexts of speech. Prerequisite: A course in speech communication or linguistics, or equivalent. 3 hours or 1 unit.
335. **Interpersonal Communication Processes.** Same as Communications 335. Study of the major processes involved in an individual's adjustment to the communication situations of everyday life; emphasis on the development of interpersonal competency and orientations, social perception, interpersonal sentiment and hostility, trust, and the social context as factors influencing the understanding and evaluation of interpersonal messages. 3 hours, or $\frac{1}{2}$ or 1 unit.

342. **Oral Interpretation of Poetry.** Analysis and oral presentation of literature representative of various poetic forms. Prerequisite: Speech Communication 141. 3 hours, or $1/2$ or 1 unit.
344. **Criticism of the Oral Interpretation of Literature.** Examination of theories of aesthetics and practical criticism and their application to the criticism of specific examples of the oral performance of literature. Prerequisite: Speech Communication 141 or graduate standing, or consent of instructor. 3 hours, or $1/2$ or 1 unit.
345. **Oral Interpretation of Prose Fiction.** Same as Theatre 376. Modern concepts underlying the relationship of interpretation to the reader's experience of literature; discussions, reports, and oral interpretations of prose forms (including chamber theatre and readers' theatre). Prerequisite: Speech Communication 141 or consent of instructor. 3 hours, or $1/2$ or 1 unit.
350. **Selected Topics in the History and Criticism of Public Discourse.** Study of selected periods and genres of public discourse in historical context, including British, American, French, Russian, German, Chinese, and Japanese. Prerequisite: One course in rhetorical criticism or consent of instructor. 3 hours, or $1/2$ or 1 unit. May be repeated as topics vary to a maximum of 12 hours or 4 units.
353. **Criticism of Contemporary Public Discourse.** Rhetorical criticism of selected aspects of contemporary public communication. 3 hours, or $1/2$ or 1 unit.
374. **Introduction to Empirical Research Methods in Speech Communication.** Introduction to descriptive and experimental methods in speech communication; intended to produce understanding and critical evaluation of research designs. 3 hours or $1/2$ unit.
375. **Speech Science, I.** Same as Linguistics and Speech and Hearing Science 375. See Speech and Hearing Science 375.
376. **Speech Science, II.** Same as Linguistics and Speech and Hearing Science 376. See Speech and Hearing Science 376.
383. **Development of Spoken Language.** Same as Speech and Hearing Science 383. See Speech and Hearing Science 383.
387. **Topics in Folklore.** Same as Comparative Literature, English, German and Slavic 387. See English 387.
396. **Combined Undergraduate/Graduate Seminar.** Seminar on advanced topics in speech communication not treated in regularly scheduled courses; see *Timetable* for current topics. Prerequisite: Junior standing and two courses in speech communication, or consent of instructor. 3 hours, or $1/2$ or 1 unit. May be repeated to a maximum of 6 hours or 2 units.
400. **Studies in Dramatic Form and Structure.** Same as Theatre 401. See Theatre 401.
403. **Seminar for Teachers of Speech.** Investigation of current principles, materials, and developments in the field of speech communication and of their relationship to the teacher. 1 unit.
417. **Contemporary Viewpoints in Speech Communication Theory.** Same as Communications 417. A readings seminar comparing the principal approaches to communication and rhetorical theory in the twentieth century along with a consideration of their philosophical assumptions. 1 unit.
429. **Seminar in Speech Communication.** Special topics in speech communication. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
430. **Contemporary Theories of Oral Communication.** Systematic study of speech making and discussion as related to contemporary views of communication; examination of the theoretical literature and experimental evidence. Prerequisite: Consent of instructor. 1 unit.
436. **Seminar in Theories and Procedures of Discussion.** Intensive examination of selected problems of communication in small, task-oriented groups; evaluation of special instrumental forms, such as the unstructured group, the work group, the panel, and the lecture-forum; critical analysis of recent research in group communication as a means of making decisions and of changing attitudes and behavior. Prerequisite: Speech Communication 313 or equivalent. 1 unit.
437. **The Analysis of Interpersonal Interaction.** Same as Communications 437. Exploration of theory, methodology, and empirical findings of descriptive and experimental ap-

- proaches to the analysis of verbal and nonverbal interaction processes, in both laboratory and naturalistic settings. Prerequisite: Speech Communication 335 or consent of instructor. 1 unit.
- 438. Seminar in Rhetorical Theory.** Study of special topics in the history of rhetorical theory. 1 unit. May be repeated for a maximum of 4 units.
- 465. Seminar in Theatre Art.** Same as Theatre 407. See Theatre 407.
- 468. Seminar in Theatre History.** Same as Theatre 406. See Theatre 406.
- 474. Experimental Design in Speech Communication Research.** Detailed treatment of major issues and options in designs employed in speech communication research. Prerequisite: Speech Communication 374 or equivalent; introductory statistics course. $\frac{1}{2}$ or 1 unit.
- 495. Special Problems.** Individual investigation of special projects not included in theses. Prerequisite: Consent of head of department. $\frac{1}{2}$ to 2 units. Open to master's candidates for a maximum of 1 unit, and to doctoral candidates for 1 or 2 units.
- 499. Thesis Research.** 0 to 4 units.

STATISTICS

Head of Department: Walter Philipp

Department Office: 101 Illini Hall, 725 South Wright Street, Champaign

- 100. Statistics.** Same as Mathematics 161. A first course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models. Prerequisite: Mathematics 112. 3 hours. Credit is not given for both Statistics 100 and any one of the following: Economics 171 or 172, Psychology 233, 234, or 235, or Sociology 385.
- 210. Statistics for Scientists.** Same as Mathematics 263. A first course in the use of statistical methodology for the interpretation and analysis of data arising from scientific investigations; directed toward a general audience of students in physical, biological, social, or engineering sciences; and prepares the student for the sequel course, Statistics 320. Prerequisite: Mathematics 242, 244, or 245; or equivalent. 3 hours. Credit is not given for both Statistics 210 and any one of the following: Economics 171 or 172, Psychology 233, 234, or 235, or Sociology 385.
- 290. Individual Study.** Prerequisite: Consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 291. Honors Individual Study.** Prerequisite: Consent of instructor. 1 or 2 hours. May be repeated to a maximum of 8 hours.
- 300. Exploring and Analyzing Data.** Exploring the structure of data: numerical summaries, graphical displays, transformations, curve-fitting; random variables: binomial, normal; statistical models: linear regression, analysis of variance, contingency tables and categorical data; statistical inference: estimation, confidence intervals, hypothesis testing. Emphasis on computational aspects and applications to data in various disciplines. Prerequisite: College algebra and consent of instructor. 4 hours or 1 unit. Students with credit in any 300-level Department of Statistics course may not receive credit for Statistics 300.
- 308. Actuarial Statistics, I.** Same as Mathematics 308. Examines elementary theory of probability, including independence, conditional probability, and Bayes' theorem; combinations and permutations; random variables, expectations, and probability distributions; joint and conditional distributions; functions of random variables; sampling; central limit theorem. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit. Credit is not given for both Statistics 308 and either Mathematics 361 or Statistics 310.
- 309. Actuarial Statistics, II.** Same as Mathematics 309. Continuation of Statistics 308. Examines parametric point and interval estimation, including maximum likelihood estimation, sufficiency, completeness, and Bayesian estimation; hypothesis testing; linear models; regression and correlation. Prerequisite: Statistics 308. 4 hours or 1 unit. Credit is not given for both Statistics 309 and 311.

- 310. Introduction to Mathematical Statistics and Probability, I.** Same as Mathematics 363. Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Offers a basic one-semester introduction to statistics and also prepares students for Statistics 311. Prerequisite: Mathematics 242 or 245, or equivalent. 4 hours or 1 unit.
- 311. Introduction to Mathematical Statistics and Probability, II.** Same as Mathematics 364. Continuation of Statistics 310. Includes moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests. Prerequisite: Statistics 310; or Statistics 100 and Mathematics 361. 3 hours or 1 unit. Credit is not given for both Statistics 311 and 309.
- 320. Methods of Applied Statistics.** Same as Mathematics 369. Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests; emphasizes when and why various tests are appropriate and how they are used. Prerequisite: Statistics 210 or an introductory statistics course, Mathematics 130, 131 or 134 or equivalent, and knowledge of basic matrix manipulations; or consent of instructor. 3 hours or 1 unit.
- 324. Analysis of Variance.** Same as Mathematics 365. Estimation and hypotheses testing in linear models; one-, two-, and higher-way layouts; incomplete layouts; analysis of covariance; and random effects models and mixed models. Prerequisite: Credit or concurrent registration in Mathematics 315 and Statistics 311. 3 hours or 1 unit.
- 325. Applied Regression and Design.** Explores linear regression, least squares estimates, F-tests, analysis of residuals, regression diagnostics, transformations, model building, factorial designs, randomized complete block designs, Latin squares, split plot designs. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 326. Sampling and Categorical Data.** Sampling: simple random, stratified, systematic, cluster, and multi-stage sampling. Categorical data: multiway contingency tables, maximum likelihood estimation, goodness-of-fit tests, model selection, logistic regression. Computer work is an integral part of the course. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 327. Statistical Consulting.** Students, working in groups under the supervision of the instructor, consult with faculty and graduate students through the Statistical Consulting Service; readings from literature on consulting. Prerequisite: Statistics 324 or consent of instructor. 3 hours or 1 unit.
- 328. Statistical Computing.** Same as Mathematics 393. Examines statistical packages, numerical analysis for linear and nonlinear models, graphics, and random number generation and Monte Carlo methods. Prerequisite: Statistics 311 or equivalent; knowledge of FORTRAN. 3 hours or 1 unit.
- 329. Time Series Analysis.** Same as Mathematics 394. Studies theory and data analysis for stationary and prestationed time series; examines auto-regressive moving average model building and statistical techniques; and discusses spectral model building and statistical analysis using windowed periodograms and Fast Fourier Transformations. Prerequisite: Statistics 311. 3 hours or 1 unit.
- 330. Topics in Applied Statistics.** Same as Mathematics 368. Formulation and analysis of mathematical models for random phenomena; extensive involvement with the analysis of real data; and instruction in statistical and computing techniques as needed. Prerequisite: Statistics 311 or 320; or consent of instructor. 3 hours or 1 unit. May be taken for credit more than once with consent of instructor.
- 351. Introduction to Probability Theory, I.** Same as Mathematics 361. See Mathematics 361.
- 356. Introduction to Probability Theory, II.** Same as Mathematics 366. See Mathematics 366.
- 410. Mathematical Statistics, I.** Distributions, transformations, order-statistics, exponential families, sufficiency, delta-method, Edgeworth expansions; uniformly minimum vari-

- ance unbiased estimators, Rao-Blackwell theorem, Cramer-Rao lower bound, information inequality; equivariance. Prerequisite: Statistics 311. 1 unit.
411. **Mathematical Statistics, II.** Bayes estimates, minimaxity, admissibility; maximum likelihood estimation, consistency, asymptotic efficiency; testing and confidence intervals; Neyman-Pearson lemma, uniformly most powerful tests; likelihood ratio tests and large-sample approximation; nonparametrics. Prerequisite: Statistics 410. 1 unit.
425. **Current Research in Applied and Computational Statistics.** Various topics, such as ridge regression; robust regression; jackknife, bootstrap, cross-validation and resampling plans; E-M algorithm; projection pursuit; all with a strong computational flavor. Prerequisite: Statistics 325, 326, and 411; or consent of instructor. 3 hours or 1 unit.
451. **Theory of Probability, I.** Same as Mathematics 451. See Mathematics 451.
452. **Theory of Probability, II.** Same as Mathematics 452. See Mathematics 452.
453. **Probability and Measure, I.** Same as Mathematics 481. Measures and probabilities; integration and expectation; convergence theorems and inequalities for integrals and expectations; independence; convergence in probability, almost surely, and mean; Three Series Theorem; laws of large numbers. Prerequisite: Mathematics 347 or consent of instructor. 1 unit. Credit is not given for both Statistics 453 and either Mathematics 441 or 451.
454. **Probability and Measure, II.** Same as Mathematics 482. Measure extensions, Lebesgue-Stieltjes measure, Kolmogorov consistency theorem; conditional expectation, conditional probability, martingales; distribution functions and characteristic functions; convergence in distribution; Central Limit Theorem. Prerequisite: Mathematics 481. 1 unit. Credit is not given for both Statistics 454 and either Mathematics 451 or 452.
455. **Applied Stochastic Processes.** Same as Mathematics 461. See Mathematics 461.
463. **Information Theory.** Same as Computer Science and Electrical and Computer Engineering 463. See Electrical and Computer Engineering 463.
470. **Statistical Decision Functions.** Same as Mathematics 470. Statistics from the point of view of decision making; introduction to the theory of games; minimax and other decision functions; techniques for determining optimal decision functions; and applications to nonsequential and sequential decision making in practice. Prerequisite: Consent of instructor. 1 unit.
471. **Multivariate Analysis.** Same as Mathematics 471. Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: Statistics 311 and Mathematics 315, or consent of instructor. 1 unit.
475. **Large Sample Theory.** Limiting distribution of maximum likelihood estimators, likelihood ratio test statistics, U-statistics, M-, L-, and R-estimators, nonparametric test statistics, Von Mises differentiable statistical functions; asymptotic relative efficiencies; asymptotic expansions. Prerequisite: Statistics 411 and either Mathematics 451 or Statistics 454. 1 unit.
478. **Topics in Statistics.** Same as Mathematics 478. Prerequisite: Consent of instructor. 1 unit.
488. **Covariance Structure and Factor Models.** Same as Educational Psychology, Psychology, and Sociology 488. See Psychology 488.
490. **Reading Course.** Directed reading on various topics. Prerequisite: Consent of instructor. 1 or 2 units. May be repeated, subject to approval by the student's adviser.
499. **Thesis Research.** Prerequisite: Consent of instructor. 0 to 4 units.

TEXTILES AND APPAREL

(See Consumer Sciences)

THEATRE

Head of Department: D. Knight

Department Office: 4-122 Krannert Center for the Performing Arts, 500 South Goodwin Avenue, Urbana

100. **Practicum, I.** Practical work in acting, directing, playwriting, theatre management, and in the design, construction, and handling of scenery, lighting, sound, properties, costumes, and makeup for public performance. 40 hours of production activity to be arranged for each credit hour. Prerequisite: Consent of instructor for non-theatre majors. 1 to 3 hours. May be repeated to a maximum of 12 hours.
106. **Basic Theatre Practice, I.** Introduction to the theatre focusing on scenecraft; the fundamentals of acting; and the introduction of specific skills needed for continued study in acting or design areas. Student must enroll for all sections to receive credit. Prerequisite: Concurrent registration in Theatre 108. Limited to Theatre majors. 2 to 6 hours.
107. **Basic Theatre Practice, II.** Introduction to the theatre focusing on costume, makeup, and acting; introduction to specific skills needed for continued study in acting or design areas. Student must register for all sections to receive credit. Prerequisite: Theatre 106 and concurrent registration in Theatre 108. Limited to Theatre majors. 2 to 6 hours.
108. **Basic Theatre Practice Laboratory.** Practical experience in two of the following four areas: scenery and props construction and crew, costume construction and crew, lighting crew, and performance workshop. Prerequisite: Concurrent registration in either Theatre 106 or 107. Limited to theatre majors. 2 hours. May be repeated once.
109. **Dramatic Analysis.** Introduction to the study of plays for theatre practitioners employing analytical methods and plays from modern theatre. Requires paper or project assignments for each play. Prerequisite: Consent of instructor for non-theatre majors. 3 hours.
110. **Literature of the Theatre.** Introduction to the principal modes of dramatic expression in the plays of three important historical periods employing methods of dramatic analysis considered in Theatre 109. Prerequisite: Theatre 109 or consent of instructor. 3 hours.
142. **Stage Makeup.** Principles, materials, and application techniques for two- and three-dimensional makeup; lecture, demonstration, and intensive practice. Prerequisite: Theatre 107 or consent of instructor. 2 hours.
151. **Acting Studio, I.** Orientation to acting vocabulary; improvisation as a tool for communication of experience through speech and action; basic scene study; basic physical training for expressive body dynamics; fundamentals of voice and speech production. A performance is given at the end of the semester. Prerequisite: Theatre 107 and sophomore standing in acting. 1 to 8 hours. Students must register for all sections to receive credit.
152. **Acting Studio, II.** Special emphasis on analysis of roles, characterization, and application of skills learned through improvisation to scripted plays; continued voice and movement training, and dialects. A performance is given at the end of the semester. Prerequisite: Theatre 151. 1 to 8 hours. Students must register for all sections to receive credit.
170. **Fundamentals of Acting.** Same as Speech Communication 161. Study of the methods of acting, with emphasis on basic acting techniques; role of character in relation to play as a whole, the internal and emotional values of the play, and their interpretation by means of voice and action. 3 hours.
175. **Improvisation in Acting.** Exploration and communication of experience through speech and action on the stage. Prerequisite: Theatre 106, 107, or 170. 3 hours.
176. **Relationships in Acting.** Behavior in stage performance explored on the basis of the actor's relationship with self, with objects, and with other players; emphasizes analysis of playscript to discover action, environment, and relationships. Prerequisite: Theatre 106, 107, or 175; or consent of instructor. 3 hours.
180. **Oral Interpretation.** Same as Speech Communications 141. See Speech Communications 141.
181. **Group Oral Interpretation of Literature.** Same as Speech Communications 142. See Speech Communications 142.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.

- 210. Stage Electronics.** A laboratory course to familiarize the beginning theatre student with current wiring practices and control techniques related to theatrical electronic control systems. 3 hours.
- 223. Stage Mechanics, I.** Studies traditional materials, techniques, and processes used in executing scenery for the theatre. Prerequisite: Theatre 107 or consent of instructor. 4 hours.
- 224. Stage Mechanics, II.** Examines newly accepted and developing techniques, processes, and materials used in constructing and rigging stage scenery. Prerequisite: Theatre 223. 4 hours.
- 225. Scene Design, I.** Projects and lectures addressing basic technical and aesthetic skills of scene design. 3 hours.
- 226. Scene Design, II.** Projects and discussions focusing on single setting problems for proscenium stage. Prerequisite: Theatre 225. 3 hours.
- 227. Senior Projects in Design, I.** Professional studio and independent projects for student designers specializing in stage scenery, lighting, or costume design. Prerequisite: Consent of instructor. 6 hours.
- 228. Senior Projects in Design, II.** Continuation of Theatre 227. Prerequisite: Theatre 227. 6 hours.
- 230. Technical Direction.** Studies in theatre production organization and technical direction. 2 hours.
- 231. Stage Lighting Practice.** A studio course analyzing current lighting practices and equipment by means of production oriented assignments. 3 hours.
- 232. Lighting Design for the Stage.** Lighting design for the proscenium stage. Prerequisite: Theatre 231, or consent of instructor. 3 hours.
- 233. Stage Drafting, I.** Drafting for scenery construction and rigging. Prerequisite: Theatre 107. 4 hours.
- 242. Introduction to Costume Patterning.** Introduction and practice of basic sewing, craft, and patterning skills required to construct period theatrical costumes. 3 hours.
- 253. Acting Studio, III.** Acting in twentieth century plays. Concentrated training in American dialects and development of movement skills and mask characterization. A performance is given at the end of the semester. Prerequisite: Theatre 152. 1 to 8 hours. Students must register for all sections to receive credit.
- 254. Acting Studio, IV.** Development of the actors' skills for musical theatre through the study of dance for actors, movement for the stage, body alignment and awareness, continued vocal training emphasizing singing, and analysis and performance of British and American musical materials. A performance is given at the end of the semester. Prerequisite: Theatre 253. 1 to 8 hours. Students must register for all sections to receive credit.
- 255. Acting Studio, V.** Major emphasis on acting in Shakespearean and other Elizabethan drama; training in stage combat, sword and rapier; concentration on speech for Shakespeare and the classical stage. A performance is given at the end of the semester. Prerequisite: Theatre 254. 1 to 8 hours. Students must register for all sections to receive credit.
- 256. Acting Studio, VI.** Study of the techniques of acting for the camera; scenes are recorded on audio-visual tape; special topics include speech for the microphone and unarmed combat for the stage. A performance is given at the end of the semester. Prerequisite: Theatre 255. 1 to 8 hours. Students must register for all sections to receive credit.
- 263. Theatre of the Black Experience.** Surveys the Black Theatre Movement's history and literature, and studies dramatic works focused on the black experience through the rehearsal and performance of representative works of black dramatists. 3 hours. May be repeated to a maximum of 9 hours.
- 281. Directing: Script Preparation.** Same as Speech Communication 255. Methods of script analysis and the development of production concepts; explorative projects culminate in the readying of a script for rehearsal. Prerequisite: Theatre 152, or Theatre 170, or consent of instructor. 3 hours.
- 291. Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.
- 292. Individual Topics.** Individual projects and problems. Prerequisite: Consent of instructor. 2 hours.

300. **Practicum, II.** Advanced practical work in acting, directing, and theatre management; the design, construction, and handling of scenery, lighting, sound, properties, costumes, and makeup for public performance. Prerequisite: For non-theatre majors, consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ or $\frac{1}{2}$ unit. May be repeated to a total of 12 hours or 2 units.
310. **Theatre Planning and Programming.** Studies recent theatre architecture and theatre renovations, examining the programming process, the stage forms, the merits of various stage technological systems, and the related business, audience and production facilities of a theatre center. 3 hours or 1 unit.
322. **Scene Design for Nonmajors.** Lectures and projects investigating aesthetic and mechanical problems of designing scenery for the stage; no prior design experience required. Prerequisite: Consent of instructor. 3 hours or 1 unit.
323. **Stage Mechanics, III.** Advanced study in the design and construction of large weight-supporting scenery. Prerequisite: Theatre 224 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
324. **Stage Mechanics, IV.** Advanced study in the design and construction of moving scenic elements. Prerequisite: Theatre 323 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
325. **Scene Design, III.** Investigates nonproscenium performance spaces and nontraditional design forms, including thrust and arena stage, television scenery, and industrial show design. Prerequisite: Theatre 225 and 226. 4 hours or 1 unit.
326. **Scene Design, IV.** Design studio investigating important design styles; students develop projects dealing with period design. Prerequisite: Theatre 225, 226, and 325. 4 hours or 1 unit.
331. **Sound for the Theatre.** An introduction to sound reproduction, recording, and basic systems design as applied to the modern theatre. Prerequisite: Theatre 210. 3 hours or $\frac{3}{4}$ unit.
332. **Stage Management.** Studies the principles and the craft of stage management. Prerequisite: Sophomore standing in a theatre curriculum or consent of instructor. 4 hours or 1 unit.
336. **History of Scene Design.** Surveys major historic developments in stage design. Prerequisite: Junior standing. 3 hours or 1 unit.
337. **Scene Painting Techniques.** Techniques and practice of scene painting; lab time required. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
338. **Rendering Techniques for the Stage.** Perspective techniques for the stage; model building; developing the perspective sketch. Prerequisite: Consent of instructor. 2 hours or $\frac{1}{2}$ unit.
339. **Property Design.** Principles of stage property design. Prerequisite: Theatre 335 or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
340. **Lighting Design for Dance.** Survey of conceptual technique and practice of dance lighting; also nontraditional lighting problems including disco, rock, cabaret and industrial shows. Prerequisite: Theatre 231 or 232, or equivalent. 4 hours or 1 unit.
342. **Costume Patterning.** Draping and drafting patterns for period costumes. 3 hours or 1 unit.
345. **Costume History for the Stage, I.** Surveys theatrical costume and fashion of major periods; emphasizes relationships to styles of art and dramaturgy, social milieu, and production design. Prerequisite: Consent of instructor. 4 hours or 1 unit.
346. **Costume History for the Stage, II.** Continuation of Theatre 345. Prerequisite: Theatre 345 or equivalent. 4 hours or 1 unit.
347. **Costume Rendering.** Studio course in costume rendering techniques: analysis of costume figure, rendering of fabrics, exploration of various rendering media. Prerequisite: Consent of instructor. 3 hours or 1 unit.
353. **Creative Dramatics for Children.** Study of the subject matter and techniques of creative dramatics for children with laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
354. **Theatre for the Child Audience.** Study of the history, objectives, and techniques of play production for the child audience; laboratory application. Prerequisite: Consent of instructor. 3 hours, or $\frac{1}{2}$ or 1 unit.
355. **The History and Development of the American Musical Theatre.** Surveys the American

Musical from early minstrel show and operetta origins to current unique theatrical form. Prerequisite: Junior standing or above. 3 hours, or $\frac{3}{4}$ or 1 unit.

361. **Development of Theatrical Forms, I.** History of the drama and theatre of ancient Greece and Rome, the Middle Ages, and the Italian and English Renaissance. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 4 hours or 1 unit.
362. **Development of Theatrical Forms, II.** History of the drama and theatre of the Spanish Renaissance, seventeenth-century France, the English Restoration, the eighteenth and nineteenth centuries in Europe and America, and the Orient. Prerequisite: Theatre 361 or equivalent and consent of instructor. 4 hours or 1 unit.
371. **Contemporary Theatrical Forms.** Study of post-World War I theatre, including the New Stagecraft, expressionism, Brecht and epic theatre, theatre of the absurd, and later developments. Prerequisite: One year of college dramatic literature and junior standing, or consent of instructor. 3 hours or 1 unit.
372. **Introduction to Theatre Management.** An introduction to the basic practices of theatre and arts management with emphasis on facilities management, arts marketing, and the financial problems in the performing arts. Prerequisite: Junior standing in theatre or consent of instructor. 3 hours or 1 unit.
375. **Acting: Rehearsal Techniques.** Acting laboratory emphasizing the actor's work with the director. Fall semester deals with contemporary drama; spring semester deals with classical drama. Taught in conjunction with Theatre 381; students may not register concurrently in Theatre 381. Prerequisite: Theatre 176 or consent of instructor. 3 hours or 1 unit. May be repeated to a maximum of 9 hours or 2 units.
376. **Oral Interpretation of Prose Fiction.** Same as Speech Communications 345. See Speech Communications 345.
381. **Directing: Rehearsal.** Exploration of methods for directing actors and conducting rehearsal. Students may not register concurrently in Theatre 375. Reading and research in current directing principles and practices required of graduate students. Prerequisite: Theatre 281 and consent of instructor. 3 hours or 1 unit.
385. **Preparation for Auditions.** Each actor, through extensive research, prepares a portfolio of audition pieces for the opportunities imminent before and after graduation for resident companies, commercial productions, and film, or professional graduate schools. Prerequisite: Theatre 151, 152, 253, and 254; or consent of instructor. 2 hours or $\frac{1}{2}$ unit.
390. **Professional Internship.** Professional employment with an approved host institution in an area related to the student's academic program; exposure to professional situations in which the commercial theatre operates. Full documentation of internship activities required. Prerequisite: Senior or graduate standing in theatre; consent of Internship Coordinator. 0 to 14 hours, or 0 to 3 units.
401. **Studies in Dramatic Form and Structure.** Same as Speech Communication 400. Studies in the relationship of dramatic form and structure to the contemporary production of historical and modern plays. Prerequisite: Consent of instructor. 1 unit.
403. **Studies in Theatre History: Seventeenth Century to 1900.** Examines selected movements and contributors to the theatre from the English Restoration to the nineteenth century. Prerequisite: Theatre 362 or consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
404. **Studies in Theatre History: Twentieth Century.** Examines selected movements and contributors to the theatre from the late nineteenth-century to the contemporary period. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 2 units with consent of instructor.
406. **Seminar in Theatre History.** Same as Speech Communication 468. Studies in the history of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
407. **Seminar in Theatre Art.** Same as Speech Communication 465. Studies in the aesthetics of the theatre. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
411. **Colloquium in Advanced Design and Theatre Technology.** Projects in design for the

theatre or in theatre technology, including stage scenery, costuming, lighting, makeup, projections, and sound and stage systems. Prerequisite: Candidacy for M.F.A. in theatre with design and technology specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.

415. **Proseminar in Theatre Practice.** Review of contemporary theatre practice in the United States and Western Europe, survey of methods in production research, and advanced instruction in theatre specialties. Prerequisite: Admission to graduate study in theatre. 1 unit.
471. **Colloquium in Acting.** Intensive professional training in acting, dynamics, voice and speech, and theatre movement with a different focus each semester on one particular period of dramatic literature. Prerequisite: Candidacy for M.F.A. in theatre with acting specialty, or consent of instructor. $\frac{1}{4}$ to 2 units. Students must register for all sections to receive credit. May be repeated to a maximum of 12 units.
480. **Theory of Staging.** Seminar in theatre interpretation which considers alternative rationales which explicitly or implicitly underlie performance conceptions; performance theory. Prerequisite: Consent of instructor. 1 unit. May be repeated to a maximum of 4 units.
481. **Colloquium in Directing.** Individual assignments in directing, stage managing, or coaching of actors carried out in conjunction with the semester's productions; prepared at Krannert Center or in conjunction with the training of actors in the undergraduate curriculum. Prerequisite: Candidacy for M.F.A. in theatre with directing specialty, or consent of instructor. 1 or 2 units. May be repeated to a maximum of 8 units.
491. **Special Problems.** Individual research in selected topics by arrangement with the instructor. $\frac{1}{2}$ to 2 units.
495. **Creative Project.** Open to M.F.A. candidates in theatre only. 1 to 2 units.
499. **Thesis Research.** 0 to 4 units.

THEORETICAL AND APPLIED MECHANICS

Head of Department: Donald E. Carlson

Department Office: 212 Talbot Laboratory, 104 South Wright Street, Urbana

NOTE: Credit is allowed for only one of T A M 150, 152, or 154. Credit is not allowed for both T A M 212 and T A M 154.

150. **Analytical Mechanics (Statics).** Resultants of force systems; conditions of equilibrium of force systems; analysis of forces acting on members of trusses, frames, etc.; forces due to friction; and centroids. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 2 hours.
152. **Engineering Mechanics, I (Statics).** Analysis of force systems; equilibrium of two- and three-dimensional systems; trusses, frames, friction; principle of virtual work. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 3 hours.
154. **Analytical Mechanics (Statics and Dynamics).** A combination of Theoretical and Applied Mechanics 150 and 212 with less emphasis on some topics. Prerequisite: Physics 101 or 106; credit or concurrent registration in Mathematics 242 or 245. 4 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
212. **Engineering Mechanics, II (Dynamics).** Elements of vector calculus as applied to mechanics; kinematics of three-dimensional motion of a particle and of a rigid body; motion relative to translating and rotating reference frames; and kinetics of particles and rigid bodies using principles involving force, mass and acceleration, work and energy, and impulse and momentum. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.
221. **Elementary Mechanics of Solids.** Relationship between the internal stresses and deformations produced by external forces acting on deformable bodies, primarily elastic components. Normal and shear stresses and deformations produced by tensile, compres-

sive, torsional and bending loading of members; state of stress and failure; deflection of beams; elastic strain energy and impact loading; stability and buckling of columns. Prerequisite: Theoretical and Applied Mechanics 150 or equivalent; Mathematics 242 or 245. 3 hours.

224. **Behavior of Materials.** Same as Civil Engineering 210. Mechanical behavior of engineering materials, including metals, ceramics, polymers, and materials of construction (concrete, wood, bitumens, and asphaltic concretes); laboratory sessions demonstrating macroscopic behavior and explanations of that behavior in terms of phenomena on the microscopic level. Prerequisite: Theoretical and Applied Mechanics 221. 4 hours.
235. **Fluid Mechanics.** Lectures and weekly laboratory sessions on fluid properties; fluid statics; continuity, momentum, and energy principles via control volumes; ideal and real fluid flow; introduction to the Navier-Stokes equation; similitude; laminar and turbulent boundary layers; closed conduit flow, open channel flow, and turbomachinery. Prerequisite: Theoretical and Applied Mechanics 212. 4 hours.
293. **Research and Design Project.** Formulation of an applied mechanics research and design project to be completed in Theoretical and Applied Mechanics 294. Guidance is received from a faculty member; experience in research and development aspects of engineering design is gained by means of mathematical modelling, numerical analysis, and laboratory experimentation. Prerequisite: Senior or second-semester junior standing in engineering mechanics. 2 hours.
294. **Research and Design Project.** Completion of the project formulated in Theoretical and Applied Mechanics 293. Each student prepares a technical report or paper and presents the results orally; the best papers are presented at a symposium held at the end of the semester, bound together and published as a Theoretical and Applied Mechanics Report. Prerequisite: Theoretical and Applied Mechanics 293. 4 hours.
299. **Thesis.** Thesis investigation of special subjects including theoretical and/or experimental research. Prerequisite: Senior standing; approval of head of department. 3 hours.
308. **Fluid Mechanics of Convective Heat Transfer.** Same as Mechanical Engineering 308. See Mechanical Engineering 308.
311. **Vibrations of Mechanical Systems, I.** Theory and application of free and forced vibrations of single and multiple degree of freedom discrete linear systems; matrix methods and the eigenvalue problem; Lagrange's equations; damping; modal analysis; impulse and spectral responses; experimental vibration analysis. Prerequisite: Theoretical and Applied Mechanics 154, or 212; and Math 341 or 285. 3 hours or $3/4$ unit. Credit is not given for both Theoretical and Applied Mechanics 311 and Civil Engineering 374.
314. **Advanced Dynamics for Engineers.** Newtonian mechanics of a system of particles; Lagrangian mechanics of a dynamical system; the kinematics and dynamics of a rigid body; engineering applications. Prerequisite: Theoretical and Applied Mechanics 212 or equivalent; Mathematics 285 or equivalent, and credit or concurrent registration in Mathematics 280. 3 hours or $3/4$ unit.
321. **Advanced Mechanics of Solids.** Review of elementary mechanics of solids; transformations of stress and strain; modes and criteria for failure, including fracture-mechanics concepts; unsymmetrical bending; shear flow and shear center; torsion of noncircular sections; curved beams; Castigliano's theorem; plasticity and limit-load calculations. Prerequisite: Theoretical and Applied Mechanics 221. 3 hours or $3/4$ unit.
324. **Flow and Fracture of Structural Metals.** Fundamental concepts of strength of crystalline engineering materials at atomic, single crystal, and polycrystalline levels of association in relation to engineering mechanisms of failure; functional relationship between material variables, state of stress, strain, time, temperature, and failure of engineering components by creep, stress rupture, fatigue, and brittle fracture. Prerequisite: Theoretical and Applied Mechanics 221 or consent of instructor. 3 hours or $3/4$ unit.
326. **Experimental Stress Analysis.** Measurement of stresses or deformations that are of significance in the engineering design of load-resisting members; use of optical, electrical, and mechanical instrumentation; brittle coatings, electrical resistance strain gages, photoelasticity; new methods. Prerequisite: Theoretical and Applied Mechanics 221 or equivalent. 3 hours or $3/4$ unit.

- 327. Deformation and Fracture of Polymeric Materials.** Same as Aeronautical and Astronautical Engineering 327. Introduction to structure, morphology, and properties of amorphous and semi-crystalline polymers and polymer blends; polymer linear viscoelasticity—continuum mechanics (phenomenological treatment); molecular aspects of polymer linear viscoelasticity; nonlinear viscoelastic behavior; yield phenomena and plastic flow; mechanisms and mechanics of damage and fracture; damping and impact behavior of polymers; adhesion, composites, and surface coating. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $3/4$ unit.
- 328. Mechanical Behavior of Composite Materials.** Same as Aeronautical and Astronautical Engineering 328. Fundamental concepts underlying formation, characteristics, and behavior of such composite materials as fiber-reinforced laminates, honeycomb structural sandwiches, and load-bearing adhesive joints; their use in engineering structures and components under static, dynamic, and cyclic loading. Micromechanics, lamination theory, viscoelasticity, anisotropic elasticity, hygrothermal stress, fracture mechanisms and mechanics, and degradation in different environments; methods of design, analysis, and testing. Prerequisite: Theoretical and Applied Mechanics 221 and 224, or consent of instructor. 3 hours or $3/4$ unit.
- 335. Dynamics of Fluids.** An intermediate course in the mechanics of fluids introducing analytical methods of solution for ideal and real fluids; potential flow theory, theoretical approaches to viscous flows, including boundary layer theory; and the analysis of compressible flows. Prerequisite: Theoretical and Applied Mechanics 235. 3 hours or $3/4$ unit.
- 351. Fundamental Concepts of Deformable Body Mechanics.** Same as Aeronautical and Astronautical Engineering 326. Introduction to the general theories of kinematics of deformable bodies; general balance laws applicable to continuum mechanics; constitutive relations (stress-strain relations); applications in elasticity, viscoelasticity, and fluid mechanics; special topics. Prerequisite: Theoretical and Applied Mechanics 221 or Aeronautical and Astronautical Engineering 224; and Mathematics 280 and 285. 3 hours or $3/4$ unit. Students in theoretical and applied mechanics may not receive graduate credit for this course, except by petition to the Graduate Program Committee.
- 360. Continuum Mechanics, I.** A unified treatment of modern continuum mechanics; linear algebra and analysis, review of kinematics and general balance laws, and general theory of mechanical constitutive equations (simple materials). Prerequisite: Theoretical and Applied Mechanics 351 or equivalent. 3 hours or $3/4$ unit.
- 373. Fundamentals of Engineering Acoustics.** Same as Electrical and Computer Engineering 373. See Electrical and Computer Engineering 373.
- 392. Design and Analysis in Engineering Practice.** Examples of design problems which occur in engineering practice and the procedures which are used to solve them; emphasis on establishing the relationship between the sophistication of analysis and the level and nature of the design process. Considerable use is made of the case study approach and students are expected to execute a number of tasks at different design levels. Prerequisite: Senior standing or consent of instructor. 3 hours or $3/4$ unit.
- 393. Independent Study.** Individual studies in any area of theoretical and applied mechanics. 1 to 8 hours, or $1/4$ to 2 units.
- 400. Seminar.** Discussion and lectures on current research topics in Engineering Mechanics. Required of all graduate students each semester. $1/4$ unit.
- 412. Vibrations of Mechanical Systems, II.** Examination of problems in the free and forced vibration of continuous linear elastic structures, including strings, rods, beams, membranes, and plates; Hamilton's principle; Sturm-Liouville problems; solution by separation of variables, integral equations and transform methods; variational and other methods of approximation; Green's functions; random vibrations and statistical energy analysis; damping. Prerequisite: Theoretical and Applied Mechanics 311 or Civil Engineering 374, or equivalent. 1 unit.
- 416. Energy Principles in Engineering Mechanics.** Introduction to the variational principles of mechanics and their applications to engineering problems; the derivation, interpretation, and applications of the principles of virtual displacements, minimum potential energy and complementary energy; major emphasis on Castigliano's theorem, Hamilton's

principle, and Lagrange's equations of motion; brief treatment of variational methods of approximation. Applications to the stress analysis of statically determinate and statically indeterminate frames, problems of elastic stability, the theories of rings and curved beams, the theory of elastic plates, vibrations of structures, and wave motion. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.

417. **Stochastic Structural Dynamics.** Same as Aeronautical and Astronautical Engineering 452. See Aeronautical and Astronautical Engineering 452.
424. **Properties of Engineering Materials.** Structure of metals and behavior of materials under various conditions of loading and use, including static loading, creep, fatigue, and impact; effects of high and low temperature, strain rate, state of stress, and internal structure; criteria of failure; relation of mechanical properties to behavior; significance of mechanical properties; tests and interpretation of test data; and material specifications. 1 unit.
428. **Analysis of Nonlinear Systems.** Same as Electrical and Computer Engineering 428. See Electrical and Computer Engineering 428.
429. **Theory of Linear and Nonlinear Viscoelasticity.** Same as Aeronautical and Astronautical Engineering 429. See Aeronautical and Astronautical Engineering 429.
431. **Foundations of Fluid Dynamics I - Ideal Flow.** Dynamics of flows in which viscosity is negligible: analysis of drag and lift, slender-body theory, Prandtl's lifting-line theory, bubble dynamics, free-streamline theory, linear and nonlinear wave motion, hydrodynamic stability, vortex motion, modern mathematical and computational techniques for inviscid flows. Prerequisite: An intermediate course in fluid dynamics, advanced calculus and a course in differential equations. 1 unit.
432. **Foundations of Fluid Dynamics II - Viscous Flow.** Dynamics of flows in which viscosity is significant or dominant: development of the necessary mathematical tools, theoretical and numerical concepts, and fundamental physics of viscous layers that arise in both high Reynolds number and low Reynolds number flows; dimensional analysis, exact solutions to the Navier/Stokes equations, jet and wakes, microhydrodynamics, fluid stability, and turbulence; demonstration of numerical techniques and their application. Prerequisite: An intermediate level course in fluid mechanics, advanced calculus and a course in differential equations. 1 unit.
436. **Instability and Transition to Turbulence.** Instabilities and bifurcations; major mechanisms of instabilities; parallel/nonparallel theories; nonlinear theories; chaotic behavior; higher instabilities and breakdown; description of transition processes; transition prediction and control; vortical structures; experimental interpretations; computational methods; receptivity; transition to turbulence in typical flows; engineering aspects and technological applications. Prerequisite: Theoretical and Applied Mechanics 432 or equivalent; Theoretical Applied Mechanics 441, Physics 420 or equivalent; or consent of instructor. 1 unit.
437. **Experimental Methods of Fluid Mechanics.** Lecture and laboratory course on the methods and techniques for measurement and analysis of data used in experimental fluid mechanics. Background material in signal processing, electronics and electro-optics is developed as needed and integrated into unified discussion of methodology. Topics include fluid mechanical properties, experimental signal processing, random data and signal analysis, analog processing, digital data processing, dynamic similarity self-preservation, pressure measurement, thermal anemometry, laser/Doppler velocimetry, flow visualization and optical diagnostics of temperature and concentration. Prerequisite: Intermediate fluid mechanics course. 1 unit.
438. **Turbulence.** Instability and origins of chaotic motion in fluid flow, Reynolds averaging and statistical description of turbulence, correlations and spectral dynamics of homogeneous turbulence, anisotropic flows, coherent structures, inhomogeneous turbulence, transport models, and large/eddy simulation. Prerequisite: Theoretical and Applied Mechanics 308 or 335 or 432 or equivalent. 1 unit.
441. **Applied Analysis in Engineering.** Training in applications of mathematics to engineering problems, including ordinary differential equations and special functions, boundary-value problems and series solutions, and partial differential equations; illustrations taken from engineering mechanics. Prerequisite: Mathematics 242; Mathematics 280 and 285 recommended. 1 unit.

442. **Applied Analysis in Engineering.** Continuation of Theoretical and Applied Mechanics 441. Application of complex-variable methods; Laplace transforms; Fourier transforms; and special topics selected by the instructor. Prerequisite: Mathematics 242; Mathematics 280 and 285 recommended. 1 unit.
445. **Advanced Physical Acoustics.** Same as Electrical and Computer Engineering 445. See Electrical and Computer Engineering 445.
446. **Nonlinear Waves in Engineering.** Theory and application of nonlinear waves in fluid mechanics, solid mechanics, and acoustics; first-order nonlinear partial differential equations, kinematic waves; Burgers' equation; nonlinear acoustics and weak shocks; linear dispersive waves, wave patterns, water waves and solitary waves; applications to current engineering problems. Prerequisite: Theoretical and Applied Mechanics 441 and one of the following: Theoretical and Applied Mechanics 431, 432, 445, 451, or 458; or consent of instructor. 1 unit.
451. **Theory of Elasticity with Application to Engineering Problems.** Study of the mechanics of elastic deformable bodies, based on the fundamental concepts of equilibrium, geometry of strain, and properties of materials; detailed study of relations between stresses, strains, and displacements; and special consideration given to their significance in engineering problems. Prerequisite: Theoretical and Applied Mechanics 221; Mathematics 280; Mathematics 341 or equivalent. 1 unit.
452. **Theory of Elasticity with Application to Engineering Problems.** Continuation of Theoretical and Applied Mechanics 451. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
454. **Theory of Shells.** Stress analysis of shell-type structures, such as ships, submarines, monocoque aircraft structures, concrete roofs and domes, pressure vessels, and containers for liquids; differential geometry of shell theory, equilibrium equations, momentless theory, strains; statically indeterminate problems; energy formulations and stability of shells. Prerequisite: Theoretical and Applied Mechanics 451. 1 unit.
457. **Topics in the Theory of Elasticity.** Topics which may be covered are: large elastic deformations, equilibrium solutions for rubber-like materials; conservation laws and variational principles for large elastic deformations; linear small/strain behavior, large displacements with small strains; infinitesimal deformations, stress functions and displacement potentials, numerical techniques for boundary-value problems, anisotropic materials; bodies with initial stress, stability of equilibrium states; elastic behavior of composite bodies. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent, or consent of instructor. 1 unit.
458. **Elastic Waves.** Simple one-dimensional waves; Fourier and Laplace transforms; review of linear elasticity; waves in an unbounded medium; reflection, refraction, and surface waves; basic singular solutions; integral representation theorems; waves in an elastic half-space; waveguides; waves in anisotropic and heterogeneous media. Prerequisite: Theoretical and Applied Mechanics 311 or Electrical or Computer Engineering 373; and Theoretical and Applied Mechanics 431 or 451; and Mathematics 346; or consent of instructor. 1 unit.
459. **Asymptotics and Singular Perturbations in Engineering and Physics.** Same as Mathematics Nuclear Engineering, and Physics 459. See Mathematics 459.
462. **Theory of Plasticity.** The physical and mathematical formulation of the mechanics of inelastically deformed bodies, plastic stress-strain laws, and their association with yield and loading functions, in biaxial and triaxial stress conditions; to flexure and torsion of prismatic members, expansion of thick-walled cylinders and spherical shells; introduction to problems in plane plastic flow and variational plasticity. Prerequisite: Theoretical and Applied Mechanics 451 or equivalent. 1 unit.
474. **Numerical Methods for Boundary Value Problems in Mechanics.** Theory and application of various numerical methods in applied mechanics: the finite element method, finite difference techniques and boundary integral methods; variational, Rayleigh-Ritz and weighted residual methods. Requirements for convergence and accuracy. Applications in elasticity, elastodynamics, nonlinear solid mechanics, fluid flow, and heat

transfer. Prerequisite: Mechanical Engineering 345 or Computer Science 355, or consent of instructor. 1 unit.

- 485. Fracture Mechanics.** Analytical and experimental techniques used to solve current fracture problems; macroscopic theories used to determine the static strength of bodies containing cracks; linear elastic fracture mechanics (the tool and the model) and its relation to the Griffith criterion; elastic-plastic fracture mechanics models; small-scale yielding results and their implications; general yielding; fracture control. Prerequisite: Theoretical and Applied Mechanics 324 and 451, or consent of instructor. 1 unit.
- 493. Advanced Independent Study (Special Problems).** Analytical or experimental studies in one or more phases of theoretical and applied mechanics, including mechanics of materials, theory of elasticity, theory of plasticity, properties of materials, mechanical vibrations, hydraulics and fluid mechanics, and applied mathematics. $1/4$ to 2 units.
- 499. Thesis Research.** 0 to 4 units.

URBAN AND REGIONAL PLANNING

Head of Department: Lewis D. Hopkins

Department Office: 907 $1/2$ West Nevada Street, Urbana

- 101. Planning of Cities and Regions.** Survey of city and regional planning as related to problems and programs of urbanization and resource development. Prerequisite: Sophomore standing or consent of instructor. 3 hours.
- 116. Analytical Planning Research Methods.** Numerical and statistical analysis of data for planning, forecasting, and decision making. Data and problems framed from planning cases and resulting in professional quality analytical memoranda. Includes use of microcomputer analytical software. 4 hours.
- 199. Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
- 203. Cities, Regions, and Social Science.** Planning implications of economic, geographic, political and social structure of cities and regions; introduces social science theories to understand and analyze cities and regions. Students use computer simulation and data bases to analyze a city or region. Prerequisite: Economics 102 or Sociology 100 or equivalent; and Statistics 100 or equivalent. 3 hours.
- 205. Ecological Systems in Planning.** Basic ecological principles pertinent to planning and management through examination of problems that arise from inadequate consideration of structure and function of ecological systems; analysis of contemporary planning issues in framework of natural and cultural systems context. One-day field trip required. 3 hours.
- 247. Planning Workshop, I.** Field work dealing with selected physical and/or social planning problems. Prerequisite: Consent of instructor. 6 hours.
- 260. Urban Social Problems and Planning.** Examines the traditional pattern of social planning decisions and emergent alternatives at the federal, city, and neighborhood levels; includes case studies, field work, and term project. 3 hours.
- 290. Planning Internship.** Professionally supervised field experience in public and private planning or development agencies; designed to introduce students to professional employment and actual planning practice. Students work in a department-approved agency of their own choice either during the summer session or part-time during a regular semester. At least two weeks of full-time employment or its equivalent is required for each semester hour of credit. Summary reports are submitted by both employer and student. Prerequisite: Senior standing or consent of instructor. 0 to 6 hours. No more than 8 hours of Urban Planning 290 may be applied toward the Bachelor's degree.
- 297. Special Problems.** Special projects, research, and independent reading. Prerequisite: Consent of head of department. 2 to 6 hours.
- 301. Development of American Planning Thought.** Planning from the mid-nineteenth century to the present as related to cultural, societal, and philosophical influences. Prerequisite: Consent of instructor. 3 hours, or $3/4$ or 1 unit.

- 303. Urban Structure and Functions.** The concept of urban structure; the elements of urban spatial structure and growth; the human stresses in urban spatial structure; and structural remedies past and present. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 304. Urban Planning Theory.** Examination of the urban planning function within a theoretical, methodological, institutional, and professional context. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 305. Environmental Planning in a Watershed Context.** Uses the watershed as the basic organizing concept in environmental planning and management; methods for assessing watershed boundaries, geology, soils and surface and groundwater system processes. Emphasizes ecological implications of patterns of land use on functional and qualitative aspects of watershed systems. All-day field trip required. 4 hours or 1 unit.
- 308. Law and Planning Implementation.** Cases, legislation, and materials illustrative of the social, economic, and environmental interrelationships of land-use planning and the dynamic role of law as a system of controlled conflict; traditional and emerging concepts of zoning, subdivision regulation, housing codes, and review procedures. Prerequisite: Political Science 150, or 305 and 306, or Urban Planning 315, or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 309. Planning Negotiation.** Examination and simulation of negotiation concepts and techniques as an ad hoc or integrated element of a planning process. Case assignments and exercises are used to supplement readings. Prerequisite: Upper division or graduate standing. 4 hours or 1 unit.
- 312. Graphics and Communication for Planners.** Graphics, media communication, photography, and report preparation techniques applied particularly to professional planning practice. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 316. Planning Analysis.** Research and analytic techniques in urban planning: economic base and employment; population; market analysis; and derivation and use of statistical data. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 320. Planning for Historic Preservation.** Survey of the preservation movement in relation to urban planning; techniques for selection of sites and definition of districts; funding, regulation, and implementation measures; and case studies of preservation plans and programs. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 326. Urban Design and Planning Methods.** Concepts and techniques of urban analysis, plan making, and implementation essential for effective interdisciplinary work in urban design; case studies of major types of large-scale projects. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 327. Preservation Planning Workshop.** Small group field work dealing with application of planning principles and techniques to actual preservation planning problems in a nearby community or area. Prerequisite: Urban Planning 101 or 320, or consent of instructor. 3 to 6 hours, or $\frac{3}{4}$ to $1\frac{1}{2}$ units. May be repeated to a maximum of 12 hours or 3 units.
- 330. Urban Transportation Planning.** Same as Civil Engineering 330. Role of transportation in urban development and planning; characteristics of urban-person transportation systems and methods of analysis and forecasting of urban-person transportation demand; transportation systems management and capital improvement programming; and emphasis on the needs and activities of metropolitan planning organizations. Prerequisite: Civil Engineering 230, Urban Planning 332, or equivalent. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 341. Land Resource Evaluation.** Same as Landscape Architecture 341. See Landscape Architecture 341.
- 342. Seminar on Environmental Policy and Law.** Identification and analysis of environmental issues and legal developments primarily at the state and federal levels. Prerequisite: Consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.
- 344. Social Impact Assessment.** Same as Environmental Studies, Forestry, Landscape Architecture, Leisure Studies, and Rural Sociology 344. See Environmental Studies 344.
- 345. Urban Economic Development and Fiscal Packaging.** Public-private-partnerships in urban economic development, including study of potentials, problems, and projects; financing urban economic development through federal grant programs, tax increment financing and other means. Prerequisite: Urban Planning 101 or consent of instructor. 3 hours, or $\frac{3}{4}$ or 1 unit.

347. **Land Use Planning Workshop.** Small group field work applying principles and techniques to specific land use problems in selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1½ units.
348. **Environmental Planning Workshop.** Small group field work applying planning theory, principles, and techniques to specific environmental problems of selected jurisdictions. Prerequisite: Urban Planning 240 or equivalent. 4 or 6 hours, or 1 or 1½ units.
349. **Environmental Management and Planning Simulation.** Management of environmental resources for a large urban area using computer assisted gaming simulation techniques; focuses on the law, technology, administration, and politics associated with environmentally sensitive decisions that require interrelated responses and development of consistent strategies. Prerequisite: Urban Planning 307, 308, 342, 401, or consent of instructor. 2 or 4 hours, or ½ or 1 unit.
365. **Social Planning Evaluation.** Evaluates design and research as it applies to social planning; emphasizes the logic and theoretical assumptions underlying the design, development, implementation, and evaluation of social planning programs rather than techniques of data analysis. Prerequisite: Sociology 185 or Urban Planning 316, or equivalent. 3 hours, or ¾ or 1 unit.
373. **Housing and Urban Policy Planning.** The role of housing in American social policy planning; economic modeling of the housing market, emphasizing supply and demand functions and private market imperfections, and analysis of public policies for housing as they affect special consumer groups (the poor, the elderly, and the minorities). Prerequisite: Economics 101, Sociology 185, and Urban and Regional Planning 260; or consent of instructor. 3 hours, or ¾ or 1 unit.
374. **Neighborhood Planning.** Examines rationale and techniques for planning at the neighborhood level; the major social, political, and economic issues that confound public and private sector efforts to revitalize distressed neighborhoods. Prerequisite: Urban Planning 260 or 360, or equivalent. 3 hours, or ¾ or 1 unit.
375. **Regional Environmental Management Simulation.** Same as Agricultural Economics 319, Civil Engineering 341, Environmental Studies 341, and Geography 341. See Civil Engineering 341.
394. **Special Topics in Urban and Regional Planning.** Seminar on topics of current interest, as announced in the *Timetable*. 2 to 6 hours, or ½ to 1½ units. May be repeated to a maximum of 12 hours or 4 units.
399. **Study Abroad.** Studies comparative urban, regional, national and supranational planning systems, with emphasis on comparing European and Third World with United States planning. Consists of a seminar-discussion section and an application-workshop section. Prerequisite: Urban Planning 247 or equivalent, Urban Planning 301 or 304, or consent of instructor. 0 to 10 hours, or 0 to 2½ units.
401. **Land Use and Site Development Planning.** Develop skills and understanding of land use and site development from an environmental and physical perspective within the context of comprehensive planning; including laboratory and field work. Prerequisites: Admission to the Master of Urban Planning curriculum or consent of instructor. Concurrent enrollment in other MUP core courses is intended. 3-4 unit.
402. **Planning Problems and Cases.** Individual and team experiences in solving problems that require creative application of knowledge and of planning processes to all aspects of human settlements; emphasizes professional skills, including graphics, computer analysis, writing, and presentation; also, reviews of planning cases. Prerequisite: Urban and Regional Planning 303, 308, 401, and 405, or equivalent preparation; and concurrent registration in Urban and Regional Planning 406. 1½ units.
405. **Economic Analysis of Public Plans and Policies.** Techniques of policy analysis and evaluation; includes microeconomic concepts, cost-benefit analysis, cost-effectiveness, and planning-programming-budgeting systems; and examines selected public policies in areas such as transportation, environmental control, health, education, housing, and local finance. Prerequisite: Consent of instructor. ¾ unit.
406. **Urban and Regional Analysis.** Same as Geography 406. Economic and demographic analysis of regional growth and change; emphasizes forecasting and impact studies. Topics include data sources, economic base studies, population estimation and projec-

- and economic impact analysis, and employment projections; practical application of methods to a study area. Prerequisite: Introductory statistics such as Sociology 183 or Geography 183 or consent of instructor. 1 unit.
414. **Issues in Local Public Finance.** Recent trends in financing local governments; revenue and expenditure analysis; accounting and budgeting methods for local governments, with particular emphasis on financing capital improvements and the planning process. Prerequisite: Graduate standing in Urban and Regional Planning, or consent of instructor. 1 unit.
434. **Urban Transportation Policy.** Major policy elements in urban transportation and the relationship of urban transportation to the region, including the decision-making process, configuration and growth of the metropolitan area, and allocation of resources. 1 unit.
440. **Public Involvement in Resource Management and Environmental Planning.** Same as Environmental Studies: Forestry, Landscape Architecture, Leisure Studies, and Rural Sociology 440. See Environmental Studies 440.
445. **Spatial Design Methods.** Same as Landscape Architecture 442. See Landscape Architecture 442.
450. **Issues in Regional Development.** Same as Geography 450. See Geography 450.
456. **Regional Science Methods: Economic and Demographic.** Same as Geography 456. See Geography 456.
457. **Seminar in Regional Science.** Same as Geography 457. See Geography 457.
474. **Housing and Community Development Law.** Seminar using expanded case methods in research and analysis of housing and community development law emphasizing rights, responsibilities, and procedures. Prerequisite: The law course using the case method (comparable legal experience). 1 unit.
475. **Housing and Urban Planning Analysis.** Housing location and developmental models; housing need and market analysis techniques; survey and appraisal of housing; and case studies of current housing problems and current research priorities. Prerequisite: Urban Planning 407 and 473, and a course in urban real estate, or consent of instructor. 1 unit.
480. **Advanced Planning Theory.** Recent advances in planning, policy-making and decision-making theories as they relate to the efficiency of land and to the complex interrelationships among the major uses of land, i.e., housing, transportation, agriculture, specific applications, very unusual, reflecting the students' dissertation research topics. Prerequisite: Urban Planning 309, 309 and 304, or equivalent. 1 unit.
483. **Environmental Science and Planning Research.** Same as Landscape Architecture 483. Critical examination of the nature of scientific knowledge and world views as they relate to environmental planning and resource management; discussion drawn from community and ecosystem ecology and planning, management practices considering research perspectives on contemporary environmental problems. Prerequisite: Urban Planning 309, but no consent of instructor. 1 unit.
490. **Professional Internship.** Summer, part-time, or other professional-level employment in the field of planning, usually in an office or concentration, exposure to the social, political, and institutional setting in which planning operates and full documentation of internship activities required. Prerequisite: Consent of instructor. 4 units.
494. **Seminar.** Selected topics in urban and regional planning, several sections each semester. Prerequisite: Consent of instructor. 1 unit.
497. **Urban Planning Research.** Independent study in selected urban and regional planning topics. Prerequisite: Consent of instructor and head of the department. 1 unit. 1 unit. No more than 4 units may be applied toward the Master of Urban Planning degree.
498. **Master's Project.** Major independent or small-group project conducted in lieu of a master's thesis. Prerequisite: Consent of instructor. 1-3 units.
499. **Thesis Research.** Prerequisite: Graduate standing in urban and regional planning, consent of the head of the department. 3-6 units.

VETERINARY BIOSCIENCES

Head of Department: Richard F. Bevell

Department Office: 3516 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln Avenue, Urbana

300. **Gross Anatomy, I.** Comprehensive study of the thorax, abdomen, and pelvis of the major domestic animals as it relates to veterinary medicine, with emphasis on systematic and topographic anatomy, by lecture and laboratory. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 5 hours or 1¹/₄ unit.
301. **Histology-Embryology, I.** Lecture-laboratory consideration of basic microscopy, cytology, and both the development and histology of tissues and their organization into the locomotory, integumentary, and digestive systems of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
302. **Gross Anatomy, II.** Comprehensive study of the head, neck, back and extremities of the major domestic animals, as it relates to veterinary medicine, with emphasis on systematic and topographic anatomy, by lecture and laboratory. Prerequisite: Veterinary Biosciences 300 and 301, or consent of instructor. 4 hours or 1 unit.
303. **Bone and Cartilage Biology.** Examines the anatomy, physiology, and biomechanics of cartilage and bone; emphasizes biology of remodeling and repair. Prerequisite: Consent of instructor. 2 hours or 1¹/₂ unit.
305. **Histology-Embryology, II.** Lecture-laboratory consideration of the development and histology of the cardiovascular, urinary, reproductive, respiratory, and endocrine systems of domestic and laboratory animals. Prerequisite: Veterinary Biosciences 301. 3 hours or 3³/₄ unit.
306. **Veterinary Orthopedic Biomechanics.** Same as Bioengineering 306. Explores the relationship between the biology and mechanics of the musculo-skeletal system and its role in the pathobiology and treatment of orthopedic diseases utilizing the techniques of morphology and mechanical engineering; interdisciplinary course for both life science and engineering students. Prerequisite: Biology 122 and Physiology 101, or equivalents; or consent of instructor. 3 hours or 3³/₄ unit.
307. **Comparative Primate Anatomy.** Same as Anthropology 308. Lecture-discussion and dissection laboratory comparing the organ systems of old and new world primates to those of a dog. Prerequisite: Veterinary Biosciences 300 or Cell and Structural Biology 234, or equivalent; consent of instructor. 2 hours or 1¹/₂ unit.
309. **Veterinary Clinical Electrocardiography.** Utilizes basic principles of cardiac electrophysiology in delineating the value and limitations of electrocardiography in veterinary medicine and diagnosing cardiac enlargement and/or arrhythmias. Prerequisite: Veterinary Biosciences 316. 1 hour.
310. **Neurobiology.** An introduction to the science of neurobiology, both neuroanatomy and neurophysiology and their importance to an understanding of the normal integrative nervous system of domestic and laboratory animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 3 hours or 3³/₄ unit.
315. **Physiology, I.** Lecture-discussion and laboratories on endocrine, reproductive, and renal systems, physiology of vision, ear structure and function. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
316. **Physiology, II.** Lecture-discussion of digestive, cardiovascular, and respiratory systems; and acid-base balance. Prerequisite: Second-year standing in the veterinary curriculum or consent of instructor. 4 hours or 1 unit.
317. **Physiology-Pharmacology Laboratory.** Laboratory study of physiological processes and the effects of drugs upon these processes. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
318. **Pharmacology, I.** Lecture-discussion on the general principles of pharmacology and analysis of the action of chemical agents on physiological processes. Prerequisite: For professional students, second-year standing in the veterinary curriculum; for graduate students, Veterinary Biosciences 315 and 316, or equivalent. 2 hours or 1 unit.

319. **Pharmacology, II.** Lecture-discussion on the action of chemical agents on physiological processes and disease-producing organisms. Prerequisite: Veterinary Biosciences 318 or equivalent. 3 hours or $\frac{3}{4}$ unit.
320. **Toxicology.** Discusses the mechanisms of action, clinical, diagnostic, and therapeutic aspects of chemical and plant toxicants in domestic animals. Prerequisite: Veterinary Biosciences 319 or equivalent. 2 hours or $\frac{1}{2}$ unit.
321. **Advanced Clinical Cardiology.** Lecture-discussion course devoted to veterinary clinical cardiology, discusses various cardiac conditions such as arrhythmias, congenital anomalies, acquired vascular disease, and other common types of acquired cardiac disease from the standpoint of diagnosis, treatment, and management. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
322. **Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Clinical Medicine 322. Lectures designed to assist the student in integrating knowledge of the science of pharmacology with an understanding of veterinary internal medicine; emphasizes the establishment of therapeutic objectives as applied to various body systems. Prerequisite: Fourth-year standing in the veterinary curriculum. 2 hours.
324. **Nutritional Aspects of Large Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in cattle, horses, sheep, and swine; presentation of therapeutic principles, and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 2 hours.
326. **Nutritional Aspects of Small Animal Medicine.** Clinical aspects of nutritional deficiencies, imbalances, and toxicities in small animals; presentation of therapeutic principles, and nutritional aspects of the etiology, prevention, and treatment of specific disease conditions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 1 hour.
329. **Advanced Veterinary Toxicology.** Applies and expands concepts in Veterinary Biosciences 320, emphasizes discussion of clinical and diagnostic aspects of major toxicoses. The optional laboratory is offered only to students enrolled in the discussion section; laboratories and field trips give students additional expertise in proper diagnostic and therapeutic practices. Prerequisite: Veterinary Biosciences 320. 1 or 2 hours.
345. **Statistical Methods.** Same as Agricultural Engineering, Animal Science, and Forestry 345. See Animal Science 345.
349. **Basic Toxicology.** Same as Environmental Studies 349. See Environmental Studies 349.
350. **Integrated Electron Microscopy.** Same as Biology 350. See Biology 350.
352. **Scanning Electron Microscopy Laboratory.** Same as Biology 352. See Biology 352.
353. **Transmission Electron Microscopy Laboratory.** Same as Biology 353. See Biology 353.
367. **Radiology and Radiobiology.** Same as Veterinary Clinical Medicine 367. See Veterinary Clinical Medicine 367.
378. **Veterinary Clinical Orientation.** Same as Veterinary Clinical Medicine and Veterinary Pathobiology 378. See Veterinary Clinical Medicine 378.
392. **Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.
405. **Morphology of Reproduction.** Morphology of genital and endocrine organs of reproduction in domestic and laboratory animals, including histochemistry and radioautography, interpretation of illustrations, such as light and electron micrographs, as well as morphometric and stereologic data. Prerequisite: Credit or concurrent registration in Physiology 406. $\frac{1}{2}$ unit.
412. **Advanced Endocrinology.** Same as Animal Sciences 412 and Physiology 412. See Physiology 412.
413. **Cardiovascular Physiology.** Same as Physiology 413. Structure and function of myocardial cells, mechanics of contraction, determinants of cardiac performance, methods for assessing cardiac contractility, determinants of myocardial oxygen utilization, coronary circulation and its regulation, neurogenic control of circulation, circulation during

- exercise, heart failure, myocardial hypoxia and ischemia. Prerequisite: Veterinary Biosciences 316 or Physiology 401; or consent of instructor. $1/2$ unit.
414. **Neurotoxicology.** Same as Environmental Studies 414 and Psychology 414. See Environmental Studies 414.
419. **Neural Control of Cardiorespiratory and Autonomic Function.** Same as Physiology 419. Critical analysis of classic and most influential papers of cardiorespiratory and autonomic control. With instructors' guidance, students select important papers for individual presentation, to be followed by class discussion. Full student participation at each class meeting is required. Prerequisite: Physiology 302 or equivalent physiology course with consent of instructor. 2 hours or $1/2$ unit. May be repeated to a maximum of 6 hours or $1\frac{1}{2}$ units.
431. **Advanced Reproductive Endocrinology.** Same as Animal Science 431 and Physiology 431. See Animal Science 431.
432. **Advanced Reproductive Physiology.** Same as Animal Science 432. See Animal Science 432.
433. **Laboratory Methods in Reproductive Physiology.** Same as Animal Science 433 and Physiology 433. See Animal Science 433.
461. **Analytical Methods: Analysis of Drugs in Biological Fluids.** Review of methods used in the detection of drugs/metabolites and toxins in biological fluids and tissues; emphasis on current laboratory methods and procedures (spectrophotometry, chromatography, immunoassay, sample preparation, method validation) used in various aspects of pharmacologic/toxicologic research requiring quantitation of drugs/toxins. Prerequisite: Consent of instructor. 1 unit.
463. **Radioisotopes in Biological Research: Principles and Practice.** Same as Animal Science 463 and Biophysics 463. Lectures, demonstrations, and laboratory on the fundamentals of radioisotope procedures and applications in biology and medicine. Prerequisite: Quantitative chemistry; one year each of mathematics, physics, and biology, or consent of instructor. 1 unit.
465. **Comparative Disposition of Xenobiotics.** Lecture-discussion concerning the fate of foreign chemicals in various species of animals; principles of absorption, distribution, biotransformation, and excretion of drugs and toxicants; and pharmacokinetics and factors which modify these processes. Prerequisite: Biochemistry 353 and Veterinary Biosciences 320, or equivalent. 1 unit.
466. **Comparative Environmental Toxicology and Drug Resistance.** The chemistry, action, and disposition of selected toxic substances at levels associated with environmental contamination; nature and biological consequences of host-toxicant interactions from the perspective of chronic and subclinical effects. Prerequisite: Veterinary Biosciences 465 or Environmental Studies 331; or consent of instructor. $3/4$ unit.
467. **Principles of Drug and Toxicant Evaluation.** Comprehensive discussion of the factors involved in the development of new drugs, the evaluation of drug safety and efficacy, and the analysis of the results of clinical trials. Prerequisite: Veterinary Biosciences 318, 349, or equivalent; and credit or concurrent registration in Agronomy 340 or Biology 371. $3/4$ unit.
468. **Molecular Toxicology.** Same as Environmental Studies 468. See Environmental Studies 468.
490. **Seminar.** Required of all graduate students whose major is veterinary biosciences. 0 or $1/4$ unit.
492. **Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $1/4$ to 1 unit.
496. **Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Pathobiology 496. See Veterinary Pathobiology 496.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

VETERINARY CLINICAL MEDICINE

Head of Department: H. Fred Troutt

Department Office: 244 Small Animal Clinic, 1008 West Hazelwood Drive, Urbana

- 322. Veterinary Clinical Pharmacology: The Basis for Rational Therapeutics.** Same as Veterinary Biosciences 322. See Veterinary Biosciences 322.
- 327. Practice Management for Veterinarians.** Principles of managing a private veterinary practice including practice evaluation, financing, legal formats for owning and operating a practice, economics, personnel management, accounting and record keeping, and marketing. Prerequisite: Third or fourth year standing in veterinary curriculum. 1 hour.
- 330. Companion Animal Medicine, I.** Pathophysiology, diagnosis, treatment, and prophylaxis of diseases of the eye and nervous system. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 2 hours.
- 331. Companion Animal Medicine, II.** Pathophysiology, diagnosis, treatment, prophylaxis of infectious diseases, endocrine disorders, diseases of the skin, and gastrointestinal diseases. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 3 hours.
- 332. Companion Animal Medicine, III.** Pathophysiology, diagnosis, treatment, and prophylaxis of diseases of bloodforming organs, and of the cardiovascular, respiratory, and urinary systems. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 3 hours.
- 333. Companion Animal Medicine, IV.** Pathophysiology, diagnosis, treatment, and prophylaxis of diseases of horses and caged birds. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 2 hours.
- 334. Food Animal General Medicine and Herd Health Management.** Diagnosis, treatment, and prevention of infectious and management related diseases of food animals. Prerequisite: Third year standing in Veterinary Medicine. 5 hours.
- 342. Interpretive Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 342. See Veterinary Pathobiology 342.
- 348. Advanced Veterinary Clinical Pathology.** Same as Veterinary Pathobiology 348. See Veterinary Pathobiology 348.
- 351. Introduction to Surgery.** Surgical principles including sterile technique, hemostasis, tissue handling, and wound healing with emphasis on clinical application in domestic animals; laboratory covers demonstrations and practice of surgical principles. Prerequisite: Third year standing in veterinary curriculum. 1 hour.
- 352. General Small Animal Surgery.** Surgical procedures of major body systems, emphasizing preoperative, operative, and postoperative patient care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 351. 1¹/₂ hours.
- 353. General Large Animal Surgery.** Surgical procedures of major body systems, emphasizing preoperative, operative, and postoperative patient care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 351. 1¹/₂ hours.
- 354. Special Small Animal Surgery.** Lecture and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and after care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 352. 2¹/₂ hours.
- 355. Special Large Animal Surgery.** Lecture and clinical demonstrations on surgical diseases and their diagnosis, operative treatment, and after care, together with appropriate laboratory practice. Prerequisite: Third year standing in veterinary curriculum or consent of instructor; Veterinary Clinical Medicine 353. 2¹/₂ hours.
- 362. Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases; lectures, quizzes, and demonstrations. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
- 363. Small Animal Dermatology.** The first half of the course presents a systematic approach

- to small animal dermatologic diagnoses and therapeutics; the second half deals with immunological disorders, seborrheic syndromes, hereditary disorders, cutaneous neoplasms, and feline dermatology. Prerequisite: Veterinary Clinical Medicine 331 or equivalent, or consent of instructor. 1 hour.
366. **Clinical and Laboratory Practice.** Clinical and laboratory practice in diagnosis, treatment, and prophylaxis of animal diseases. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
367. **Radiology and Radiobiology.** Same as Veterinary Biosciences 367. General principles of radiology and radiobiology techniques and application to the diagnosis and therapy of animal diseases; lectures and discussions. Prerequisite: Third-year standing in veterinary curriculum or consent of instructor. 3 hours.
369. **Clinical and Laboratory Practice.** Clerkship in veterinary clinical medicine and surgery for VM-4 professional students. Prerequisite: Fourth-year standing in veterinary medicine professional curriculum, or equivalent. 2 to 5 hours.
371. **The Evolution and Principles of Surgery.** Studies the evolution of surgery from an empiric craft to a scientific discipline. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
372. **Veterinary Jurisprudence.** Principles of law of importance to members of the veterinary profession; animal disease and related regulatory laws and their administration; and federal procedure under animal disease, food, and meat inspection laws. Prerequisite: Second-year standing in veterinary curriculum. 1 hour.
373. **Small Animal Urology.** The anatomic and physiologic basis for urologic examination of the dog and cat; discussions integrate lesions, pathogenesis, and signs of disease and stress the pathophysiologic basis of diagnosis and therapy in small animal urology. Prerequisite: Veterinary Clinical Medicine 332 or consent of instructor. 1 hour or $1/4$ unit.
375. **Theriogenology.** Examines principles of animal reproduction, fertility, and obstetrics of all species of domestic animals, emphasizing farm animals; lectures, discussion, and laboratory practice in obstetrics, pregnancy diagnosis, and male and female infertility. Prerequisite: Third-year standing in veterinary curriculum. 4 hours.
376. **Veterinary Anesthesiology and Fluid Therapy.** Principles of veterinary anesthesiology emphasizing clinical application of anesthetic techniques and procedures in domestic animals; clinical pharmacology of preanesthetic, anesthetic and related drugs, anesthetic and physiologic monitoring equipment, and shock; teaches fluid and electrolyte therapy with overall emphasis on maintenance of homeostasis in anesthetized animals. Prerequisite: Third-year standing in veterinary curriculum. 2 hours.
377. **Disease Prevention and Therapy in Swine Production.** Practical diagnostic, preventive, and treatment procedures in modern veterinary swine practice; relationships between swine production methods and disease conditions; and herd health programs. Lectures, laboratories, and field trips. Prerequisite: Fourth-year standing in veterinary curriculum. 2 hours.
378. **Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Pathobiology 378. Lectures and demonstrations illustrating the interrelationships between the basic sciences and their applications in medicine and surgery; includes methods of restraint and handling of several animal species. Prerequisite: First-year standing in the veterinary curriculum. 1 hour.
379. **Advanced Veterinary Ophthalmology.** Anatomic, physiologic, pathologic, and pharmacologic considerations in eye diseases and their treatments; instrumentation and methods of study of ocular structure, physiology, and diseases; and laboratories devoted to techniques of examination of the eye and surgical procedures used in treatment of eye diseases. Prerequisite: Fourth-year standing in veterinary curriculum. 1 or 2 hours (1 hour if taking lecture only; 2 hours if taking lecture and lab), or $3/4$ unit.
380. **Dairy Herd Health Management.** A study of dairy cattle practice, including economics, enterprise, management, herd and individual cow health, reproduction, and disease control. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
381. **Advanced Equine Internal Medicine.** Advanced instruction in case management, laboratory data interpretation, decision-making regarding therapeutics, and advanced diagnostic techniques. Prerequisite: Veterinary Clinical Medicine 333 or consent of instructor. 1 to 2 hours, or $1/4$ to $1/2$ unit.

- 382. Exotic Pets.** Principles of restraint, diagnosis, and medical and surgical treatment of diseases of small exotic mammals, birds, reptiles, and fish kept as pets. Prerequisite: Third-year standing in veterinary curriculum. 1 hour.
- 384. Client Relations.** Introduction to client relations, including techniques of effective verbal and nonverbal communication and applications of these techniques for veterinary students. 1 hour.
- 385. Advanced Radiographic Interpretation: Large Animal.** In-depth study of radiographic diagnosis applied to large animals, primarily equine; lecture, case study, and discussion centering on anatomic areas, e.g., foot, fetlock, metacarpus/metatarsus, carpus, tarsus, upper limb joints, and head and neck. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
- 386. Advanced Radiographic Interpretation—Small Animal.** An exercise in systematic interpretation of small animal radiographs. Prerequisite: Veterinary Clinical Medicine 367 or equivalent. 2 hours.
- 387. Advanced Veterinary Anesthesiology.** Lectures cover mechanical ventilators and the physiologic effects of mechanical ventilation on acid-base status, cardiopulmonary function and other homeostatic mechanisms in anesthetized animals; high frequency ventilation in relation to other forms of mechanical respiratory support; recently developed anesthetic agents, techniques, and their clinical applications; interactions between nonanesthetic drugs and their effects on surgical patient response to anesthetic and anesthetic-related agents. Prerequisite: Fourth year standing in veterinary curriculum or consent of instructor. 1 hour or $\frac{1}{4}$ unit.
- 388. Human Interactions with Nonhuman Animals - Issues and Answers.** Study of human interaction with, behavior toward, and treatment of nonhuman animals. Prerequisite: Registration in the veterinary curriculum or consent of instructor. 1 hour.
- 389. Small Animal Diagnostic Instrumentation.** Training in the use of special medical and surgical diagnostic techniques, including endoscopy, ultrasound, and an introduction to electrodiagnostics. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 390. Equine Reproduction.** Instruction in equine reproductive physiology, infectious and noninfectious infertility problems, obstetrical procedures, and preventive medicine practices. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 391. Advanced Orthopedics: Fracture Fixation.** Advanced instruction in the pathophysiology of bone fracture and healing, techniques of fracture fixation and complications of fracture repair. Prerequisite: Veterinary Clinical Medicine 354; fourth year standing in the veterinary curriculum. 1 hour.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ units. May be repeated to a maximum of 6 hours or 1 unit.
- 393. Advanced Neurology.** An advanced course which expands the participants' knowledge of clinical neurology and introduces participants to research techniques used in the elucidation of neurologic disease processes. Prerequisite: Senior or graduate standing in the College of Veterinary Medicine; or consent of instructor. 1 hour or $\frac{1}{2}$ unit.
- 395. Beef Cattle Economics, Management, and Herd Health.** A study of management systems and the economic factors that influence the cattle industry; health programs for beef cattle emphasizing the herd approach and the veterinarian's role in the beef cattle industry. Prerequisite: Fourth-year standing in veterinary curriculum. 1 hour.
- 396. Advanced Small Animal Surgery.** Lecture and laboratories in advanced small animal surgery. Prerequisite: Fourth-year standing in veterinary curriculum or consent of instructor. 1 hour.
- 397. Advanced Equine Lameness.** An elective in the diagnosis and treatment of equine lameness. Prerequisite: Fourth-year standing in the veterinary curriculum. 1 hour.
- 399. Special Senses.** Studies the structure, development, and function of the eye and ear; discusses specific pharmacologic agents and selected anatomical abnormalities which alter normal physiologic processes. Prerequisite: Registration in the veterinary curriculum. 1 hour.

- 484. Current Concepts in Comparative Surgery.** Advanced study of topics concerning the pathophysiology, diagnosis, and current therapy of diseases which are treated with surgical procedures. Prerequisite: DVM or equivalent or consent of instructor. $\frac{1}{4}$ unit. May be repeated to a maximum of 1 unit.
- 488. Advances in Veterinary Dermatology.** A series of lectures, seminars and discussions devoted to the intense study of pathophysiologic aspects of the integument and related systems including: structure and functions, endocrinology, immunology, microbiology, virology, parasitology, pharmacology, oncology, and miscellaneous disorders. Students enrolling for $\frac{1}{2}$ unit credit will also participate in weekly critiques of current literature. Prerequisite: DVM degree or equivalent and consent of instructor. $\frac{1}{4}$ to $\frac{1}{2}$ unit. May be repeated to a maximum of 2 units. Duplicate registration is permitted up to 1 unit.
- 490. Seminar.** Required of all graduate students whose major is Veterinary Clinical Medicine. 0 or $\frac{1}{4}$ unit.
- 491. Recent Advances in Veterinary Internal Medicine.** A series of lectures, seminars, and discussions devoted to intense study of new pathophysiologic aspects of selected topics in veterinary internal medicine. Each semester is devoted to three topics. Prerequisite: D.V.M. degree or equivalent, and consent of instructor. 0 or $\frac{1}{4}$ unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $\frac{1}{4}$ to 1 unit.
- 493. Advanced Topics in Veterinary Clinical Medicine.** Instruction in advanced diagnosis, therapeutic modalities, and research methodologies in the areas of small animal internal medicine, small animal surgery, equine and food animal medicine and surgery, ophthalmology, theriogenology, radiology, and clinical pharmacology. Prerequisite: D.V.M. degree or equivalent; consent of instructor. $\frac{1}{4}$ to 1 unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

VETERINARY MEDICAL SCIENCE

Dean of College: Victor E. Valli

Department Office: 3229 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln Avenue, Urbana

Effective January 1, 1980, the graduate courses in veterinary medical science have been realigned with one of the three departments in the College of Veterinary Medicine. The following courses have been retained to allow existing VMS students to complete their degree requirements in veterinary medical science.

- 490. Seminar.** Required of all graduate students whose major is veterinary medical science. $\frac{1}{4}$ unit.
- 499. Thesis Research.** 0 to 4 units.

VETERINARY PATHOBIOLOGY

Acting Head of Department: Kenneth Todd

Department Office: 2522 Veterinary Medicine Basic Sciences Building, 2001 South Lincoln Avenue, Urbana

310. **Immunogenetics and Immunophysiology.** Same as Animal Sciences 310 and Biology 310. See Animal Sciences 310.
326. **Parasitologic Techniques and Systematics.** Survey of taxonomy of animal parasites; structures used for taxonomy are studied after collection, preservation, and preparation of parasite specimens. Prerequisite: Veterinary Pathobiology 333 or equivalent. 3 hours or $3/4$ unit.
329. **Veterinary Medicine and Society: Ethics, Economics, and Egos.** Introduction to the process of integrating personal and professional development with social need and cultural determinants of that need; seminar format using selected writings in history and philosophy of medicine, science, and developmental psychology with class discussions relating readings to professional development. Prerequisite: Veterinary Pathobiology 330. 1 or 2 hours.
330. **Veterinary Medical History, Ethics, and Orientation.** Introduction to the history, recent developments, scope, and trends of veterinary medical education, practice, research, public health, and other areas; functions, obligations, and organization of the profession. Prerequisite: First-year standing in veterinary curriculum. 1 hour.
331. **Veterinary Bacteriology and Mycology.** Studies the properties of bacteria and fungi responsible for diseases of domestic and wild animals; emphasizes epidemiology, pathogenesis, and morphological and cultural characteristics of bacteria and fungi, and diagnosis. Prerequisite: First-year standing in veterinary curriculum or consent of instructor. 4 hours or 1 unit.
332. **Veterinary Immunology.** Fundamental principles of immunology; mechanisms and functions of the humoral and cell-mediated immune responses; role of the immune system in protection against infectious diseases and tumors; immune dysfunctions and diseases of immunologic origins. Lectures and laboratory. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 2 hours or $1/2$ unit.
333. **Veterinary Parasitology.** Protozoan, arthropod, helminth parasites affecting domestic animals and humans; lectures, discussions, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 20 hours in chemistry or animal biology, or both; consent of instructor. 5 hours or 1 unit.
334. **General Pathology.** Cellular, organic, and systematic reactions to acute and chronic injury related to infections, circulatory disturbances, intoxications, parasitism, immunologic disorders, metabolic disturbances, and disturbances of growth, including neoplasms; lectures, quizzes, demonstrations, and laboratory. Prerequisite: Second-year standing in veterinary curriculum or 25 hours in histology, parasitology, physiology, and microbiology; consent of instructor. 4 hours or 1 unit.
335. **Special Pathology.** Disease processes including specific diseases, affecting organs and anatomic systems. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 4 hours or 1 unit.
337. **Veterinary Virology.** Fundamental principles of animal virology; mechanisms of virus-cell and virus-host interactions; explores properties of the major groups of animal virus in relation to replication and pathogenesis of viral disease. Lecture and laboratory. Prerequisite: First-year standing in the veterinary curriculum or consent of instructor. 2 hours or $1/2$ unit.
338. **Veterinary Clinical Pathology.** Discusses the function and interpretation of hematological, chemical, and certain other procedures, including exfoliative cytology, as aids in the diagnosis of animal diseases; emphasizes the correlation of laboratory findings with fundamental changes and clinical manifestations of disease. Prerequisite: Second-year standing in veterinary curriculum. 4 hours.

- 341. Food Hygiene and Public Health.** Introduction to public health; diseases of animals transmissible to man; and procedures and techniques used in inspection of food of animal origin. Prerequisite: Second-year standing in veterinary curriculum or consent of instructor. 2 hours or $1/2$ unit.
- 342. Interpretive Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 342. Discusses clinical pathologic findings used in the diagnosis of disease affecting domestic animals including dog, cat, horse, and cow with emphasis on hematology, urinalysis, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338 or equivalent. 2 hours.
- 343. Diseases of Poultry.** The causes, symptoms, lesions, prevention, and treatment of noninfectious and infectious diseases of domestic birds; lectures, quizzes, and PLATO demonstrations. Prerequisite: Third- or fourth-year standing in veterinary curriculum or consent of instructor. 2 hours.
- 344. Clinical Immunology.** The impact of immunologic mechanisms in clinical medicine; autoimmunity, tolerance, immune complex disease, and immunoprophylaxis; lectures and demonstrations. Prerequisite: Veterinary Pathobiology 332 or equivalent. 2 hours or $1/2$ unit.
- 346. Principles of Laboratory Animal Science, I.** First of two course series. Addresses fundamental issues in Laboratory Animal Science including history, regulatory aspects, ethical considerations, and basic biology and husbandry of common laboratory animal species. Prerequisite: Second or third-year standing in the veterinary professional curriculum, registration in the graduate college, or consent of instructor. 1 hour or $1/4$ unit.
- 348. Advanced Veterinary Clinical Pathology.** Same as Veterinary Clinical Medicine 348. Advanced lectures, discussions, and laboratory work in hematology, exfoliative cytology, and clinical chemistry. Prerequisite: Veterinary Pathobiology 338. 2 hours.
- 350. Epidemiology.** Principles and uses of epidemiology and biostatistics in the practice of veterinary medicine. Prerequisite: Second-year standing in veterinary curriculum. 2 hours or $1/2$ unit.
- 355. Animal Necropsy Procedures.** Instruction and practice in the performance of postmortem dissections; emphasizes the recognition of macroscopic pathologic changes on the assessment of their effects and on their diagnostic significance. For nonpathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, and Veterinary Clinical Medicine 371; or equivalent; and consent of instructor. 1 or 2 hours, or $1/4$ or $1/2$ unit. May be repeated to a maximum of 6 hours or $1 1/2$ units.
- 356. Principles of Laboratory Animal Science, II.** Continuation of Veterinary Pathobiology 346. Additional topics include laboratory animal diseases, biohazard control, gnotobiology and animal models of human disease. Prerequisite: Veterinary Pathobiology 346 or equivalent, or consent of instructor. 1 hour or $1/4$ unit.
- 370. Computer Literacy/Information Management.** Tutorials and assignments on the Macintosh microcomputers complemented by lecture/discussion sections. An integrated program, Microsoft Works, will be used to introduce the student to four basic microcomputing tools; word processing (WP); database management (DB), spread sheet (SS) with graphics; and communications (CM). Pass/fail grades will be based on successful completion of 8 to 10 projects on the computers. Prerequisite: Enrollment in the College of Veterinary Medicine professional curriculum. 2 hours.
- 371. Epidemiology and the Media.** Same as Health and Safety Studies 371. Seminar based on student presentation of current epidemiological topics, followed by class discussion. Topics originate from popular media accounts, combined with information from original scientific communications. Outside speakers provide alternative views about the role of the media in presenting scientific issues. Prerequisite: One semester of epidemiology. 1 hour or $1/4$ unit to $1/2$ unit.
- 374. Principles of Epidemiology.** Same as Environmental Studies, Health and Safety Studies, and Medical Sciences 374. See Health and Safety Studies 374.
- 378. Veterinary Clinical Orientation.** Same as Veterinary Biosciences and Veterinary Clinical Medicine 378. See Veterinary Clinical Medicine 378.
- 392. Special Problems.** Individual research on a special problem chosen in consultation with the instructor and department head. Prerequisite: Registration in veterinary curriculum

with grade-point average of 4.0 or above, or consent of instructor. 1 to 3 hours, or $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 6 hours or 1 unit.

- 414. Free Radicals in Biology.** Discussion of oxygen radical reactions in simple chemical and biochemical systems, the role of defenses against oxidative stress, physiological, pharmacological, toxicological, and pathological aspects of oxygen radicals. Prerequisite: Consent of instructor. 1 unit.
- 415. Mechanisms of Microbial Infections.** Newer concepts of host-microorganism relations; emphasis on the dynamics and pathogenic mechanisms of microorganisms, immune responses and defense factors of the host, and pathogenesis of specific infections. Lectures, discussions, laboratory, and special problems. Prerequisite: Microbiology 326 or Veterinary Pathobiology 332, or equivalent; consent of instructor. $\frac{3}{4}$ or 1 unit.
- 416. Epidemiology of Infectious Diseases.** Same as Health and Safety Studies 476. Ecology of infection and disease; spread of disease and modes of transmission; methods of control; socioeconomic consideration; selected diseases: malaria, Lyme disease, anaplasmosis, schistosomiasis, salmonellosis, pseudorabies, AIDS. Student presentations. Prerequisite: Epidemiology class (Veterinary Pathobiology 350, Health and Safety Studies 374 or equivalent), or consent of instructor. 3 hours or $\frac{3}{4}$ unit.
- 417. Principles and Methods of Veterinary Epidemiology.** Same as Health and Safety Studies 477. Theoretical and applied principles of veterinary epidemiology; quantitative and computer-based methodology for evaluating disease risk, prognosis, and treatment at the individual and population level. A veterinary degree is not required for enrollment. Prerequisite: Graduate student standing. $\frac{3}{4}$ unit.
- 418. Concepts and Topics in Immunology.** Same as Biology 418. Newer concepts and theories in the field of immunology, including theories of antibody formation and immunological tolerance, regulation of the immune response, biosynthesis and structure of antibodies, and evolutionary aspects of the immune response. Lectures and discussion. Prerequisite: Consent of instructor; Microbiology 327 and Cell and Structural Biology 308 recommended. $\frac{1}{2}$ unit.
- 419. Animal Virology.** Same as Microbiology 419. A discussion-laboratory with major emphasis on host-parasite relationships, natural history, and epidemiology, supplemented with appropriate laboratory techniques as they pertain to the major groups of animal viruses. Prerequisite: Microbiology 327 and 328, or Veterinary Pathobiology 331 and 332; Biochemistry 350 or 354; consent of instructor. $\frac{3}{4}$ unit.
- 426. Statistical Techniques in Epidemiological Research.** Same as Environmental Studies 427, Health and Safety Studies 427, and Medical Sciences 463. See Health and Safety Studies 427.
- 427. Parasitology and Epidemiology Seminar.** Discussion of selected historic and current literature related to parasitology. Prerequisite: Veterinary Pathobiology 333; or concurrent registration in any one of these courses. $\frac{1}{4}$ unit. May be repeated to a maximum of $\frac{1}{2}$ unit.
- 437. Molecular and Immunoparasitology.** Discussion of the genetic and immunologic mechanisms for parasite evasion of the immune system, effective and ineffective host responses to the parasite, and disease pathology; these factors are related to parasite survival, vaccine development, and diagnosis. Prerequisite: Consent of instructor. 1 unit.
- 442. Laboratory Animal Medicine.** Weekly clinical rounds, weekly or biweekly facilities rounds, and supervised clinical experience. Topics include: biology and husbandry of laboratory animals; diagnosis, treatment, and prevention of disease of laboratory animals; principles of animal use in research and teaching; and management and design of laboratory animal facilities. DVM or equivalent or consent of instructor. $\frac{1}{4}$ to $\frac{3}{4}$ unit. May be repeated to a maximum of 4 units.
- 444. Immunobiological Methods.** Same as Animal Science 444. Laboratory exercises, demonstrations, and discussions of methods and techniques in cellular immunology and immunobiology. Prerequisite: Cell and Structural Biology 308 or Microbiology 327; or equivalent survey course in immunology or immunochemistry. $\frac{1}{2}$ unit.
- 445. Veterinary Diagnostic Pathology, I.** Instruction in the performance of necropsy examinations; emphasizes recognition, interpretation, oral presentations, and written descriptions of gross and histologic lesions; emphasizes histologic features of lesions. For

pathology majors only. Prerequisite: Veterinary Pathobiology 334 and 335, Veterinary Clinical Medicine 369 or equivalent; consent of instructor. 0 to $3/4$ unit. May be repeated to a maximum of $2\frac{1}{2}$ units.

- 446. Veterinary Diagnostic Pathology, II.** Instruction in the use of supplemental diagnostic data in the areas of bacteriology, clinical pathology, immunology, parasitology, toxicology, and virology in arriving at differential and definitive diagnoses; emphasizes pathogenesis of gross and histologic lesions and mechanisms of lesion development. Prerequisite: Veterinary Pathobiology 445 or equivalent, or consent of instructor. 0 to $1/2$ unit. May be repeated to a maximum of $2\frac{1}{2}$ units.
- 447. Pathology Seminar.** Discusses selected pathologic and clinico-pathologic material; requires presentation of a formal seminar. Prerequisite: Credit or concurrent registration in Veterinary Pathobiology 445, and consent of instructor. 0 or $1/4$ unit. May be repeated to a maximum of $1\frac{1}{2}$ units.
- 448. Toxicologic Pathology.** Examines the morphological and biochemical aspects of cellular reactions to injury in acute and chronic toxicities; effect of selected toxic agents on target organs in relation to induced functional and structural changes. Prerequisite: Veterinary Pathobiology 334; and Veterinary Biosciences 320 or Animal Science 360; or equivalent. $3/4$ or 1 unit.
- 449. Pathology of Selected Systems.** Pathogenesis and pathology of disease processes in selected tissue and organ systems; emphasizes the mechanisms of cellular and tissue responses to injury. Topics differ each term. Prerequisite: Veterinary Pathobiology 335 or equivalent; consent of instructor. $1/2$ to 1 unit. May be repeated to a maximum of $2\frac{1}{2}$ units.
- 450. Concepts in Pathology.** Discusses experimental and theoretical aspects of general pathology; emphasizes an interdisciplinary approach to mechanisms of disease. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. 1 unit.
- 453. Tumor Biology.** Examines concepts and principles of the neoplastic process and its morphologic correlates; topics include events mediated by chemical and viral causes of neoplastic transformation, behavioral alterations that mark commitment to neoplastic growth, biology of metastases, and clonal selection as a property of successful tumors. Prerequisite: D.V.M. degree or Master of Science in Biology; or consent of instructor. $3/4$ unit.
- 455. Comparative Oncology.** Comparative study of the nature of mammalian and avian neoplasms based on general and special methods of tumor identification and classification; lectures, demonstrations, and laboratory. Prerequisite: Veterinary Pathobiology 334 and 335, or equivalent. 1 unit.
- 459. Surgical Pathology.** Discusses and interprets disease processes of domestic animals; emphasizes interpretation of pathologic changes in tissue specimens obtained during surgical procedures; correlates structure, function, and prognosis. Prerequisite: Veterinary Pathobiology 445 and 455, or equivalent; consent of instructor. 0 to $1/2$ unit. May be repeated to a maximum of $2\frac{1}{2}$ units.
- 490. Seminar.** Required of all graduate students whose major is veterinary pathobiology. 0 or $1/4$ unit.
- 491. Design and Analysis of Biomedical Experiments.** Principles of sampling, treatment assignment, and statistical analysis applied to biomedical experiments; major emphases include sampling size determination, dose-response functions, and computerized data analysis; use and reporting of statistical methods in biomedical literature are evaluated. Prerequisite: Agronomy 340, Biology 371, or consent of instructor. $3/4$ unit.
- 492. Special Problems.** Basic and applied study including orientation and research on pertinent initial and continuing problems in the student's area of interest. Prerequisite: Consent of instructor. $1/4$ to 1 unit.
- 496. Interdisciplinary Toxicology Seminar.** Same as Environmental Studies 496 and Veterinary Biosciences 496. Interdisciplinary seminar on topics within the area of toxicology; topics vary each semester. Seminars are presented by faculty, visiting lecturers, and students based upon their study, research, and/or professional activities in the selected topic area. Prerequisite: Consent of instructor. $1/4$ unit. May be repeated to a maximum of 2 units.
- 499. Thesis Research.** 0 to 4 units.

VOCATIONAL AND TECHNICAL EDUCATION

Head of Department: Tim L. Wentling

Department Office: 345 Education Building, 1310 South Sixth Street, Champaign

101. **Nature of the Teaching Profession.** Introduction to educational problems; a general study of the nature of teaching; its opportunities and responsibilities. Through individual work, students are helped to evaluate their potentialities for teaching. 2 hours.
152. **Pre-educational Internship.** Early field experiences in an educational setting, including observation and laboratory experiences in community colleges, adult vocational programs, business and industry, health service settings, or governmental agencies; provides opportunities for career exploration, professional orientation, interrelating theory and practice, and understanding the place of the student in the educational process. Prerequisite: Consent of instructor. 0 to 3 hours.
189. **Supervised Occupational Experience.** Provides students preparing to teach in the vocational and technical fields the occupational experience necessary or appropriate to complete the requirements in these curricula. Students who are employed and concurrently enrolled in this course complete assignments covering the related technical information of their chosen fields and undergo regularly scheduled written, oral, and performance examinations. Application for a job assignment must be made three months prior to the semester in which placement is desired. Prerequisite: Sophomore standing. 2 or 3 hours. May be repeated to a maximum of 17 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
240. **Principles of Vocational and Technical Education.** Provides each specialized educational worker with a common orientation as to the major responsibilities of the public school as a unit and to the educational worker's own specialized responsibilities and problems within the framework of the total educational enterprise. Prerequisite: Vocational and Technical Education 101; Psychology 100. 2 to 4 hours.
249. **Independent Study.** Permits study of problems not considered in other courses; designed for students who excel in self-direction and intellectual curiosity. Prerequisite: Upperclassman; upper five percent of class in grade-point average; demonstrated writing competence, research potential, scholarly attitude, and interest as attested to by instructors; consent of adviser and staff member who supervises the work. 2 hours.
252. **Educational Internship.** A practicum in a postsecondary educational setting to prepare students for educational roles where public school certification is not necessary or appropriate. Prerequisite: Vocational and Technical Education 152 and satisfactory progress in the Technical Education Specialties curriculum. 5 to 8 hours.
271. **Technique and Curriculum Development for Teaching Data Processing and Office Machines.** Introduces curriculum and techniques for teaching the operation of a variety of office machines and computers for processing data; introduces current methods of teaching the use of computer processing equipment and requirements for employment. 3 hours.
277. **Programs and Procedures in Agricultural Education.** Preparation for a successful experience in student teaching and for beginning work as a secondary teacher of agricultural education; teaching high school and adult classes, maintaining and using facilities and equipment, supervising agricultural experience programs, advising youth organizations, counseling students, and keeping records and making reports. Prerequisite: Educational Policy Studies 201 and Vocational and Technical Education 240, or consent of instructor; concurrent registration in Vocational and Technical Education 276. 5 hours.
291. **Thesis.** Prerequisite: Senior standing. 2 hours.
292. **Thesis.** Prerequisite: Senior standing. 2 hours.
309. **Vocational Education for Special Needs Learners.** Same as Special Education 309. Examines contemporary legislation, program models, assessment, and instructional practices pertaining to special needs learners in vocational, technical and practical arts education programs at the secondary and postsecondary levels. Prerequisite: Student teaching or consent of instructor. 2 to 4 hours, or $1\frac{1}{2}$ to 1 unit.

- 345. Vocational Training for Mentally Retarded Adolescents and Adults.** Same as Special Education 345. See Special Education 345.
- 349. Special Study and Investigation in Vocational and Technical Education.** Offers opportunity for an individual to study, on or off campus, selected problems, trends, and new developments or to conduct specialized technological investigations for the improvement of instructional programs in areas related to vocational and technical education. Prerequisite: Consent of instructor; demonstrated ability to pursue special study or investigation proposed. 2 to 4 hours, or $1/2$ to 1 unit.
- 350. Education for Rural Development in Low Income Countries.** Same as Agriculture 350. Study of educational institutions needed to further rural development in developing nations; emphasizes educational programs that enable rural families to improve their quality of life. Prerequisite: Senior standing. 2 to 4 hours, or $1/2$ to 1 unit.
- 359. Professional Skill Development Workshop in Vocational and Technical Education.** Designed to teach practitioner-oriented skills in specialized areas of vocational and technical education; students or faculty members may make requests for initiation of sections of this course. Topics vary; consult *Timetable* for specific section offerings. 2 or 4 hours, or $1/2$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
- 370. Agricultural Education for Inexperienced Teachers.** Specific help with the problems of beginning teachers; campus meeting in early fall; other meetings in centers in the state convenient to beginning teachers; and visits by instructors to schools in which enrolled teachers are employed. Prerequisite: Vocational and Technical Education 276 and 277 or equivalent. 3 to 4 hours, or $3/4$ to 1 unit.
- 381. Foundations of Career, Occupational, and Practical Arts Education.** A study of basic concepts and practices of career, occupational, and practical arts education; explores the development of the curricular areas concerned, including types of programs, their place and role in various types of educational settings, students served, and issues and trends in program change. 2 or 4 hours, or $1/2$ or 1 unit.
- 382. Cooperative Vocational and Technical Education Programs.** Provides the specific professional background required of teachers, coordinators, and administrators who organize and conduct public school programs utilizing community resources and experiences; includes the background, philosophy, organization, and administration of cooperative education. 2 or 4 hours, or $1/2$ or 1 unit.
- 383. Planning and Organizing Content for Career, Occupational, and Practical Arts Education.** Emphasizes selection, organization, and preparation of content for instructional programs in career, occupational, and practical arts education; students perform task analyses, prepare instructional objectives, arrange content in appropriate sequence, and determine allocation of resources. 2 or 4 hours, or $1/2$ or 1 unit.
- 385. Problems in Concurrent Work-Education.** While employed in approved cooperating business firms, students observe the relationships between their activities and the specialized educational programs in the high school and community college; in class sessions, emphasis on job analysis, current trends, wage and benefit structure, personnel practices, labor relations, and their implications for teaching. Prerequisite: Completion of prescribed courses in vocational and technical education for teaching in their area of specialization; consent of instructor. 4 hours or 1 unit.
- 387. Training Programs in Industry.** This course is designed to provide an overview of the status of education, training and development in the private sector, describe a systematic process for planning, delivery, and evaluation of training programs conducted within business and industry, and explore the major problems, trends and issues associated with field of human resource development. 4 hours or 1 unit.
- 388. Special Techniques of Teaching Career, Occupational, and Practical Arts Education.** A study of teaching techniques appropriate to career, occupational, and practical arts education; focuses on communication methods and instructional strategies; students conduct investigations, develop materials, and make applications to their areas of concern. 2 or 4 hours, or $1/2$ or 1 unit.
- 392. Curriculum Modification and Individualized Instruction.** Gives students a working knowledge of, and skills in, the principles and application of individualized instruction

theory and methods with competency-based vocational education as its prime focus; includes theory and practices in modifying existing curricula and developing new programs and curricula. Prerequisite: Vocational and Technical Education 383, or course work in curriculum development. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit.

399. **Issues and Developments in Vocational and Technical Education.** A special course for experimentation or for seminar on topics not treated by regularly scheduled courses; requests for initiation of this course may be made by students or faculty members. Topics vary; consult *Timetable* for specific section offerings. 2 or 4 hours, or $\frac{1}{2}$ or 1 unit. May be repeated to a maximum of 8 hours or 2 units.
442. **The Community College.** Same as Administration, Higher, and Continuing Education 442. See Administration, Higher and Continuing Education 442.
445. **Investment in Human Resources.** Same as Labor and Industrial Relations 445. See Labor and Industrial Relations 445.
448. **Continuing Education Program Development.** Same as Administration, Higher, and Continuing Education 448 and Curriculum and Instruction 402. See Administration, Higher, and Continuing Education 448.
449. **Independent Study.** Offers opportunity and challenge of self-directive, independent study, that is, develops the individual's ability as an independent student and enables the student to pursue needed study in a field in which appropriate courses are not being offered during a given semester. Prerequisite: Approval of study outline by adviser and the department chair prior to enrollment. $\frac{1}{2}$ or 1 unit. May be repeated for credit with consent of adviser and department chair.
450. **Evaluation in Vocational, Technical, and Practical Arts Education.** Theory and techniques of vocational education evaluation in cognitive, affective, and psychomotor domains at different educational levels; development and analysis of activities and instruments for student and program evaluation, follow-up studies, and interpretation of results for self-evaluation and for administrative decision making. Prerequisite: Educational Psychology 392 and Vocational and Technical Education 471, or consent of instructor. 1 unit.
451. **Directing Personnel Development in Vocational, Technical, and Practical Arts Education.** Principles and techniques for development of personnel in programs of vocational, technical, and practical arts education; emphasis on personnel development and instructional supervision of paraprofessionals, employers, and foremen of vocational and technical education students. Prerequisite: One unit in vocational and technical education or consent of instructor. 1 unit.
453. **Disciplined Inquiry in Vocational Education.** Provides an analysis and synthesis of disciplined inquiry in vocational education including an historical perspective, formulation of the research process, and the utilization and communication of research. Prerequisite: Vocational and Technical Education 381 and Educational Psychology 390; or equivalent. 1 unit.
456. **Problems and Trends in Specialized Fields of Vocational and Technical Education.** Introduction to significant problems, points of view, and trends in the field concerned; explores significant research relating to organization, content, and techniques in the field in question. Topics vary; consult *Timetable* for specific section offerings. Students are encouraged to make special studies in approved areas. 1 unit.
471. **Policy and Program Development in Vocational, Technical, and Practical Arts Education.** Local, state, and national policies for vocational and technical education; organizing for policy making and program development; and developing desirable policies and programs. 1 unit.
472. **Course Planning and Teaching Procedures in Agricultural Education Programs.** Gathering data essential in course planning, constructing course plans, and developing resource units, teaching procedures, and instructional aids for agricultural and extension education programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
473. **Adult Education in Agriculture.** The case for adult education, needs of young and older adults for agricultural education, development and present status of adult education in

- agriculture, objectives, evaluation, using advisory committees, organizing adult classes, enrolling students, course planning, teaching procedures and aids, supervised practice, group activities, and facilities. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
474. **Supervised Experience in Agricultural Education Programs.** Supervised agricultural experience programs as an educational strategy; importance and meaning of supervised agricultural experiences; planning, conducting, supervising, and evaluating agricultural experience programs; relation of supervised agricultural experience programs to establishment and advancement in an occupation; keeping and using records; and relating class instruction to supervised agricultural experience programs. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
475. **Organizing and Teaching Agricultural Mechanics.** Agricultural mechanics and laboratory instruction as a phase of vocational education in agriculture: purposes, course planning for high school students, young and older adults; methods of teaching and evaluating on-job instruction; planning agricultural-mechanics laboratories and facilities; and providing and teaching safety in agricultural mechanics. Prerequisite: Vocational and Technical Education 276 and 277, or consent of instructor. $\frac{3}{4}$ to 1 unit.
476. **Guidance in Vocational, Technical, and Practical Arts Education.** The guidance function of a vocational or technical teacher; developing guidance related instructional programs; identifying and selecting students for vocational and technical programs; determining labor market needs and projections and job requirements; providing occupational information; placing graduates; counseling parents, students, supervisors, advisory committee members, union members, and employers; and conducting follow-up studies. 1 unit.
481. **History and Basic Concepts of Vocational and Technical Education.** The historical development of modern vocational education; the educational theories underlying its development; and the educational concepts upon which present programs and procedures are based. 1 unit.
482. **Research Studies in Vocational and Technical Education.** Study and evaluation of examples of research in this field; consideration of the research needed to solve present problems. Each student proposes and completes a brief research project, or plans in detail a major research project to be completed later. 1 unit.
488. **Foundations of Curriculum Development for Occupational and Practical Arts Education.** Synthesizes selected sociological, psychological, and epistemological foundations for curriculum development in occupational and practical arts education; application of theories from fundamental disciplines to practice in existing and emerging curricula involving perceptual and psychomotor learning. $\frac{1}{2}$ or 1 unit.
489. **Administration of Vocational and Technical Education.** Problems and approved practices in the administration and supervision of programs of vocational, technical, and practical arts education in secondary schools, junior colleges, and technical institutes. Prerequisite: Consent of instructor. 1 unit.
490. **Seminar for Advanced Students of Education.** Seminar in vocational and technical education open only to persons who have been admitted for doctoral study in vocational and technical education; sections are usually offered in the following areas: (a) industrial education, (b) agricultural education, (c) home economics education, (d) business education, and (e) general vocational and technical education. 0 to 2 units.
491. **Field Study and Thesis Seminar.** Assists doctoral candidates in planning field studies and thesis problems; students present their studies at each of four stages: (1) the inception, delimitation, tentative design stage; (2) the proposed design stage; (3) the revised design stage; and (4) the final design stage. Students are expected to analyze critically all presentations. Prerequisite: Limited to students who have been admitted for doctoral study. 1 to 2 units.
499. **Thesis Research.** Individual direction of research and thesis writing. 0 to 4 units.

WOMEN'S STUDIES

Director of Program: Marianne Ferber

Program Office: 304 Stiven House, 708 South Mathews Avenue, Urbana

111. **Introduction to Women's Studies in the Humanities.** Interdisciplinary introduction to women and gender. Analysis of representations of women (including race, class, and sexuality) in popular culture, painting, film, literature, music, history, religion. 3 hours.
112. **Introduction to Women's Studies in the Social Sciences.** Same as Human Development and Family Studies 145 and Sociology 145. The impact of culture and society on gender roles, including socialization and identity formation, as expressed in life-styles, marriage and family alternatives, and patterns of education and employment. 3 hours.
199. **Undergraduate Open Seminar.** 1 to 5 hours. May be repeated.
201. **Introduction to Feminist Theory.** Interdisciplinary introductory survey of feminist theory. Traces developments in feminist theory and explores contemporary debates. 3 hours.
219. **Women in Japanese Literature.** Same as East Asian Languages and Cultures and Comparative Literature 219. See East Asian Languages and Cultures 219.
224. **Women in Society.** Same as Sociology 224. See Sociology 224.
235. **Women in Politics.** Same as Political Science 235. See Political Science 235.
240. **Sex and Gender in Classical Antiquity.** Same as Classical Civilization 240 and Comparative Literature 262. See Classical Civilization 240.
245. **Women in the Labor Market.** Same as Economics 245. See Economics 245.
250. **Black Women: Histories and Cultures.** Interdisciplinary study of black women's multiple histories and varied cultures including black women from North America, Africa, and the Caribbean. Prerequisite: Afro-American Studies 100 or Women's Studies 111 or 112 or consent of instructor. 3 hours.
262. **Cultural Images of Women.** Same as Anthropology 262. See Anthropology 262.
273. **The History of American Women: Colonial Period to the Present.** Same as History 273. See History 273.
280. **Women Writers.** Same as English 280. See English 280.
290. **Individual Study.** Special topics not treated in regularly scheduled courses; designed especially for advanced undergraduates. Prerequisite: One course in Women's Studies; consent of instructor. 0 to 3 hours. May be repeated to a maximum of 6 hours. Students may register in this course more than once in the same term.
302. **Sex Roles.** Same as Human Development and Family Studies 302 and Sociology 302. See Human Development and Family Studies 302.
332. **Women and Language.** Same as Linguistics and Speech Communication 332. See Speech Communication 332.
341. **Applications of Sex Role Theory to Counseling.** Same as Educational Psychology 341. See Educational Psychology 341.
370. **Selected Topics on Women and Politics.** Same as Political Science 370. See Political Science 370.
380. **Gender Roles and International Development.** Interdisciplinary seminar examining theoretical and empirical research on gender and the transformation of social and economic structures. Students will develop a comparative perspective on issues of women and public policy by contrasting and comparing such policies in North and South America, Eastern and Western Europe, Asia, and Africa. Prerequisite: One course in Women's Studies or one course in international social, economic, or political development, or consent of instructor. 3 hours or 1 unit.
396. **Seminar in Women's Studies.** Interdisciplinary seminar on special topics in women's studies. Prerequisite: Women's Studies 111 or 112, and two courses in women's studies at the 200-300 levels; junior standing; or consent of instructor. 3 hours, or $\frac{1}{2}$ to 1 unit. May be repeated once as topics vary.

- 401. Feminist Scholarship in the Humanities: Theory and Method.** Interdisciplinary graduate-level course in feminist theory, with an emphasis on the humanities. Explores current debates in feminist theory as they pertain to humanities disciplines. Prerequisite: At least one graduate-level humanities course or permission of instructor. 1 unit.
- 402. Feminist Scholarship in the Social Sciences: Theory and Research.** Same as Sociology 425. Interdisciplinary feminist theory and research course with emphasis on the social sciences. Examines theoretical, methodological, and empirical research on sex, gender, and women in the social sciences. Prerequisite: Undergraduate statistics; at least one graduate-level social science course or permission of instructor. A graduate-level course in social science research methods is strongly recommended. 1 unit.

APPENDIX A

Language Offerings

The following is a complete list of the languages regularly offered, together with the unit responsible for offering the course. The reader should consult the listing for the unit for the specific courses offered in the language.

<i>Language</i>	<i>Unit responsible for the language</i>
African Languages	Linguistics
Arabic	Linguistics
Bulgarian	Slavic Languages and Literatures
Catalan	Spanish, Italian, and Portuguese
Chinese	East Asian Languages and Cultures
Coptic	Classics
Czech	Slavic Languages and Literatures
Danish. <i>See</i> Scandinavian	Germanic Languages and Literatures
French	French
German	Germanic Languages and Literatures
Greek (Ancient)	Classics
Hebrew	Linguistics
Hindi	Linguistics
Italian	Spanish, Italian, and Portuguese
Japanese	East Asian Languages and Cultures
Korean	East Asian Languages and Cultures
Latin	Classics
Lingala. <i>See</i> African Languages	Linguistics
Norwegian. <i>See</i> Scandinavian	Germanic Languages and Literatures
Persian	Linguistics
Polish	Slavic Languages and Literatures
Portuguese	Spanish, Italian, and Portuguese
Russian	Slavic Languages and Literatures
Sanskrit	Linguistics
Scandinavian	Germanic Languages and Literatures
Serbo-Croatian	Slavic Languages and Literatures
Spanish	Spanish, Italian, and Portuguese
Swahili. <i>See</i> African Languages	Linguistics
Swedish. <i>See</i> Scandinavian	Germanic Languages and Literatures
Ukrainian	Slavic Languages and Literatures
Urdu. <i>See</i> Hindi	Linguistics
Wolof. <i>See</i> African Languages	Linguistics

Other languages may be offered by tutorial in the following units:

East Asian and Pacific Studies
 East Asian Languages and Cultures
 Latin American and Caribbean Studies
 Linguistics

APPENDIX B

Rubric Abbreviations

Following is a list of official rubric abbreviations for courses currently approved for offering on the Urbana-Champaign campus of the University of Illinois.

A A E	Aeronautical and Astronautical Engineering
ACCY	Accountancy
ADV	Advertising
AFAS	Air Force Aerospace Studies
AFLNG	African Languages
AFRO	Afro-American Studies
AFRST	African Studies
AGCOM	Agricultural Communications
AG E	Agricultural Engineering
AG EC	Agricultural Economics
AG M	Agricultural Mechanization
AGR	Agriculture
AGRON	Agronomy
AHCE	Administration, Higher, and Continuing Education
ANSCI	Animal Sciences
ANTH	Anthropology
ARAB	Arabic
ARCH	Architecture
ART&D	Introduction to Art and Design
ARTCI	Cinematography
ARTCR	Crafts
ARTED	Art Education
ARTGD	Graphic Design
ARTGP	General Professional Courses in Art and Design
ARTHI	History of Art
ARTID	Industrial Design
ARTPA	Painting
ARTPH	Photography
ARTPR	Printing
ARTSC	Sculpture
AS ST	Asian Studies
ASTR	Astronomy
ATMOS	Atmospheric Sciences
AVI	Aviation
B ADM	Business Administration
B&T W	Business and Technical Writing
BIOCH	Biochemistry
BIOEN	Bioengineering
BIOL	Biology
BIOPH	Biophysics
BR	Bridge Program
BULG	Bulgarian
BUS	Business
CATAL	Catalan
C E	Civil Engineering
CER E	Ceramic Engineering

CH E	Chemical Engineering
CHEM	Chemistry
CHIN	Chinese
CLCIV	Classical Civilization
C LIT	Comparative Literature
COMM	Communications
COP	Coptic
C S	Computer Science
CSB	Cell and Structural Biology
C&I	Curriculum and Instruction
CZECH	Czech
DANCE	Dance
EALC	East Asian Languages and Cultures
ECON	Economics
ED PR	Educational Practice
EDPSY	Educational Psychology
EDUC	Education
ECE	Electrical and Computer Engineering
EEE	Ecology, Ethology, and Evolution
E I L	English as an International Language
ENG	Engineering
ENG H	Engineering Honors
ENGL	English
ENTOM	Entomology
ENVST	Environmental Studies
E P S	Educational Policy Studies
E S L	English as a Second Language
F A A	Fine and Applied Arts
FACE	Family and Consumer Economics
FIN	Finance
F N	Foods and Nutrition
FOR	Forestry
FR	French
F S	Food Science
G E	General Engineering
GEOG	Geography
GEOL	Geology
GER	German
GMC	Germanic
GRK	Greek
HDFS	Human Development and Family Studies
HEBR	Hebrew
HINDI	Hindi
HIST	History
HORT	Horticulture
HRFS	Human Resources and Family Studies
HSS	Health and Safety Studies
HUMAN	Humanities
I D	Interior Design
I E	Industrial Engineering
ITAL	Italian
JAPAN	Japanese
JOURN	Journalism
KINES	Kinesiology
KOREA	Korean
L A	Landscape Architecture

L A S	Liberal Arts and Sciences
LA ST	Latin American and Caribbean Studies
LAT	Latin
LAW	Law
LEIST	Leisure Studies
LING	Linguistics
L I R	Labor and Industrial Relations
LIS	Library and Information Science
MATH	Mathematics
MATSE	Materials Science and Engineering
MCBIO	Microbiology
M E	Mechanical Engineering
MED S	Medical Sciences
MET E	Metallurgical Engineering
MFGE	Manufacturing Engineering
MIL S	Military Science
MUSIC	Music
N S	Naval Science
NUAS	Administrative Studies (Nursing)
NUC E	Nuclear Engineering
NUMC	Maternal-Child Nursing
NUMS	Medical-Surgical Nursing
NUPH	Public Health Nursing
NUPS	Psychiatric Nursing
NUSC	Nursing Sciences
NUTRS	Nutritional Sciences
PERS	Persian
PHIL	Philosophy
PHYCS	Physics
PHYSL	Physiology
PLBIO	Plant Biology
PL PA	Plant Pathology
POL	Polish
POL S	Political Science
PORT	Portuguese
PSYCH	Psychology
REES	Russian and East European Studies
REHAB	Rehabilitation Education
RELST	Religious Studies
RHET	Rhetoric and Composition
RMLNG	Romance Linguistics
R SOC	Rural Sociology
RUSS	Russian
R TV	Radio and Television
SANSK	Sanskrit
SCAN	Scandinavian
S CR	Serbo-Croatian
SLAV	Slavic
SOC	Sociology
SOC S	Social Science
SOC W	Social Work
SOILS	Soils
SPAN	Spanish
SP ED	Special Education
SPCOM	Speech Communication
SPSHS	Speech and Hearing Science

STAT	Statistics
T A	Textiles and Apparel
T A M	Theoretical and Applied Mechanics
THEAT	Theatre
UKR	Ukrainian
U P	Urban and Regional Planning
V B	Veterinary Biosciences
V C M	Veterinary Clinical Medicine
V M S	Veterinary Medical Science
VP	Veterinary Pathobiology
VOTEC	Vocational and Technical Education
W S	Women's Studies

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